About the Package

NCERT has developed exemplar material on continuous and comprehensive evaluation (CCE) for the elementary stage in all curricular areas. The material has been developed with wide consultations with subject experts, practitioners and educationists in a series of meetings and developmental workshops at NCERT. This endeavour has been done with the support of MHRD. The package has been field-tested in schools by teachers after orientation by the members involved in the development of the package. The underlying idea of developing the exemplar *CCE material is to provide some examples on how CCE can be used effectively by teachers in various curricular areas till the elementary stage*. The package would facilitate and equip the teachers to implement CCE meaningfully in the classroom. This material would address different facets of CCE, that is, how to carry out assessment *during the teaching-learning process,* assessment after teaching-learning process, recording *and* reporting the child's progress, etc. At the primary stage, generally one teacher teaches all the subjects. Therefore, for this stage, a comprehensive document has been developed covering examples from different subjects. This would not only help primary teachers to follow an integrated approach to teaching-learning across different subjects but also reduce the curricular burden by avoiding overlap of the content. However, at the upper primary stage, subject-wise material has been developed in Science, Mathematics, Social Sciences, Hindi, English, Urdu and Arts Education. The examples given in this package can be conducted in a classroom having teacher-pupil ratio as per the RTE norms (1:30 for primary stage and 1:35 for the upper primary stage). These examples may be adapted/adopted by the States and UTs as per their needs. Broadly, the document includes three sections:

- **Section I:** It begins with an overview which clarifies the need of this package and some misconceptions about CCE that are prevailing in the system. The section develops an understanding on continuous and comprehensive evaluation in the context of Right to Education Act, 2009.
- **Section II**: This section provides subject-wise examples which show how assessment process needs to be followed so as to use assessment as an in-built component of teaching-learning process focusing on assessment for learning (formative assessment). This section also provides criteria for assessment for each subject, spelt out in the form of 'indicators' given in Annexure I. These indicators are purely suggestive in nature. The examples also elaborate how and when *assessment of learning* (summative assessment) can be used by the teachers. This section highlights various methods/ways that can be used to assess child's progress rather than depending on paper-pencil tests only. The section also suggests what kind of data needs to be recorded by the teacher and what kind of assessment data needs to be reported in the report card so as to present a comprehensive picture of child's progress.

- **Section III**: Based on the examples given in section II, this section provides guidelines for practitioners about necessary steps to be followed for implementing CCE. It informs the teacher about assessment as an in-built part of teaching learning process, what kind of preparedness is required, what type of methods to be used for assessment, what can be the various sources for collecting data, what kind of information is to be recorded for reporting and how to communicate the progress of children in a comprehensive manner. This section also provides guidelines for teacher educators and administrators on their role to make CCE as meaningful as possible.
- The package also includes a video film on '*CCE in mathematics classroom',* focusing at the primary stage. The film depicts through examples how a teacher assesses children while teaching-learning process is going on, and what are the ways to provide feedback to children during the process itself. This would also clarify some misconceptions related to various aspects of CCE.

Section 1

What is CCE and what it isn't?

If you are a teacher, you may be often bothered whether students are actually learning as a result of your efforts. It is possible to get some idea, looking at students' faces or participation, but when you give a test later, it may turn out that their learning is inadequate or faulty or only some students could progress the way you wanted. If you do not see desired results of your work, you may feel dejected and frustrated. It is often too late to correct the situation if the class has moved on to later topics. At times, the later topics are also not learnt fully well, since the previous learning has not been strong enough. You also may find your learners not taking enough responsibility of their learning, and you have to somehow push them to put in effort.

What can you do to save yourself from this constant stress? It is being realised the world over that using assessments *formatively* is one way to save the teacher from this frustration and help her/him in actually making learning better. But the evolving newer approach, which came to be known as CCE **(Continuous and Comprehensive Evaluation)** in India, is often misunderstood. CCE, as currently implemented, is not helping learning as it should. CCE when correctly understood, is quite different from traditional assessments, and in this document, we will try to show how it can be done differently to help both the teacher and learner. The correct CCE approach actually helps to change the classroom situation ***dynamically***, meaning, to improve as it proceeds. It helps ***lessen*** the teacher's stress and burden. It's a process that goes ***along with*** teaching-learning and that's why the word '**continuous**' is an important part of it. We will first discuss this part and then come to the '**comprehensive**' part. It must be clearly stated that continuous assessment is **not** just more frequent testing of students. Testing done in traditional ways is often extremely stressful and burdensome for both the teacher and students. CCE can help learning only if the stress, anxiety and burden in classrooms are drastically reduced for both the teacher and the learner and teaching-learning is made non-threatening, as well as free from fear.

To understand continuous assessment, think of a doctor who is giving a prolonged treatment to a patient. The doctor diagnoses the condition of the patient, gives treatment, but keeps judging from time to time whether the treatment is working. She/he keeps changing treatment strategy if the current one is not giving desired results. The teacher does not have patients with ailments whose condition need correction, but learners with different learning needs and styles. She has to roughly use the same diagnostic strategy to adjust her inputs. She judges the effectiveness of her teaching and gaps in learning from time-to-time. Accordingly she keeps evolving her teaching strategy. This is a very creative and thoughtful process, since there are a large number of learners, who keep responding differently to everything done by the teacher and are at different stages of learning. So the teacher must constantly make alert judgement, using her

previous knowledge of her learners. CCE assumes a teacher who is a reflective practitioner, someone who constantly reflects on her interaction with students.

Does continuous assessment sound too difficult? Actually good teachers have always used it effectively. Here, we are stressing on some important aspects of it, to show how it can help strengthen learning.

Understanding Important Terms Related to CCE:

Let us first discuss some important terms and misconceptions related with assessment and CCE:

- Assessment during teaching-learning gives clues about pupils which the teacher *can act upon immediately* to enhance learning, especially when students are facing difficulties and additional help is needed. Continuous assessment does not always require the use of structured tests which are given to all pupils at the same time. Often they may not even know they are being assessed. Thus continuous ***does not mean more frequent formal tests.***

- One major misconception is related to the words **formative** and **summative**. In report cards in a large number of schools, currently teachers report formative assessment in every quarter that include project work and other activities. Actually formative assessments are ***not*** meant to be reported in report cards. The word formative comes from 'formation', i.e., formation of the learning process. These are assessments designed to monitor and improve students' progress during the teaching-learning process (also called assessment ***for*** learning). Any information on learning of a child, for example, written work, oral responses or simple observation of the child, can be used *formatively* by the teacher to help the learner. Summative assessments are done to determine the totality of a student's learning after a pre-decided portion of syllabus or time period is completed (also called assessment ***of*** learning or evaluation). The word summative comes from 'sum', or making an estimate of ***total*** learning.

- Often the terms '**assessment' and 'evaluation'** are used interchangeably. There is a difference in what these terms imply. **Assessment** mainly aims at judging the quality of performance of children *while learning is going on*. **Evaluation** focuses on the actual level of performance attained after a certain period of instruction. Evaluation is not concerned with why or how that level was attained. It judges the quality of students' work on the basis of established criteria and assigns a value to represent that quality (for example, marks or grades). *Assessment is more* ***process-oriented*** *or formative; while evaluation is* ***product-oriented*** *or summative.*

- The term **'comprehensive'** is often misunderstood. It refers to a holistic view of the child. This means taking the child's personality as a whole, for example, her attitudes towards learning, social interactions, emotional health, motivation, physical health, strengths and weaknesses etc.

- A confusion exists related to what will be treated as curricular and co-curricular areas. Arts Education, Health and Physical Education, Work Education are often treated as co-curricular areas

whereas Language, Mathematics, EVS, Science, Social Sciences are considered as curricular/scholastic areas. NCF-05 treats all of the above as curricular areas, since curriculum (the totality of planned learning) is seen much more broadly than only scholastic achievement.

- Educators think that the prime purpose of evaluation is labeling or comparing performance of children against each other. Evaluation often points out weaknesses of the child or what the child ***does not*** know, rather than focusing on improving the child's learning. The spirit of CCE is to enhance student learning both through assessments and evaluations. It compares the performance of a child with her/his previous performance, instead of comparing her/him with others.

- Yet another misconception is related with the terms **marks and grades**. Educators often think of marks as quantitative or reflecting the product of learning, and grades as qualitative, reflecting the process of learning. Since teachers are habituated of marks, they often give marks first and then convert them into grades. This shows faulty use of both marks and grades. Marks and grades both are evaluative judgment of the child's performance. They assign a number or value to learning. ***They should not be used during the process of learning for formative purposes***.

- There is a general misunderstanding of the role of recording in CCE. Educators think that in CCE they need to record each child's progress daily, weekly or continuously on a large number of criteria. This is totally contrary to the spirit of continuous assessment. Teachers *need not assess all the children all the time, nor do they need to make elaborate records of pupils' progress and report them to others*. Continuous assessment is only to help the teacher teach better and she may record only that which would be genuinely useful for her to enhance teaching-learning. Often in class, instead of individual students, the teacher may assess only the processes, to see how well her teaching strategy is working.

- It is also mistakenly thought that in CCE, every child needs to be promoted whether he/she learns or not. The real spirit of CCE is that every child would *get an opportunity to learn all through the process and she/he would get help whenever facing difficulties*. This means if the teacher assesses the student all along and devises strategies to help so that the student keeps learning, then the situation of a child 'failing' at the end of a term will not arise at all.

