



ASSESSMENT PRACTICES IN SCIENCE TEACHING AND LEARNING AT SECONDARY LEVEL- SOME ISSUES

Rajesh Kumar¹ & Gaurav Rao², Ph.D.

1. Research Scholar, Department of Education, C. S. J.M. University, Kanpur.

2. Assistant Professor, Department of Education, C. S. J.M. University, Kanpur.

Abstract

Being an important constituent of general education, Science adds capability to the learners to understand and transform nature, to produce goods and services for the community. Assessment is an essential element of teaching learning process which guides teachers to reform and reconstruct their teaching strategies. Assessment Practice meant a set of activities undertaken by the teacher and student about student learning. Present paper reveals a research study with mixed-method approach to identify the problems of assessment practices in Science teaching and learning in 15 Secondary schools of Nawada district in Bihar.

Keywords: - Constituent, Community, Assessment Practices, Mixed-method approach, Secondary School.



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Science is an essential element in general education and a powerful way of thinking. Science can contribute to a more equal society where students are prepared to achieve their efficiency to contribute to society, and intended to potential perceptions about the world. Nowadays the basic Science Education is not a simple education of Science but is an education for Science and through the Science. In a good Educational system, the teaching and learning of Science to all students must satisfy the need for Science expertise- Education for science. UNESCO (2011) had recognized the right to universal access to quality Science Education and identified various challenges in achieving Quality basic Science Education. Among which the non inculcation of the Science in basic education is the more concerned one. Therefore, it is a global requisite to settle the place of 'Science for all' in elementary education and to meet the challenge of quality Science Education for all. The Quality Science education cannot be achieved without easy access and competency use the opportunities made by schools. The Copyright © 2020, Scholarly Research Journal for Humanity Science & English Language

aims of Science education are ever-changing with the recent advancements in the field of Science and demands of fast changing world with the modified views of learning. Science Education should make the learner competent to know the facts and principle of Science, to acquire the Science process skills, to nurture curiosity and creativity, to develop a historical and developmental perspectives of science, to relate it with environment, cultivate scientific temper, and improve Values. (NCERT, 2006) The National Curriculum Framework (2005) had also identified three critical issues for Science education in India, enumerated as 1.Science education far from achieving the goal of equity, 2.Science education with its best developed competence unable to encourage contravenes and creativity, and 3.The irresistible Examination System basic to most. Despite the capacity of young minds to assimilate, understand and appreciate Science, it is difficult to load a highly explored information into young minds in minimum time. This '*Dynasaur Syndrome*'(Rastogi,2000) of the science Curricula cause imperfect development of the habit of thinking, enquiring and analyzing , as constituents of constructive and reflective approach of school science education. The students approach to study the syllabus, the standard of teaching process and the evaluation procedures are interrelated and the first two are often guided by the third. The quality of questions designed for evaluation is critically important and be more 'concept laden' to guide the students in the path of logical thinking, analysis and enquiry. Boradapurkar (2006) observed the aim of education in general, and Science in particular, is to understand and explain the experiences in a new way. The education is aimed to make student competent to understand Science *per se*. It is always kept in mind that the object of Science education is neither the meta-study of Science nor the study of child psychology. Assessment and evaluation, based on constructivism reveals though that teachers should first value and apply constructivism when teaching. In addition, relating this to assessment, Cresswell (1996, p.59) asserted that "*An analysis of various national and international assessment systems will quickly reveal a broad spectrum of assessment techniques and approaches. All of these systems have their strength and weaknesses in relation to technical resources and time considerations and in their impact on the associated education system.*"

Despite global promotion of laboratory courses in Science curricula the school science education have a problem of lack of an effective and efficient assessment practices of student's learning in the laboratory environment, Researchers (like Hofstein and

Lunneta,2004; Olfender and Grelsson, 2006) argued the unavailability of the specially designed achievement instruments to assess the kinds of higher order thinking skills as emphasized in laboratory works, such as study design, hypothesis testing, problem solving, interpretation and communication of experimental results, etc.

In India, since the era of Chanakya, Assessment Process has been mentioned in *Arthshastra* to select a candidate for ministerial position includes Observation, Performance Appraisal, Refereed Assessment, Interviewing and other forms of testing. To be effective in promoting learning, teaching must involve interaction between students and teachers, and the assessment for learning is a key element to such interaction. A comprehensive review of the literature remain evident that frequent formative assessment practices lead to significant improvement in students' test scores, i.e. attainment as measured by summative assessment. Assessment of students' achievements includes the purposeful generation, interpretation, communication and use of data generated from an immense range of various activity includes- 1. Engagement in an activity, 2. Collection of data from that activity, 3. judgement of the data as compared to some standard, and 4. Describing and communicating the judgement.

“Principles of Assessment Practices.(as cited in Harlen, 2013, p.82).

