EDUCATING THE RAINBOW: TOWARDS AN ALL INCLUSIVE APPROACH TO ASSESSMENT IN SCHOOL SCIENCE

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The paper aims at discussing the possibilities of enriching the educational experiences of all the children in a school, through a well planned and focussed scheme for continuous and comprehensive assessment in science. Broadly divided into three parts, it begins with a discussion about the need and significance of formative assessment. Next the paper discusses various issues and challenges associated with assessment in school science. The third section illustrates the strength of a finely crafted assessment mechanism in unfolding and gradually optimising the otherwise hidden potential of individual child in a regular school system.

Keywords: Formative assessment, School science, Misconceptions, Optimising learning

FORMATIVE ASSESSMENT: BUILDING A VIEW- POINT

New ideas or innovative strategies form the core of educational planning. In the past one decade alone (NCERT, 2000, 2005), the field has enthusiastically considered multiple dimensions of school curriculum, classroom processes, assessment programmes and school administration. But ironically enough, despite the openness with which educators moved towards educational innovation, the field is considered to be static and polarised. The policy makers and the planners are often described as glued to their own ways, oblivious of field realities and taking ignorant decisions on behalf of the large volumes of (uninvolved) stakeholders. The basic reason for such a contradiction could be lack of unbiased, rigorous intellectual debate around the proposed educational ideas, as also the instantaneous implementation of the same without devoting a realistic time for preparing the practitioners in the field. The new programmes reach the schools which are completely unprepared to mull over them, ensuing confusion, conflict, inaccuracy, frustration and consequently failure. Many of these ideas are, therefore, prematurely discarded or are inappropriately adopted without a contextual relevance. Either ways the end user-*the school student*- receives very little, tries to, somehow, cope with the new situation and in most cases maintains the status-quo.

The latest educational mantra is alternative assessment. It has become the hallmark of educational innovations and is described as an answer to falling enrolment rates, compromised academic achievement and frosty school environments. Undoubtedly, the rigid, standardised, one time summative assessment had unconstructive impact on the school education. The children with fewer resources and least opportunities were constantly harassed by such mechanisms. Clearly, the education needs an alternative to this restrictive mode of judgement about the student abilities. Yet, the proposed alternative should have passed through a rigorous field test and professional scrutiny, before being rushed, for a long term gain.

Formative assessment would, anytime, be a more productive option, leading to significant improvement in the outcomes for learners, as; it is continuous, progressive, interactive and participative. It involves students proactively or reactively and leads to unpredictable outcomes. It provides an opportunity to the students to plan and monitor their own progress. The students are expected to be alert all the time, and most importantly, they are expected to disclose their thinking patterns, which many of them describe as a source of potential harm. The validity of formative assessment relied on the extent of student's disclosure (Cowie & Bell, 1999).

The teachers, on the other hand, are expected to be well prepared and highly motivated. They are required to map the scope of the subject beyond the content, design suitable learning experiences and develop assessment tools for each of those experiences. Their candidness to ideas and non-stereotypical responses, allowing openness and thinking beyond the textbook, would be the key to success.

As an integral part of the teaching-learning process, formative assessment can depict the gradual progress of each student, and facilitate the process of taking informed decisions about the next steps in teaching and learning. Thus, the process of formative assessment is primarily based on constructing a congruency between the act of teaching and learning in a classroom situation. Fundamentally, these two components

should, constantly rediscover each other and regularly redefine themselves for optimising the educational outcomes.

Formative Assessment in School Science: Issues and Challenges

School science is a rhythmic mix of content, processes and skills. It offers unlimited opportunities to learn finely differentiated life skills and promote an integral existence for each individual. With its unique composition, this school subject requires unmatched skills from both, teaching as well as learning- inquisitiveness and passion to learn being the most basic of all. School science has a spectrum of events, from some very easily observable daily life phenomena to objects requiring microscopic view to description never observed directly; there are distances, least counts, wavelengths, frequencies beyond vision yet measurable.

A multifaceted subject, with a homogeneous blend of products and processes, science is directly related with the spirit of inquiry, and thus, requires forthcoming, self motivated participants in the process of learning. It has a language of its own and requires a set of vocabulary. The subject has a medium (which could be any language), terminological base and involves symbolic, mathematical, graphical, diagrammatic and numerical representations. The subject requires a range of skills from observation to experimentation to inference. It requires analytical, critical and rational thinking skills, as also the skill to visualize and the skill to imagine. Sporadically, science may, present contradiction to the explanations offered by other sources (other school subjects or social enterprises).

The procedures for assessing the learning outcomes of all these components require extensive planning. Each day, every interaction offers more than just the content discussed that day. The teacher needs to identify the learning objectives based on the *scope* of the content and not merely the perceptible content. Since each class has something to offer, the assessment needs be, (essentially*),* planned on daily basis. The assessment designs and procedures should incorporate the demands of the subject as well as the diversity among learners. This would have significant implications for designing the suitable variety of assessment situations.

Students have a spectrum of abilities. While concurrent learning experiences need to be created, there should be enough opportunities for self appraisal and forward mobility towards higher sequences. They come from differential socio-cultural milieu and bring cultural descriptions of observable events and social stereotypes with themselves. They have unique combinations of individual learning styles and possess diverse expression styles. They may be comfortable with one or more of the expressions viz written, oral, pictorial, poetic or dramatic. If their expression styles are not duly attended during the process of assessment, they may find it difficult to express themselves fully and end up underachieving. Students with special needs, require alternative provisions for assessment.