- Another mistaken view is that in CCE, the teacher needs to take complete responsibility and burden of both continuous and comprehensive assessment. This makes the task seem impossible and makes the teacher feel extremely burdened with unrealistic expectations. On the contrary, CCE actually aims at *reducing* the teacher's burden. It places the responsibility of learning equally on learners. This means that children have to be given responsibility of assessing their own work, their peers' work and helping each other learn. Learners who go at a faster pace can be a good

resource to help the teacher. Thus collaborative learning and group work become an important means to lessen the teachers' burden.

The 'comprehensive' part of CCE

Many aspects of a person contribute towards making him or her a good learner. The 'comprehensive' part in CCE recommends that the student's learning is seen holistically by the teacher along with her personal and social qualities. The on-going assessment (especially through observation) of regular pupil activity in class should also cover development in these areas. This is what makes it ***comprehensive.***

However, it is important to recognise that many of these qualities cannot be judged over short-term and some cannot be recorded based on 'hard' evidence. Qualities like enthusiasm, cooperation, patience, concentration, interest and motivation, helpfulness and sensitivity to others and to the environment, can only be observed over several months and not 'shown to others' with evidence. These can only be observed by the teacher to understand the student's overall personality and how it contributes to the student's growth. Formal tests for aspects of personality are very difficult to make. More informal ways of noting progress in these aspects must be used. Peer assessment and self-assessment done in a friendly and non-threatening manner are very useful here.

Section II

Examples of Continuous assessment

We are presenting some examples of teaching-learning situations to help you see how continuous assessment can be done during teaching. We request the reader to keep in mind that the purpose of the examples is not to show how good teaching can be done. Good teaching can be done in a large variety of ways and there is no single best method. The use of these examples in any way must also be as per the children's cognitive levels and syllabus requirments. These are only to show how ***assessment can go on continuously along with teaching.*** Here we have shown the teacher's thinking, judgements and decisions in brackets/italics.

It is important to note that a teacher will mostly try to assess what she expects the children to learn from the lesson. So prior thinking by the teacher on ***what is expected to be learnt*** from a lesson /unit is extremely important and we have tried to show it in each example.

Example 1: A class on magnets

Prior knowledge: Students are familiar with poles of a magnet and have already classified materials as magnetic and non-magnetic.

(The teacher now wants to take their learning further along with assessing their concepts of magnets acquired so far. He thinks of an activity which will help him in assessing this and also lead to further learning.)

The teacher divides the class into groups of 4-5 students. He asks them to take out magnets from their science kits.

Prakash takes out a bar magnet. He is amazed that nothing is marked on its ends. He shows it to others in the group and they bring it to the notice of the teacher.

Teacher: What type of marks did you expect on the magnet?

Indu: All the magnets I have seen had 'N' on one end and 'S' on the other end.

Teacher: What do you think N and S mean?

Raman: North and South.

Teacher: How can you decide which end is N and which is S if nothing is written? Discuss among yourselves and let the class know your answer.

(The teacher's objective here is to see whether they have actually understood the interaction between poles of two different magnets. He also observes participation of students in peer discussions in their groups).

Nafisa, a student, speaks.

Nafisa: Bring a magnet with markings and see which end attracts the N of that magnet.

Teacher: Do others agree that Nafisa's method will work?

(There is general agreement to her suggestion. Their agreement shows the teacher that they have correctly understood the interaction between poles of two magnets)

Teacher: But what if you don't have another magnet that has N and S marked?

Students start to discuss, but seem to be at a loss.

The teacher (giving a hint): A compass needle is a magnet, free to move. It always settles in the North–South direction. Does that give you some clue?

Lakshmi: Oh yes, I saw that at home. So is the end that points towards the North the N end?

Teacher: Yes.

Raj: Oh, then the magnet should be made free to move! Suppose we balance it on a pin?

Lakshmi: How can you balance this on a tiny pin?

Karenk: Suppose we float it on water in a paper boat?

(Lakshmi's and Karenk's responses indicate to the teacher that they are following the idea of a freely suspended magnet settling in a direction)

Teacher: These are good ideas, but let's see what we can do right now. Can you find out using just a thread and this magnet?

The teacher, as he walks around the class, notices groups trying to suspend their magnets with a thread. It keeps slipping; sometimes it gets nearly vertical. All groups have difficulty getting the magnet in a horizontal position. Some students try making two loops. A student points out that tied in two loops, it will not turn easily. The group ties both loops to a single thread and suspends it. Another group uses a paper in which the magnet is held, like a basket.

(Their success in this activity indicates to the teacher how good they are at thinking independently or designing solutions in a novel situation. The teacher encourages students and groups to help each other, and discuss their ideas. If there is a learner who has a better understanding, the teacher asks the student to explain to others. He observes the ideas they try and sometimes gives suggestions to them. He notices some children are patient in their trials, some are helping others, some won't allow anyone to try and want to do it all by themselves. These

***indicate their attitudes towards collaboration. The teacher makes a rule that everyone in the group has to try their hand at suspending the magnet.*)**

The teacher asks students to notice whether all their magnets are pointing in the same direction. They have to wait until the magnet stops swinging. Once everyone is satisfied of this crucial observation, he proceeds. He asks how to decide which is N and which is S, after the magnet has freely taken a particular direction. Lakshmi says that we know the end pointing north is N. The teacher asks her to write it on the blackboard for everyone to notice it clearly.

Now the teacher asks the groups to take their magnet to another group's magnet and see what happens when the N-N, N-S and S-S are brought together. He asks them to fill up the table.

S. No.	Magnet-1	Magnet-2	Observation
1.	N	N	
2.	S	S	
3.	N	S	
4.	S	N	

(The correctness of the table indicates to the teacher of children observing interaction between poles of two magnets carefully. He asks groups to compare each other's tables, and see if they differ anywhere. This way he is allows them to assess each other or to do peer-assessment and help each other learn. These tables are present in students' note-books as record of their work, only for their memory. They are not for reporting of learning)

The teacher asks if any group has some difficulty that is not being solved. He finds that in one group they found N-N attracted. He asks the class how this might have happened. A student points out that maybe there are magnets with the same pole on both sides.

Teacher: 'If a magnet had the same pole on both ends, do you see any problem?'

Kanika: Then how would the magnet settle in one direction. Both ends will try going towards north?

Teacher: Great answer! Now think if there can be any other explanation.

Jyoti: Someone could have marked a magnet wrongly by mistake.

Teacher: How can we find out which one was marked wrong?

He guides a discussion on it and eventually students figure it out.

(This helps him assess if students can now apply what they have learned to solve a practical problem, providing justification for their conclusion.)

By now the bell rings, but students want to continue playing with their magnets. He promises that they will do more activities on magnets in the next class.

Example 2–Physical properties of metals

Before a science class a teacher is thinking, "Children would have some idea of the word metal from their daily lives. The goal of my lesson should be to make them see some very characteristic physical properties of metals, to be able to make broad distinctions between metals and other materials. Of course the distinctions do not always hold for all metals (for example, sodium is soft as against common metals), but currently simple distinctions that hold largely for common metals will do for this stage, till they learn the distinction on the basis of periodic classification in later classes."

She also decides in the beginning that making a distinction between metal and alloy will confuse children, so she will not take up the distinction right now and treat alloys also as metals.

To gauge their view of metals she asks in class: "Can you name some metals?"

Children come up with answers like iron, silver, gold, aluminium, brass, steel, copper etc..

The teacher asks: "What makes you call these things as metals?"

Child 1: "Everyone calls these as metals."

Teacher: "But there must be some reason why people call these as metals. What do you think is the reason?"

Child 2, 3 and 4 give some reasons: "They are hard. They shine. They give a 'thannnn' or 'ting-ting' sound when we hit them."

Teacher: "Suppose I have a stone which is hard, shines and makes a similar sound. Will you call it a metal?'

The children look lost.

(This helps the teacher assess that their concept of metals is based on daily experiences but is hazy and ill-defined. So she decides to do many activities to help establish the distinction clearly.)

She provides some metallic materials like iron nail, aluminium wire, copper wire, a spoon, a lock etc. and some common substances like piece of coal, chalk, wood, stone, plastic, cloth etc. to the class. She asks students, "Now let's see the differences in the sound produced by metals and other materials when we drop them on the floor."

Radha starts dropping items in the two categories one by one on the floor. Rest of the class is making observations on the sound produced.

Rita – Metals are giving the same kind of sound and other materials are giving somewhat different sound.

All students try their hand at it. They quite enjoy the exercise and the teacher encourages each of them to participate.

(Their enjoyment gives an idea of interest and involvement in the lesson, so the teacher encourages each student to try by himself/herself)

The teacher asks one of the students to get a metal plate in the class and hit it with a wooden stick first and then with a spoon and tells students to listen to the sound carefully.

Students – When you hit the plate with a spoon, it produces a loud ringing sound but the sound is not that loud when hit with wooden stick.

Teacher asks: Can you tell me some property of metals from this?

Student: Yes, when two metals hit each other the sound is sharper. When one metal hits something else, it is less sharp and when there is no metal the sound is not sharp at all.

Teacher: Very good. We call this sharp ringing sound as sonorous. Metals are generally sonorous materials whereas other materials are not sonorous. Can you think of some use of this property of metals?

Student 2: Yes, all bells are made from metals, for example, school bell, *payal, ghungroo.*

Teacher: Good!

(The teacher assesses here that students are able to apply what they have been learning).

Teacher – Out of these materials can you separate the materials with shiny surfaces?

Students are working in groups of three to four. They separate materials as Group I: shiny and Group II: without shine.

Raja – Group I materials are mostly metals whereas Group II mostly includes other materials.

This makes some children very dissatisfied. Seema is one of them. She brings a rusted iron nail and asks "If iron is a metal, then why is the surface of this iron nail not shining?"

(The teacher is very happy at her observation power and critical thinking ability)

The teacher gives sand paper to Seema and asks her to rub the rusted iron nail with sand paper.

Seema – (Starts rubbing)– Wow! It is shining now.

Teacher – Metals often lose their shine and appear dull because of action of air and moisture on them.

Raja– But there can be shining materials also which are not metals? Look at glass!

Teacher: Very good observation Raja! Let us put it this way. All metals shine. But all other materials don't. Some of them may.

Seema: But then how will we know the difference?

Teacher: Another very good question. You see, shining is not the only property that metals show. When we see a collection of many properties, we decide it's a metal.

(This exchange helps the teacher assess how some children are showing interest, curiosity and are critically analysing received knowledge by asking questions, to convince themselves. She also keeps judging how questions from a few students are helping the whole class learn better. If appropriate questions/comments do not arise she gives them herself.)

The Teacher now asks students to take all the materials and hit them one by one with hammer or stone and record their observations. She also advises students to be careful not to get hurt in the process.

Rahul – Shape of iron nail, aluminium wire and copper wire change on hitting.

Sheela – Coal, chalk, glass, plastic and stone break into smaller pieces on hitting.

Rahul – I can also feel that iron nail, aluminium wire and copper wire etc. are very hard, whereas coal, chalk etc. are soft and can break easily.

Teacher : Can anyone tell me anything general about metals from this?

Sheela: Metals are not easy to break into small pieces, whereas some other materials are.

Teacher – Good! Notice that there are always exceptions to this general rule, for example,. cloth and plastic sheet. These will not break on hammering but can be cut or torn easily.

(She has assessed that the students have reached a reasonable general conclusion, but are bound to be confused when they see exceptions to it, so decides to clarify. This is a situation of giving immediate feedback to a response from students).

Teacher – Can you think of a metal beaten into very thin sheets?

Sunita – Aluminium! Takes out aluminium foil form her bag in which her lunch was wrapped. She shows it to the entire class.

Radha: And silver foil too. Have you not seen silver '*vark*' over sweets?

(The teacher observes that the students are able to analyse their everyday experiences carefully and can apply their newly-acquired knowledge).

Teacher – This is a characteristic property of metals, if they are beaten hard and uniformly, they can be changed into thin sheets without breaking into small pieces. This property of metals is called malleability.

The teacher now asks students to recall how they made an electric circuit in their previous class with cell, wires and a small bulb. She asks them to make a circuit with one of the materials as part of the circuit and then see if they allow current to flow in the circuit or not. She tells them to record their observations in the given Table.

Table – Electrical Conductivity of Materials

S.No.	Materials	Good Conductor	Poor Conductor
1.	Iron nail		
2.	Copper wire		
3.	Aluminium wire		
4.	Wood		
5.	Coal		
6.	Chalk		

Students start doing the activity in groups of three to four. Teacher walks around the class. She notices that some children are patiently doing the activity, some are helping others. There is noise in the class since children are discussing among themselves. ***(Record of this table can be kept in children's note-books for their own reference)***

Sheela – Iron nail is a good conductor of electricity.

Ram – Aluminium and copper wires are also good conductors of electricity.

Sonu – Wood and coal pieces are poor conductors of electricity.

Raja – How do you know?

Sonu– Because the bulb is not glowing.

Raja – This means metals are good conductors of electricity whereas other materials are not.

Teacher – Can you tell me examples of the use of this property?

Many Students– In making electric wires!

Teacher tells them that the property of a metal by which it can be drawn into wires is called ductility.

(The activity helps the teacher in assessing previous knowledge, experimental skills, observation skills, skills of recording and analysing data, ability to provide explanation in her students)

Teacher – Can you guess why metallic pans are usually provided with plastic or wooden handle?

Raja – So that we do not feel hot and get burnt.

Teacher– Why do we find wooden/plastic handles less hot than metallic utensils?

Children start discussing about this. Teacher walks around the class, trying to listen to the discussion going in the class. After having a discussion, they collectively arrive at a conclusion that metals are good conductors of heat as compared to other materials.

The teacher now asks children to name the properties on the basis of which now they will distinguish between metals and other materials and writes them on the black-board. She asks children to write this in their note-books also for the sake of memory.

Example 3 : Parts of a flower

A teacher is planning to discuss different parts of a flower in the class. She has told children to bring flowers having 5-10 petals. She told them names of different common, abundant and seasonal flowers having all parts clearly visible such as Lily. She herself has also brought a flower and its flower-buds of different sizes.

She shows the flower-bud and flower and asks students to draw a diagram of the front view of the bud and flower and also describe them.

The descriptions given by students are:

1. Flowers are open and flower buds are closed.
2. Flower buds are small and flowers are bigger in size.
3. Flowers are coloured.
4. Flower buds are also coloured but covered with green structure.
5. Flowers are beautiful.
6. Flowers are used to worship God.

(This helps her in assessing observation power of learners. Drawing of diagrams helps learners in remembering the relevant part. It helps the teacher in assessing that the student is noticing carefully and participating actively)

She shows buds of different sizes and asks, "Have you seen a little bud growing bigger in size?"

Students: "Yes. The closed bud opens out into a flower after some time."

(On the basis of comments of children, the teacher assesses prior knowledge of students and puts her effort to connect the lesson with the experiences of the learner.)

The teacher has mixed different flowers and their buds. She asks them to pick a flower and find its corresponding bud from the mixture. The teacher asks children to talk about similarities between a flower and flower bud if there are any.

Students notice that thin, flat, green and coloured projections are present in both. In flower bud, coloured projections are covered by green. There is a green covering around the bud and outer-most whorl around the flower. The teacher informs students that this is called a sepal and asks them to have a look at sepals from each other's flower.

Now teacher asks them to remove sepals, count them and place them together, marking 'Sepals'. Teacher asks all children to see each other's flowers and record the following observations:

S.No.	Flower	Number of sepals	Size of sepal	Shape of sepal
1	A's flower	4	small	thin
2	B's flower	5	big	flat
3	C's flower	5	large	flat
4	D's flower	6	very small	Bell shaped

(Recording of different flowers makes them see diversity in shapes, sizes or numbers. But they see the commonality in every flower. The teacher assesses careful comparison by students through the table)

After removing sepals, the teacher asks children to draw a diagram of remaining parts of their flower, make an observation of petals, the next whorl. She requests them to write observations in the table given below:

S.N.	Number of petals	Colour of petals

Now she asks students to remove petals from the flower, place them together and mark as 'Petals'. She allows children to touch, feel and observe both sepals and petals carefully and asked them to write similarities and differences between these two.

Differences

S.N.	Sepal	Petal

1	Outer circle	Inner circle
2	Green	Coloured
3	Smaller in size	Bigger in size
4	Thicker	Thinner
5	Outer surface is rough	Soft, delicate

Similarities:

Both are arranged in circle.

Both are leaf like structures.

Both are same in number.

(This helps her in assessing observation, categorising and differentiating power of learners.)

She provokes thinking in learners by putting questions such as: What do you think is the role of sepals in flowers? When the flower is in bud stage, the green structure covers it. Have you noticed how tightly it covers it? What could be the advantage? Can you make out the difference between sepals of flower and flower-bud? Has anybody seen sepals inside petal? Imagine, what will happen if sepals are inside petals?

Next, the teacher gives a demonstration of cutting a bud longitudinally. Since she does not want children to handle blades at this level, she gives them some sections cut by her. She asks them to draw a diagram and describe it verbally.

The teacher writes three statements made by students on the blackboard:

1. Sepals form outer-most circle of flower.
2. Sepals are thick.
3. Sepals cover other parts of flower in bud stage.

She asks: 'Think and comment on function of sepals for flower.'

Children conclude that sepals present in outer circle provide protection to the flower when it is a bud. The teacher extends the discussion further by asking if they can think of a protective covering in an animal. Children come up with the example of tortoise and the teacher appreciates their creative thinking.

Now the teacher asks children, "have you seen insects or butterfly moving around flower. Can you think why?"

One student: The colour of petals attracts them.

Another student: No they are attracted by smell.

The first student: But all flowers do not have smell.

This gives the teacher an opportunity to allow children make guesses about functions of petals.

Now the teacher draws students' attention towards the remaining parts of the flower and asks them to draw a diagram and describe it. Students draw diagrams and describe in the following manner:

1. Inside the petal there is one circle of thread-like structures (the teacher tells them the name 'filaments').
2. Filaments are smooth.
3. Thin filaments have lobes at the tip.
4. When touched, the lobes release a powder.

The teacher observes the diagrams in note books of students and tells them about stamens. She asks students to count the number and measure the length of stamens and record in the following table:

S.No.	Number of Stamen	Length of Stamen

The teacher asks some students to come one by one and write their observations on the black-board and comment on the data. Students conclude that:

1. Different flowers have different number of stamens.
2. Length of stamens varies with the type of flower.
3. All stamens in a given flower may or may not be equal in length.