The variations among students need to be taken into account while planning assessment for them. This would be most crucial for retaining them in the system, which may otherwise jeopardize their continued existence (Barba, 1997). Thus any formal or informal assessment related with the learning outcomes of science, with such a great deal of diversity among learners in a regular school group, needs to be planned meticulously. The effective learning of the subject requires presenting variety of learning situations for cognitive engagement of each child in the task. This may pose multiple challenges for each of the participants across the school system.

Planning a Comprehensive Assessment Scheme for School Science

Formative assessment can be structured around profiles of learning outcomes that are set out in levels and describe a progression in learning (Venville & Dawson, 2006). Traditional testing through formal modes can be used periodically, but a more informal and rather unprompted assessment is required to support and enhance learning on a day to day basis. This calls for an unparalleled approach to assessment which would involve teachers initiating change by themselves. The teacher would play a central role in planning and implementing the assessment measures. They are expected to facilitate learning by asking suitable questions and providing clues on their way. Even though it may appear to be spontaneous to the learner group, the teachers require to construct an all inclusive conceptual map in their minds. They should possess an overview of the entire concept including the content, skills, representations and applications therein. The inter-conceptual and inter-disciplinary connections have to be carefully observed in details, to estimate the level and progression in learning. They would need to move stepwise to avoid confusion overlapping and repetition. One such evocative plan of action is described below (the point form is to reinforce the sequential planning).

— Prepare a list of learning objectives based on the given content, related scientific processes and skills.

— Plan short daily task for reinforcing the content, process and skills on regular basis.

— Involve learners in planning assessment activities.

— Include diverse expression styles while planning the task, in order to motivate maximum members of the group.

— Plan realistically. Whereas the task may present a cognitive challenge to promote higher levels of learning, it should not pose any emotional or motivational threat to any of the learners.

— Regular observation, activity based home task would extend the cognitive engagement of the student, beyond the classroom. These task may reinforce the content learn that day or may provide an experience for future and/or advanced learning.

— Term end examinations may focus upon an extensive knowledge base, suitably balanced with the projected thinking and other skills the students were taught during the classroom interactions.

— The laboratory experiences of the students require detailed planning with an intention to promote the spirit of inquiry and provide a chance to implement what is learnt in the theory classes.

— Highly deviated results, unmatched inferences and inappropriate procedures can be some of the highlights of a science laboratory work. In any of these situations an elaborate discussion (rather than discarding as undesirable) would encourage students to revisit their own work and strengthen their concept map.

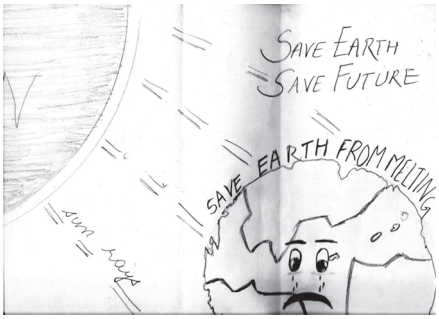

Figure 1: The learner showed earth melting due to sunrays falling on it, to depict global warming

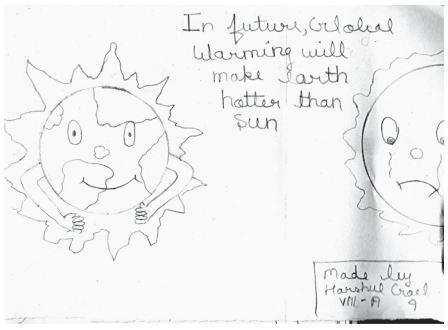

Figure 2: Another student wrote "In future, Global warming will make earth hotter than sun"

(Images generated as part of creative assessment planned for class VIII students, of a school in New Delhi, India).

The above two pictures are a part of regular informal assessment in two schools of Delhi. The students were provided with the theme of 'global warming' and given a choice to express their connotation of the term in whichever form they desired. While most choose pictorial representations, some wrote descriptions, poems and even skits to express their understanding. These two drawing are chosen here for the purpose of illustrating, that how these informal task presented on regular basis to the students, would help in restructuring the classroom procedures to maximize learning in the most effective and efficient manner.

Both, these pictures depict the children's conception of global warming. This can be a crucial evidence for the teacher and they may plan to address these alternative frameworks in most suitable way.

Such a well planned all inclusive approach to assessment in science would support learning in multiple ways. Student's misconception and alternative frames can be understood by the teacher and an appropriate planning to combat the same may be done the earliest (Driver, 1996). The teacher can revise the content or revisit the pedagogic decisions for enhancing the learning outcomes. While recognising the significance of informal learning, it would promote the active engagement of the learners and foster both individual and social skills preparing them for life in its broadest sense.

Concluding Remarks

Formative assessment is an integral part of learning. It facilitates forward mobility towards complex learning, while ensuring that the essential basics are adequately learnt. It may be organised in a collective mode, but an analysis of the responses/ participation of each student, provide the much needed feedback to the individual learner. Thus assessment could be significant for holistic growth of each child. It would help in identifying the strengths and locate focal areas to be strengthened within each child. The process calls for an active involvement of each child, creating self motivation and an individual passion to learn- the ultimate goal of any educational endeavour.

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