She asks children to remove stamens and put them aside.

Teacher: "All of you have reached the centre of flower. Can you see one more part? This is called the pistil."

She asks students to draw a diagram of pistil and describe it. Students draw a diagram in their note book. The teacher asks them to notice that the pistil has three parts: one swollen base, elongated filament and a flattened/disk at the tip.

The teacher adds, "yes, now you have recognised three parts of pistil." She writes on the blackboard:

1. The swollen base is called ovary.
2. The extended filament is called style and

3. The disk at the tip of filament is stigma.

The teacher asks students to cut ovary through length and width to observe inside. She inquires, "Do you see small beads inside the ovary? These are its ovules."

Finally the teacher gives students two kinds of flowers and asked them to record their observation in the following table.

S.N.	Flower name	Sepals		Petals		Number of Stamens	Number of Stigma(s)
		Number	Colour	Number	Colour		
1	Flower 'A'						
2	Flower 'B'						

(This table and the diagrams that the children make in their notebooks with labelled parts, remain as a record of learning with them. It is not recommended to be used for reporting of learning).

Example 4: Project involving interviews of farmers and gardeners

A teacher's reflections: I always noticed that students found the chapter on 'crop production and management' a very dry one. It was a challenge for me to make it interesting. Moreover, students from urban areas had little awareness of agriculture. Rural children, though being aware of practices in their surroundings, often did not know much about what was grown in other areas. So I decided to initiate a project on interacting with farmers and gardeners and interviewing them. My rationale behind the design of this task was:

- *Develop communication skills of students.*
- *Develop inter-personal relationships in them.*
- *To link their classroom knowledge with their surroundings.*
- *To inculcate an appreciation of dignity of labour.*
- *To sensitise them to the inter-dependency of humans for their survival.*

I gave them some guidelines as to how to conduct these interviews. This included some sensitisation towards respecting farmers, their profession and dignity of labour.

I allotted one week for preparation. The task was divided into 3 steps:

- An interview with a farmer or gardener.
- Organising the collected information.
- Presenting the event in class.

Students needed ideas on what to observe and report on. The following questions were collectively gathered in class through discussion, with inputs coming from my side:

- What crops are grown by the farmer?
- Which crops in the area are grown locally and which come from outside?
- Which crops were grown 50 years back? How has the pattern changed? Why?
- How is the soil prepared before sowing?
- How are seeds selected?
- Which crops are grown in different times of the year?
- Are there perennial plants that yield a crop?
- Which manure or fertilizer are added and when?
- What measures are taken to control pests?
- What are the sources of irrigation?
- Which implements are used?
- How is the produce stored, transported and sold?
- Does the farmer face risks, losses or uncertain income?
- Which activities in agriculture are done by women? What share of work do they handle?

(Their responses when framing these questions helped me assess how much or how little they knew about crop practices. I realised they had no idea how much affected the farmers were by draughts and floods and how risky farming was as a profession.)

The interviews were conducted in pairs. I then made use of peer-assessment, in which each pair made a presentation and the class gave it ratings on the following criteria, on a 4 point scale of: Very good, Good, Average, Not Much Work Done. I gave them freedom to write extra comments on other group's work.

(I did this to ensure that they take interest in each-others' work, analyse it and learn impartial judgement based on merit)

- How many different aspects of crops was the group able to collect (richness of information collected)?
- How well the interview was conducted, data organised and presented (communication skills)?
- Was the group able to raise some questions on problems of farmers and report on difficulties associated with farming (sensitivity towards socio-economic problems or scientific problems like soil health getting affected)?

- Was the group able to collect some reasons for the changing nature of agriculture (ability to look for explanations)?

In the end, I added my own observations to each presentation and kept the students' reports as part of their portfolio.

(This was done to help build a record of each student's work over a length of time, for recording and reporting purposes. If the teacher deems fit, this can be a part of the student's portfolio.)

Example 5: Distance-Time graphs

The teacher's reflection before the class:

"After discussing distance-time graphs I thought I need to see if my students have really understood it and if they can draw a graph starting from real observations. So, I thought I will ask them to collect data in a real situation and then plot a distance-time graph with it. I asked them to bring a watch/stop-watch next day."

Next day, I asked my students to stand in a line with their watches. I told them they have to count the number of footsteps per minute while walking from the classroom to Science lab. Footsteps of uniform length were marked on the ground for the walk with the help of a scale beforehand. I began the activity by announcing `Start'. They had to record their footsteps per minute, up to five minutes and note down the number of footsteps taken in each minute on a paper/notebook or their palm.

During the activity, after 3 minutes a child asked- "May I rest for a minute?"

(I thought this was an interesting opportunity to notice how the distance-time graph gets affected and whether the student sees that (the distance covered by her child does not change after 3 minutes, whereas the time is increasing).

I said, "Yes, you may, but find out the effect of this resting time in your distance-time graph."

Tiya noted her data and plotted the graph as-

Time (min)	0	1	2	3	4	5
Distance (no. of footsteps)	0	11	13	12	12	13

Rohit's data was –

Time (min)	1	2	3	4	5	6
Distance	0	12	13	11	12	14

(no. of footsteps)

I was watching the students drawing graphs. I asked Rohit, "How could you have time starting directly from 1 minute (instead of 0)?"

He replied "Ma'am, since we start our counting from 1, 2, 3…."

I showed him a scale (ruler) and said - "Look, it is starting from 0 to 15 and there is some quantity between 0 and 1. Similarly we can have some footsteps between 0 and 1 minute. Now, tell me when did you celebrate your birthday? The day when you were born or the same day after a year's span?" With this, he understood the mistake he was making.

(This is a clear instance of the teacher assessing a student's work to see problem areas and giving corrective feedback)

I found that 4 students out of 42 noted the data as shown –

Time (min)	0	1	1	1	1	1
Distance	0	13	12	13	11	12

(no. of footsteps)

Here, since they had written the time as 1 minute each, without showing time as increasing, they drew faulty graphs (as shown in the figure).

Students were asked to compare and discuss with others the results they achieved. During this classroom discussion, those 4 students realised their mistake, corrected it and drew the correct graph again.

(Doing this, I discovered that peer assessment is of great help as one child understands another child's psychology better than me.)

Initially, I was hoping for nearly uniform motion in this activity, but when I saw the footsteps taken by the same student varying widely every minute, I thought this was a good opportunity to strengthen the concept of uniform and non-uniform motion. I asked them to divide into two groups i.e., a group with uniform motion and the other group with non-uniform motion depending on their graph. I found that some students were unable to decide to which group they should go. Then I realised that this concept needs to be reinforced and I started planning my next lesson for that purpose.

(Here the reader can notice that the teacher is dynamically evolving her teaching and assessment strategies. She sees something different from her expectation, but uses it to check the concept of uniform motion. When she does this, she finds that the students are not sure about the concept.

This assessment helps her design her next class. A record of this activity remains with the students as data collected and graphs prepared by them, for their personal record of learning and not for reporting. The teacher may want to put this in the student portfolio, which is her choice).

Example 6: Wood and forests

A girl in the text-book is shown thinking: "What would happen if there were no wood? Is there any alternative available to wood? I know that paper is one of the important products we get from forests. I wonder whether there are any alternatives available for paper?"

A teacher decided to use the above thought to generate a group discussion in her class. She divided the class into six groups. The discussion was initiated by a task given to all the groups –

1. Each group had to make a list of items in their school bags which were made from wood.
2. Three of the groups had to think about how the wood had been obtained (whether it would have involved cutting down just one tree or the whole forest area would have been cleared for it).
3. The other three groups had to think about alternative materials to make these items.

The students' ideas were to be reported in categories of:

1. Items and the sources of wood used for them.
2. Alternatives to paper.
3. Alternatives to wood.
4. Advantages/disadvantages of other alternatives.

After all the groups were ready with their lists and suggestions, these were to be shared with the other groups by putting down the different lists on charts, to be stuck in the class.

(While the groups were discussing about the items from their bags, the teacher went around with her assessment of the kind of discussions that were going on, how many of the students were participating actively and how many were just listening quietly. She also noted if any of the students were able to point out some new item which used to be produced from wood, but now is produced from other plant products.)

Students made comments like the following, which the teacher noticed, while taking rounds:

A – Paper used to be made from cutting down trees, but now paper is made from bamboo.

B – Paper is also made from waste left over after getting *ganne ka ras*.

C – My mother says paper can be recycled. That means, we don't need to keep cutting down trees.

D – I have this writing board which looks like wood, but my uncle who got it for me says it has been made from cashew-nut shells.

E – I have this paper cutter made of sandal wood. It would not have required cutting down an entire tree.

F – No, they would have cut down a whole tree and made many paper cutters or different things from it.

G – I have also heard that they make *agarbattis* from sawdust.

H – My sister went on a tour to a plywood factory and she said that small pieces of wood were used to make thick boards, so that means wood is not wasted at all. Plywood furniture looks just like wood.

I – My Nanaji's house in the village had thick wooden doors with beautiful carvings on them. But our house has plywood doors, which are very plain.

J – Most of us have pencils made from wood, but X has a pencil made of plastic in which she puts in leads, you don't even have to keep sharpening it.

K – Yes, I don't have a writing board made of cardboard, it is a plastic one with a picture of Spiderman on it.

L – Oh, yes! So many things are made of plastic now, all of us have plastic scales, only Y has a wooden scale.

M – Yes, earlier halls used to have folding metal chairs with special chairs on the stage made of wood. Now all the chairs are made from plastic.

N – The teacher's chair has legs made of some metal and the seat is made of plastic.

After the groups finished their round of discussions, they prepared their charts and presented them in front of the class. After this, the teacher asked students if they had any comments on the points made by others. This led to a spirited discussion involving the whole class in which almost all the students were encouraged to participate.

O – The first group has said that we could use pencils made of plastic instead of pencils made of wood. But we have learnt that plastic causes pollution.

P – And the third group has said that we could use metal instead of wood for furniture. But last month, we read in the papers about people in Orissa protesting against mining for metals because it destroys the forests.

Q – We can save paper if only one of us writes the list in our notebook!

R – My mother saves envelopes and uses them again.

S – We should tell kids to stop tearing pages from their note-books for making paper planes, they can collect old note-books for this.

T – Yes, like our craft-teachers makes us practise with used sheets of paper and lets us make paper toys with good quality paper only after we have learnt the folds properly.

(The teacher was noticing which students had keen observations and how much sensitivity they were showing about reducing consumption to conserve the environment, etc.)

The teacher winds up this discussion by noting that there are no simple solutions to any of our problems. The use of wood to make certain items causes one set of environmental problems, but using other materials like plastic and metals have their own problems. Still wood consumption has to be drastically reduced if we have to stop the environmental havoc brought by rapid deforestation. She tells them about the special role women and forest tribes have played in conservation of the environment.

The teacher ends the lesson by asking the students to write at least three things they could do to reduce the amount of paper or wood products that they use. She also gives them a task to find out about environment protection movements in their area.

(The three things the students write, is collected as a record of their learning by the teacher. If the teacher decides, she can make these part of the student's portfolio.)

After two months, she again brought up the topic to ask the students if they remembered this discussion and how many of them were trying to reduce the amount of paper or wood products they had used and if they had been able to think of any other things they could do to further reduce their consumption of wood products.

Thinking before teaching, to help assessment

In the above example, you can see how teacher's constant reflections before and during the lesson guide learning. We are now giving a list of questions below that may help you in thinking before the lesson, to get an 'overall picture' of the lesson in mind. This consists of two crucial components:

1) What learning do you expect to happen through the lesson (goals of your teaching)?

2) What is your strategy to go towards achieving these goals?

Reflections before the lesson:

- What understanding and abilities do I think children can gain through this lesson/activity?
- What ideas my students might have about this topic? Why might they have these ideas?
- How can I help them move away from unscientific ideas?
- What role does the activity I am planning play in teaching of the targeted concepts (or knowledge), abilities or attitudes (values)?
- What could possibly show me they are gaining understanding or abilities?

Example 7: An example guided by prior thinking: Heat and Temperature

Here, only parts of the lesson are shown to illustrate the kind of thinking that can help the teacher in CCE.

Q. What knowledge/concepts/understanding can children gain through this lesson?

A. Sensation of hot/cold, difference between ordinary use of terms like hot, cold and use of the terms temperature in science, concept of temperature.

Q. What ideas my students might have about this topic and why?

A. Children might think we can 'see' hotness due to colour/glow for example glowing red coals/ heater coils, yellow flame or glowing fireworks. They would most likely not know the difference between heat and light and therefore would not know the visible part is because of light given out by the heated substance. They may think of heat being shown by smell (smell of paper burning) or taste (hot tea on one's tongue) or sound (crackling of burning wood, flame etc.).
We usually say in our day to day lives, 'cold or heat is coming inside through the window'. Because of this, students may think of 'heat' and 'cold' as substances and also as separate substances. This is likely because children do not have any concept of things flowing which are not matter/substance or do not have any weight, mass or volume. They have no clear concept of energy which is a very abstract concept. Heat, light, sound, electricity etc. exist as experiential notions but for children it is very hard to think of all of them as different forms of the same thing.

Q. How can I help them move away from these everyday ideas?

A. I can ask them to think of hot objects which do not glow even when very hot, for example, hot oil in a pan. I will tell children that we speak only of 'flow of heat' in science and not 'flow of cold', since heat loss in the reverse direction is what is referred to as cold flowing in day-to-day life. The concept of 'heat as energy flow' has to be established giving example of heat and light both from the sun reaching us through space, and many more examples, but it will develop slowly.

Q. What could possibly indicate to me they are learning these concepts?

If students are correctly able to define temperature by themselves and suggest some ways it can be measured, I will be satisfied that they have learnt the concept of temperature.

A classroom helped by the above thinking

Do we sense hot/cold due to touch alone?

The teacher lets children give examples of many situations when we notice hotness/coldness of substances. She deliberately brings in situations where we assume something is hot or cold even without touching. She allows them to analyse each situation to decide how we decide hotness/coldness. Suppose

a student says 'I can make out that the firecracker is very hot from its looks', she asks other students if they agree with this statement. If they do not agree, they have to state and defend their reasons.

(This discussion helps the teacher assess students' everyday notions about heat and temperature. This helps students to analyse and assess each other's responses, thus helping each-others' learning. The teacher is also gauging their ability to analyse. An evidence for learning here would be students changing their opinions after hearing contrary arguments)

Can sensation of hotness/coldness be precise?

The teacher puts a cup of water on the table and asks, "Is that cup of water hot or cold? How will you find out?" The students say: 'By putting our fingers in it.' After touching, some say 'it is cold' or 'normal'. The teacher now puts a cup of tea at room temperature and asks the same question: "Is this cup of tea hot or cold? How will you find out?" Students once again say by touching, but now call it 'cold'. So the teacher points out that even upon touching water and tea with similar level of hotness/coldness, we use the word cold differently in the two cases. We use the words hot and cold according to what we expect to find. Now she says "Let's see how our skin feels hotness/coldness".

Experiment:

Three identical cups A, B and C are taken. A is filled with water from a water-cooler, B with tap water and C with some heated water. Children try this one by one: Dip one finger of each hand simultaneously in the cold water (cup A) and hot water (cup C) for a few seconds (5–10) and then remove both fingers together from the cups and dip them both in the cup with tap water (cup B). Children quite enjoy doing this and are amazed at their sensations. One or two of them shout 'Hey! it feels so different!' A discussion follows: What do you feel? Is the tap water cold or hot? Children record their observations in their notebooks in the following manner:

Step 1

Left hand finger in Cup A felt : Cold

Right hand finger in cup C felt: Hot

Step 11

Left hand finger in cup B felt: Warm

Right hand finger in cup B felt: Cold

(These observations remain as a record of the activity with children in their note books and is not for reporting)

Children discuss their experiences. It is seen that the same person's skin on two different hands can feel hotness/coldness differently, as: 'The finger earlier in hot water finds ordinary water as cold and the

finger earlier in cold water finds the same water as warm'. The teacher writes down on the blackboard the agreement that the class reaches.

(The teacher assesses here if students are able to observe their experiences carefully to reach some conclusion that they can share with others. She assesses their communication skills too and if a child is hesitant or under-confident, she helps by giving cues of helpful words)

The teacher asks what this experience tells them about touch showing hotness/coldness. Some say, 'Our skin can be fooled' and some others say 'does not tell accurately'.

The teacher now asks if there is a difference between these two sentences:

"My hands feel cold when I touch this object" and "This object is cold".

(The first sentence is about how a person's body feels on touching. The second is a property of the object whether a person touches it or not. The student's responses help the teacher judge whether children see hotness/coldness as an 'objective' property, independent of the person. If they do not see this, then it will be hard for them to understand temperature being measured by an instrument. The teacher lets them say whether they see the difference.)

To help them, she asks, "Do inanimate objects respond to hotness/coldness, other than our body?" She lets children respond by thinking of the effect of hotness/coldness on non-living substances giving examples of butter, ice or a metal bench. She judges if clarity on this has emerged, then asks, "How can we know that the object is actually hot or cold even if we don't touch it?"

Some children talk about temperature and its measurement by a thermometer. The teacher asks, "Suppose there was no thermometer. Can I know if an object is hot or cold without touching?" A girl responds, "We can touch butter with it. If the butter melts I will conclude it is hot. If the butter hardens, I will conclude it is cold." ***(The teacher is very pleased with this answer because it shows original thinking.)*** She says, "Great idea Minati! So we can have a butter thermometer to measure hotness/coldness."

The teacher asks, "Now let us see what we mean by the word 'temperature'." She asks children to try to define it collectively. **(*She accepts the definition even if it is not in exact technical words, because framing the definition in their own words helps establish the concept properly and helps her assess the clarity they develop in their own minds.).*** They say, "Temperature means how hot it is." She encourages them, "yes, yes, you are close to its definition. But think of it, you can measure it. Can you tell me what you measure?" One student says, "We measure hotness or coldness." The teacher is once again happy with this definition. She asks, "Suppose we say instead: temperature is a measurement of…..?" Some children shout, "Hotness or coldness!" She writes this collective idea on the blackboard as definition and asks them to write this definition in their notebook also. ***(This is just for students' own***

***memory and not for reporting. The teacher decides that in the next class she will teach them measurement of temperature with a thermometer*).**

Section III

Some noteworthy elements of continuous assessment

- Continuous Assessment need not be a separate activity or an activity distinct from learning situations and generally it should not break the flow of the class. It is built *into* the learning situation, as an integral part.
- The whole idea of assessment is to help the student learn better. Here, assessment is as much of *teaching strategy used by the teacher*, as of *learning acquired by the learner*.
- If a teacher spends enough time sensing children's responses, she gathers a collection of nuanced observations on each of her student's learning. Hence continuous assessment is not a one-time activity, which can be done over some hours or some days.
- Continuous Assessment demands that the goal of teaching is to actually help the student learn, not merely to transmit some content which students can somehow reproduce in a test, often through rote memorisation of poorly understood material.
- Detailed and atomised criteria for continuous assessment for every learning situation (sometimes called learning indicators) cannot be given to the teacher by someone distant from the learning situation, because it is the teacher alone who can judge whatever situation or responses come.
- If the activity involves the whole class, whether an experiment or a discussion, then the assessment would not involve a sequential look at one child after the other. Hence the teacher will be able to assess without making the children fearful about being tested.
- Continuous Assessment also requires that the teacher respect children. By respecting, we mean that she believes that if appropriate conditions are created, children have a natural desire and capacity to learn and can show constant growth. The teacher should encourage the children to reflect on their learning so that they can assess themselves and the explanations given by their peers. If a child/class does not respond adequately to a teaching strategy, the teacher needs to change her techniques instead of putting the blame on the learner or learners for non-performance.
- Continuous Assessment can work only in a non-threatening situation where students are not fearful of constant judgement. Free from fear, learners can report their own progress, express their doubts and problems, ask questions to give the teacher evidence of their learning or not-learning. They can, to an extent, assess their own learning as well as each other's learning and even help each other learn better.

Giving comments

Grading of regular work or giving marks is not recommended in continuous assessment, since it means assigning a value to a students' learning at a particular point of time (as is done in exams), even though the student's understanding is constantly growing. It may not even be helpful in improving learning. A teacher may use written work, questions, small quiz etc. in between teaching, to help her assess learning, but this is meant to be used for giving feedback and support to the child. In regular feedback, it is recommended that ***no marks or grades should be given***. Instead, only suggestive comments for the child should be given by the teacher to allow the child to see where she needs to put in more effort or attention, for example, "you need to check your data once again. Look at some of your classmates' work to see where you are making a mistake." "You have given very lengthy descriptions of your project work. It would be good if in future you try to put only brief and important points." "Your conclusion is correct but you have not shown how you arrived at it". "Your use of language is very good here. Please keep it up" "Your diagram is detailed and neat. Keep it up" etc. (This is called ***'comment-only marking'***). This actually helps the child understand what is done well and what needs to be improved.

Giving opportunity for Self assessment

One way to truly respect a learner, as an intelligent and thinking human being, is to allow him/her to assess his/her own learning. We do great injustice to children by never allowing them to take charge of their own learning. But genuine assessment of one's own progress can be done only when an individual is completely free from fear and pressure. We need to strive for a situation where any child can confidently tell the teacher without fear, shame or a diminished self-image–"I could not understand this particular concept very well. Can you help me a bit more, in this aspect?" or, similarly, say confidently –" I feel that I have learnt it well, and I can even explain it to my classmates well."

What can the teacher observe to assess a child's learning?

"When there are many students in a class, you have to come up with creative ways to assess them. Well-designed worksheets, challenging open-book assignments with plenty of time to complete (as homework for example), individual or group projects where the quality of work reveals the effort and achievement of the student—these are all exciting possibilities. If you look at traditional tests or exams, they are the opposite of all this. Poorly designed, emphasizing memory over understanding and application, closed-book, testing performance with severe time restrictions…Examinations conducted by external boards have to be all these things (except poorly designed!) due to the constraints of large systems, but classroom tests made by the teacher or the school can be free of these limitations. Another simple way of getting to know your students better is to allow for discussion and dialogue in class, even a short time each day. The discussion can be an offshoot of what is being covered in the class that week. (It is not meant as an oral test; if it turns into that it will become a source of stress for students!) Keep it as an open-ended discussion around the main topic, allowing for every student to have a valid response, even if all do not

get the opportunity to express it. Over the year, make an effort to encourage silent ones, throw specific questions to one or another. Soon, you will develop a sense of where each child is, and this will add to a rich descriptive report. The point is, there are several abilities and aspects to your students other than just getting the answers right, and you as a teacher have to find ways of discovering these.....enjoyment of a subject, self perception of ability, oral expression, ability to explain to others, perseverance with hard problems, neatness, classroom behaviour…reporting on these adds so much richness to the picture of the student……..there is no need to make comparative evaluations; however, there is always a 'standard' in mind when you are assessing something. This is the difference between so-called 'norm referenced' and 'criterion referenced' tests. Can we develop a criterion (instead of a pre-decided norm) against which to evaluate our students, so that we do not have to say, "She is better than 54% of her class at mathematics," since that is not a very useful statement? Certainly we can."

(Extract from An Approach to Assessment and Reporting, Kamala V. Mukunda, India Education review, http://www.indiaeducationreview.com/article/guest-article-approach-assessment-and-reporting-dr-kamala-mukunda-teacher-centre-learnig)

The teacher can use some of the following for formative assessment:

- Student questions, their answers (oral or written) to questions posed by the teacher
- Students' written work, notebooks, portfolio (a collection of things prepared by individual child), and their communication skills.
- Children preparing charts, graphs, models, student's drawings.
- Drawings made by the teacher or found elsewhere to draw out their opinions (for example, which out of the illustrated situations is correct)?
- **The teacher observing children working in groups (observation of collaboration and cooperation).**
- The teacher observing a child working individually (observation of concentration and interest).
- The teacher observing children working on projects (observation of participation).
- Students sharing experiences, observations, questions, opinions, guesses and arguments.
- Designing of an activity by children or an alternative to the activity given by the teacher.
- The teacher making some small change in a performed activity/experiment/situation (even an imaginary situation like a thought experiment) and asking children's reactions.
- Whether a student is having or not having confidence (not coming forward to participate).
- The responsiveness of the class (indicating the level of understanding or connection of the topic with their current level).

Note that one or more of these may be appropriate for a given situation. Not all can be used for every situation.

Some important questions which will help the teacher to reflect:

- Are my children completely involved in assigned tasks? Are they able to learn properly? If not, what level they are at?

- Am I able to understand children's varying needs? If yes, what can I do to fulfil those needs?
- Are there children who are unable to reach even the first level of learning? What can I do to motivate and excite them?
- What can I do to improve my teaching strategy to take children from one level to the next?
- How can I motivate children to assess themselves?
- Where am I facing difficulties (e.g. in making children's groups, in choosing activities appropriate to their level, having a shortage of materials or improper materials)?
- What other kinds of help do I need? Who can give me this kind of help (people involved in education, parents, community, other teachers)?
- What can be done for to improve teaching- learning tasks?

Evaluation at the end of a period of learning

The traditional evaluation system is concerned almost entirely with summative assessment, which was done through unit tests, monthly tests and term end tests. These tests focus on the progress made by the pupil during a period of instruction which covered a given section of the syllabus. It is called summative since it comes after instruction has been ***completed*** and so is not linked to on-going teaching-learning.

The important point is that here the child's learning is judged against some kind of standard set earlier by the syllabus or expected level for that stage or period of learning. Here a value is assigned to the child's achievement and reported to the child, parents, or the school, usually in the form of a report card. Traditionally tests and exams have been doing this kind of evaluation. The spirit of CCE requires that some important changes need to be brought in the way this evaluation is done.

1. It is recommended that summative assessment may be done after every quarter of learning (every three months). However, the final decision regarding this must be made by the school in consultation with teachers. However, **weekly or monthly evaluations should be necessarily discouraged,** since the continuous assessment should take care of judging and improving gaps in the child's learning throughout.

2. Instead of marks, grades should be assigned. Marks often make faulty judgements and comparisons. A child receiving 70 marks and one receiving 77 marks may not have much difference in their levels of understanding but would be ranked very differently. On a few exam questions, done at one time, rating the totality of a person's learning is mostly faulty. Suppose a child has understood a concept partially and because of that answers an exam question wrongly. She may be given zero, even though she understands a part of the concept quite well.

   Grades can be given in the following manner:

Academic achievement of the child can be graded on a five point scale of **A+, A, B, C,** and **D.** These could roughly correspond to:

D: The child's basic understanding of targeted knowledge/concepts is weak and she needs to be given extra time and help to improve her learning.

C: The child has acquired basic understanding of targeted knowledge/concepts, but still needs to put in more work.

B: The child has achieved a reasonable understanding of targeted knowledge/concepts.

A: The student has achieved a very good understanding of targeted knowledge/concepts.

A+: The child has shown extra interest, talent or creativity in some topics covered during this period.

It would be extremely helpful if the teacher can specify in her report when giving such a grade: 'The child's basic understanding of force and pressure is weak and she needs extra help in this'. 'The child has shown very good understanding of biodiversity in her area'. 'The child has a very special interest/ creative in designing experiments related to electricity and magnets.' This is much better than only saying the child is 'very creative', which may not be true in all aspects of learning. Such kind of comments will help other teachers or parents to give the child help and encouragement in very specific ways where she needs them. Without this, evaluations remain at the level of passing judgement alone, which may be often faulty, unfair or blanket judgements. If a child is given an overall grade 'D' alone, without any specific qualitative information about her, it labels her as a poor performer, fails to reflect/encourage about any strength that the child has and does not give an opportunity to improve weak areas. It may seriously damage the child's confidence, motivation to learn and public image. On the other side, a child receiving a blanket 'A' grade may be viewed as capable or good in every aspect of achievement and may lead to over-confidence. It is also important to recognise that summative assessment holds ***only*** for a given period and 'good' or 'poor' grades cannot hold for the child's entire growth period. Her learning and achievement can keep showing drastic variations through the year.

3. To be of real use for learning, results of evaluations (for example, tests) must be used to inform the next stages of inputs given to the child and not for labelling alone, which is totally contrary to the real purpose of education. This is not currently done at all, and a child's performance in exams and tests is just treated as the end of a phase of learning.

4. In the period for which we are doing evaluation, we must recognise the effort put in by the child, especially in comparison to his/her own efforts in the past. So a 3-point grading scale can be given to rate the effort to learn, for example as shown below:

   I. **Extraordinary effort:** Extraordinary effort put in by the student in the period of evaluation

II. **Normal effort:** Normal effort put in by the student in the period of evaluation

III. **More effort needed** The child needs to be motivated to put in more effort

5. Evaluation questions should consciously try not to ask for pre-memorised answers. Otherwise their purpose gets reduced to making students memorise information, which they anyway forget later. Instead, the questions should look for broader understanding, should provoke thinking and even allow open-ended answers, if needed. Also they should give questions that allow children to show even partial understanding or come up with their own arguments. A child giving a good argument or analysis also deserves appreciation, even though she may not have given the 'correct' answer. Given below are two examples of different kind of exam questions that test a student's abilities more than pre-memorised answers.

Example 1:

18th century French scientist Antoine Lavoisier heated a piece of tin in a tightly sealed flask.

The tin began to melt, and greyish ash appeared on its surface. The heating continued for a day

and a half, until no more ash formed. Then he allowed the flask to cool. When he inverted it

and unsealed it under water, he noticed that the water rose one fifth of the way into the flask.

Now consider the following conclusions:

a. Zinc oxide is greyish in colour.

b. Water reacts with zinc.

c. Air is a mixture.

d. Tin needs air to oxidize.

e. The production of oxide of tin takes a day and a half.

f. Some component of air is used up in the burning of tin.

g. The density of water is higher than that of air.

Task: Which of the above can be accepted as conclusions of Lavoisier's experiment described above? (Your answer may specify a single item from the above list or more than one item, or you may say, 'none of them'.)

Answer: ……

(The above example is taken from 'Assessing Science Talent-*K. P. Mohanan and Tara Mohanan' available at* http://www.iiserpune.ac.in/~mohanan/education.htm)

Example 2:

I. *Statements*	*II.* *Observations*	**III.** **Statement relevant to observation**	**IV.** **Your reason**
A. In bud stage flowers are closed, protected and covered **B.** Insects are attracted towards flowers and help in pollination. **C.** Flower has two non-reproductive parts. **D**. Flowers develop into fruits in later stages. **E**. Stamens are regarded as male reproductive part of flower. **F**. Self pollination is a process when pollens reach the stigma of the same flower.	**1.** Ovules are present in the ovary.	**D**	After fertilisation, ovary develops in fruit and ovules in seeds
	2. Sepals are flat in structure and thicker in texture		
	3. Flowers have fragrance		
	4. Powdery substance is present in the anthers of stamens.		
	5. Stamens are longer than pistil.		
	6. Pistil is the inner most central part of the flower.		
	7. Petals are colourful		

In the table given below, column I has a number of statements about the parts and functions of a flower. Column II has some observations about a flower. The observations support one or more statements in column I.

In column III, write which statements are supported by the observation in column II. In column IV, give a reason why you think this observation supports the statement (One example is shown for observation 1). If you think this observation does not support any of the statements, write 'Unrelated'.

Recording of Information related to assessment and evaluation

Since continuous assessment is for informing and improving learning as it continues, it is not necessary to produce copious and frequent recorded evidence of all learning to show to people other than the teacher. As shown in our examples, the assessment is often to help see the next step to be taken. However some records can be built for the student's own memory (for example, written work in note-books, graphs, drawings, performance in written tests etc.). There may be some evidence of learning the teacher may want to retain as her personal record, to inform her on a student's progress over time. This may help her in evaluation after a period, to report to the student, parents, or other teachers (for example, the next teacher who takes over a student's learning in the next year, if required) or the school.

Reporting of a child's progress

How can a child's progress be reported to others? We are giving only suggestive strategies here and the final decision must lie with the teacher and the school.

- As discussed before, a report card can show grades A+, A, B, C, D in specific subject areas. These grades will indicate the range within which the child's learning and performance lies in the performance bands or levels for evaluation.
- Grades should be supported by qualitative statements about where the child needs extra help or shows extra competence.
- A separate rating on child's efforts can be given on a 3 point scale.
- Qualitative statements about how the child is looked at comprehensively or holistically by a group of teachers should be given.
- It must be noted that that a child's general abilities (for example, language abilities, comprehension, ability to concentrate, to design, to judge critically, to come up with innovative answers etc.) and attitudes (like motivation, interest, enthusiasm, helpfulness etc.) cannot be judged over weeks or over a small set of activities. Abilities and attitudes change and evolve slowly over several months or years and show their evidences sometimes. Some of these may be very hard to judge at all, so trying to judge the child on every aspect of personality may not be fruitful, and may result in faulty or meaningless judgments. At times in schools, children's traits are reported on a long list of criteria in report cards, which are often tick-marked without sufficient thought or much evidence.
- At times personal qualities are also given grades. This is faulty, because many such qualities (for example, empathy or helpfulness) cannot be sharply defined or even identified in a person. Assigning a grade-value like A to one student and B to another on such things is problematic because such distinction cannot have a sound basis.

A. Recording and Reporting Personality Related Aspects

The teacher can make a diary where one page is dedicated to every student. It is recommended that every time a teacher notes something special about a child, she makes a note on the student's page. If she does not do it, she may forget it in the long term. When a report of a student is to be made, the teacher can consult her diary and other teachers. Then all teachers can collectively make a judgement on the student's personality and how they view her comprehensively. An important input of this part can come from other students or through peer assessment. For example, the whole class can be asked which students they rate highly on being helpful, kind, enthusiastic, sensitive etc. This feedback can even be taken in writing and if many students' opinions agree on these parameters, they can be reported. *If the teacher does not find anything worthy of reporting, she can leave some blanks in the report.*

Suggestive format of Progress Report in science for one quarter:

Name of the child …….. Class…….. Quarter- I / II/ III

Learning	Topic/theme*	Grade	Comment
Topics taught in this quarter -Knowledge and understanding	Sound Physical properties of Metals Respiratory system	B A A+	*If her understanding is probed, many areas are strong, but some seem to be memorised without understanding in depth, For example, she had only memorised the definitions of frequency, amplitude and vibration without understanding. She is sharp and if she focuses more on understanding of her concepts, her learning would improve substantially.*
Abilities	Ability to observe Oral expression Written expression Design skills Quantitative skills Independent-thinking Analytical skills		*Since her learning is generally strong, she can help other students in learning.* *She has good observation and analysing capacity.* *Her work is less organized and she is encouraged to try being more organized in her work.*
Attitudes	Enthusiasm Patience Concentration		*She has a good retention of her previous knowledge and would be the first to answer any question asked in class. If you tell her to allow other children to speak, she gets discouraged and may*

	Cooperation with others Completion of home assignments		*stop participating. It would be good if she can moderate her speaking in class to give other children more chances, without stopping her participation. Her participation can be more towards asking questions or clarifications.*
Effort put in		Level II	

Grade scale:

D: The child's basic understanding of targeted knowledge/concepts is weak and she needs to be given extra time and help to improve her learning.

C: The child has acquired basic understanding of targeted knowledge/concepts, but still needs to put in more work.

B: The child has achieved a reasonable understanding of targeted knowledge/concepts.

A: The student has achieved a very good understanding of targeted knowledge/concepts.

A+: The child has shown extra interest, talent or creativity in some topics covered during this period.

Effort scale

Level I- Extraordinary effort: Extraordinary effort put in by the student in the period of evaluation

Level II: Normal effort: Normal effort put in by the student in the period of evaluation

Level III: More effort needed: The child needs to be motivated to put in more effort

* It may be noted that no grades have been given for abilities and attitudes. Only general observations of the teacher are given, not necessarily on all criteria. The teacher writes only whatever she finds noteworthy in the period of reporting.

B. Giving feedback to the Child

On preparing a report, the teacher needs to communicate and share her feedback with the child and parents. This is important and needs to be done carefully and in a constructive, positive manner, so that it does not damage the confidence or self-image of the child. On a regular basis most teachers do provide informal feedback to the child while she/he is involved in a task/activity. What needs to be encouraged through feedback is to make the child to *compete with herself/himself rather than with others.* It should be with reference to – *'Where was I yesterday or a week ago and where am I today?'* Comparisons between children are damaging. By and large they lead to feelings of '*I am not good enough'*. Conversely, if a child has done very well, he/she is put under pressure to keep up the performance by teachers and parents, or she may suffer from a sense of superiority over her peers. If some gap in the child's learning is to be pointed out, pointing it gently and privately is far better than doing it in front of others. Children, like adults, do not mind being corrected but are equally conscious of their public image.

C. What to Share with Parents/Guardians

Parents are likely to be the most interested in knowing how their child is *'doing in school'*. More often than not, teachers feel they have communicated effectively through comments made to parents such as – '*can do better', 'good', 'poor'*, '*needs to put in more effort'*. Such statements do not provide any clear information of what the child can do or has learnt. For parents, these judgements may create faulty impressions about their child's competence, without actually allowing the parent to understand the child's difficulties or strengths, or to be able to help the child in any way. If the feedback is to be rich and helpful, it is suggested that the teacher should focus in simple language on:

- What the child can do and where does she/he needs more help. How the help can be given.
- What a child likes or does not like to do.
- Highlighting the child's extraordinary work with parents, to help indicate areas of success and improvement, along with appreciation of any special strengths, as well as efforts put in by the child.
- Talking on aspects such as cooperation, responsibility, sensitivity towards others, interests, etc. with both the child and parents in a positive manner. If the child needs to improve in some area, instead of saying 'she is not cooperative', it will be better to say 'the child needs to put in more effort towards cooperating with others'.
- Discuss with parents (a) how they can help (b) what they have observed at home about the child that would help the teacher support the child's learning better.

Assessment linked to learning of science

Students come to the classroom with their own ideas that are different from the scientifically accepted ones. They have arrived at these ideas by trying to make sense of their observations and experience and knowledge or information from many sources in their lives. Many concepts in science that students are introduced to in the elementary classroom are counter to what students have experienced - for example, earth is easily seen as flat from daily experience and roundness of earth is not intuitive at all. Many of their notions are unclear, not deeply thought about and are often different from the current scientific view. Science teaching needs to take students from the everyday conceptions they have, to the scientifically accepted ones. This is a process that takes time and along the way students will pass through stages where input from the teacher is critical to helping them make the changes in their conceptions. The teacher thus needs to assess students' views continuously and identify their learning needs.

It is helpful to remember that all knowledge in science is built *starting from observations*. If we encourage children to observe phenomena around them, notice patterns with the help of some mental or physical activity, and report what they think, it will lead to many advantages. It will tell them that it is reality that they are trying to understand through science and science is not only knowledge residing in books. *Reports*

of their own experiences and analysis are very good assessment guides for the teacher. So the first assessment strategy in science classes would be to allow children to speak, discuss, question each other and raise questions to the teacher. When they talk about what they are observing and analysing, you will know what they think about phenomena and in which direction you need to take them in your teaching.

After observations, it is good to go towards the most important questions of science, namely the ***how*** and ***why*** questions. If one is noticing some phenomena, it is important to go through *how* it happens in nature, for example, how a seed grows into a plant or a bud turns finally into fruit or how phases of the moon vary with time or how a candle burns in air. Here, again, the learners' clear reports of the process or mechanism are important, which the teacher can assess and lead them towards clearly noticing what is happening, in what sequence or order or pattern. *The teacher can ask for verbal/ written reports, charts, graphs or other representations, which can be either individual or collective. Coming to a collective view on a situation helps children discuss and argue amongst themselves and helps learners in assessing their understanding against their peers. Therefore collaborative and group work is a powerful tool in CCE, which leads to self and peer assessment. It also lightens the burden on the teacher.*

The most challenging aspect, indeed the crux of science is, moving towards looking for *explanations* of the patterns observed. These emerge when looking for answers to questions on phenomena, for example, why a hole is present in the seed? Why the moon changes its phases or why wax melts easily on heating but iron does not. Since this is the essence of science, it is important to allow children to raise their own questions. Once again, the teacher can assess their level of interest or engagement from their questions. If sufficient questions/comments do not come from students, the teachers can draw attention towards some questions. If given freedom, children throw a large number of questions, particularly small children. The teacher also has to judge which questions can be handled at their current level of cognitive development. If some questions are of much higher order than their ages, the teacher can say that finding answers or explanations can be a prolonged process which may happen over many years. In finding answers appropriate at their ages, it is once again useful to let children make guesses at explanations. These guesses (or conjectures), which are called *hypotheses* in science, are a step towards finding explanations and allows children to learn to think scientifically. *It is important not to judge these hypotheses by children as 'wrong' or 'right', since they are a very important step in knowledge building, in judging how children are currently reasoning.* The teacher, through her teaching inputs has to build their knowledge from guesses to some explanation which makes sense to them, convinces them.

Often teachers ask questions requiring only information and the vocal students raise their hands, often to jump at every opportunity to answer a teacher's question. It is important to see that often *no learning is happening in such situations.* The 'hand-raisers' are often giving pre-memorised answers. Else, they are trying to guess which correct answer the teacher is looking for. There is no deep thinking or reflection on the part of such extra-eager students and their motive is to just make a good impression on the teacher. Such question-answer sessions are harmful for those who give such answers since they kill careful thinking.

They are harmful for other quiet students too, since they interfere with knowledge building, and break their confidence and will to learn. *Looking for a correct memorised answer, or seeking information, is anyway totally contrary to learning of science.* What is actually learnt is the ability to memorise and guess what the teacher is looking for, rather than looking for an explanation of phenomena.

What would we expect a Science Classroom to be like?

Based on the discussion above, we expect students to *engage with the processes of science*. Specifically, they should:

- Observe things carefully
- Record their observations, make measurements
- Organise observations in a form that can be shared
- Discuss their observations with others
- Arrive at generalizations based on data

Further, we expect them to learn to:

- Frame hypotheses
- Design experiments to test hypotheses
- Carry out experiments designed by themselves or by others.
- Understand and critically evaluate the evidence and arguments leading to their conclusions

In all this, they will often be working in groups. Thus we expect them to work together and learn from each other. Ideally the teacher will be facilitating the above, conducting whole class discussions, throwing challenges and provoking debate. The science classroom therefore cannot be a quiet place, or a place where only the teacher's voice is heard most of the time.

While some special materials and equipment may be needed for some activities (e.g. lenses, magnets, some chemicals), most of the above processes are not crucially dependent on the availability of such materials. Thus, irrespective of resources, we expect some of these processes to be going on in a science classroom at any given time. CCE in science therefore will involve precisely these processes.

Role of Teacher Educators/BRC/CRC Personnel in CCE

While organising professional development of teachers like in-service training, following points need to be addressed by educators:

- Trainings are not to be organised in a 'top-down' manner, by telling teachers to implement methods or strategies suggested by them for CCE. Teachers need to be suggested how to do assessment by taking examples so that they would get opportunities to discuss, reflect and share their problems.
- Teachers must get the chance for peer discussion and sharing of school practices related to CCE. This process would facilitate mutual and participatory learning.

- Clear understanding on ***purposes*** of assessment and evaluation procedures is required otherwise it would damage the learning process.
- Under CCE, many states have developed various formats for recording and reporting progress of children. Clarity on different aspects of CCE is required while generating any kind of assessment data. Without such clarity, experience has shown that prescribed formats are not helping in teaching-learning process, rather wasting teaching-learning time.
- Teachers are working in varied and often difficult situations, such as large-size classrooms, in difficult-terrain schools, multi-grade classrooms etc. A uniform recording and reporting format would not serve the purpose of CCE. Prescriptive formats that do not give flexibility to the teacher go against the very spirit of CCE.

Role of Administrators in CCE

The CCE approach believes that teaching-learning is a continuous process that depends on dynamic interactions between the learner, her peers and the teacher. The teacher is the person who spends the maximum time with children in the classroom. Therefore the teacher is the best person to judge children's learning needs, levels and progress. If any record is to be maintained in assessment, it should be mainly to inform the teacher and the choice as to what records she wants to keep, must be with her. Recording of each and every classroom activity is burdensome, impractical and does not help teaching-learning. ***The teacher should not be forced to record and report continuously, for all her classes or activities.***

This would require that education officials, superiors and inspectors respect the teacher's autonomy, making her feel responsible and worthy of taking charge of children's learning. CCE can only work in non-threatening situations, for both the teacher and the learners, where the charge of teaching-learning is given to them. Here administrators can encourage teachers to concentrate more on assessing *the process and interaction in their classroom, rather than the product*. They can give them feedback on the processes that go on in class, for which we have provided some examples above.

Besides this, the following can be done:

1. Short duration trainings of 4-5 days at one time may be considered, preferably during vacations so that teachers' and children's learning time is not consumed for trainings.
2. Administrators need to know that they are also a part of teaching-learning process and their role is very important. Regular interactions with teachers to discuss their problems and find solutions can solve many difficulties.
3. It is necessary to give flexibility of time-table to the teacher for designing and evolving her teaching in CCE. CCE cannot work in rigidly bound time-schedules decided by people other than the teacher.

4. Teachers should be encouraged to use locally available resources and opportunities of learning outside the classrooms, which sometimes are not encouraged by administrators.
5. The essence of training programmes attended by teachers, head teachers and other educational personnel must be shared with all implementers. This process would help everyone update their knowledge and also make them understand the rationale of newly recommended changes.
6. Autonomy needs to be given to teachers to undertake the syllabus in a sequence or manner they would like to take. For example, in most of the schools teachers have to take chapters in a sequence suggested by schools. Without this flexibility, a teacher cannot implement CCE or improve her teaching.

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