1. All Assessment should ultimately improve learning.
2. Assessment methods should enable progress in all important learning goals to be facilitated and reported.
3. Assessment should promote public understanding of learning goals relevant to student's current and future lives.
4. Assessment procedures should include explicit processes to ensure that information is valid and is as reliable as necessary for its purpose.
5. Assessment of learning outcomes should be treated as approximations, subject to unavoidable errors.
6. Assessment should be part of a process of teaching that enables students to understand the aims of their learning and how the quality of their achievement will be judged.
7. Assessment methods should promote the active engagement of students in their learning and its assessment.
8. Assessment should motivate and enable students to show what they can do.

9. Assessment should combine information of different kinds, including students' self assessments, to inform decisions about students' learning and achievements.
10. Assessment methods should meet standards that reflect a broad consensus on quality at all levels from classroom practice to national policy."

Various challenges has been observed during Assessment of Science teaching and learning and UNESCO(2011) identified some Major Challenges as below.

1. A mismatch between the short term and long term objectives for Science learning.
2. Assessment of values is a less explored and has no suggestions for future work.
3. Timing i.e. " most studies of assessment relate to shorter- term impact, typically during the course of a module or less often a school year whereas few studies of long term impacts of learning raise some puzzling possibilities. While it is acknowledged that information retention falls off with time, investigations of teaching and learning where the aim is deeper understanding show that long term outcomes can be better than short term ones.(p.14)"

In general, Assessment process in schools is divided into formative assessments and Summative assessments. Formative assessment is the classroom assessment whereas the summative assessment is done after the completion of a particular unit of a course or at the end of a course. As William & Thompson (2008), the nature of classroom assessment estimates the value of the students' learning which is to be assessed and how? Black and William (1998) strongly argued that when teachers use the classroom assessment as formative assessment there is possibilities of substantial gain in learning. Therefore, as per need of the curriculum, the classroom assessment must be formative and supportive in learning with improved quality.

In India, school level assessment system can be classified into two broad categories: First is Classroom assessment, assessing during classroom teaching-learning activities; and another is consisted of examination oriented assessment practices formal tests. The assessment practices undergoing in Indian secondary school classrooms are far from formative assessment and is mainly guided by paper pencil based tests.

Classroom assessment or the assessments employed within the day to day classroom structure have the potential to improve teacher instruction and pupils learning. Students' achievement depends on how teachers perform with different assessment practices. Grant (1996) pointed

out Teacher’s sound knowledge of classroom assessment practices and principles can improve the student achievement and teachers’ perceptions on classroom assessment acts as an indicator of their practices in classroom.

To assure the quality of education, Classroom assessment is a most important tool in the hands of the teacher, and teachers should be aware to role of assessment in teaching and learning , well documented in Stiggins & Chappuis(2005), and how to use assessment practices effectively.

Methodology: A Mixed Method Approach comprised of Student Survey, Teachers Survey, Science Classroom Observation, Focus Group Meetings and Interviews, School Information Blank and Document Analysis.

Population: Students and Teachers from Secondary Schools located in District of Nawada (Bihar) and different stakeholders of Educational System.

Sample: 15 Secondary schools (10 affiliated with BSEB and 5 affiliated with CBSE),randomly stratified sampled, situated in District of NAWADA(BIHAR). 600 students (300 boys and 300 girls studying in Standard IX and X) and 60 Teachers teaching Science in Sampled Schools. Focus Group participants were 20 comprised of 7 Science teachers, 2 School Principals, 2 Teacher Educators, 5 Representatives of Parent Teacher Association, 2 Scientific Professional and 2 Education Officers participating in 2 Focus Group Meetings.

Research Instruments: Self made Student Survey Questionnaire, Self Made Teacher Survey Questionnaire, Self Made School Information Blank, Self Made Science Classroom Observation Schedule, Self developed Focus Group Protocol.

Findings:

The statement numbers 16 and 18 in Section II and statement numbers 2 and 3 in the Section III of the Student Survey Questionnaire respectively dealt the teaching learning activities and problems in relation to Assessment practices. The summary of the responses are given in Table-1.

Table-.1. Summary of Student’s response on Assessment Practices.

Sl. No.	Statements	N	1	2	3	4	5	Mean Percent	Std. Deviation
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Discussion on concepts									
1	in presence of science teachers.	600	7.0	19.2	10.0	27.3	36.5	3.6717	1.325
2	Self Assessment of known concepts.	600	8.2	14.7	16.0	25.7	35.5	3.625	1.3121
3	Memorization of more concepts.	600	50.7	10.8	34.8	1.3	2.3	4.3117	0.85581
4	Understanding more scientific hypotheses/facts.	600	59	10.5	30.3	0.2	0	4.4817	0.68589

About 36.5% of the respondents rarely discuss the concepts in presence of the Science Teacher in classroom. 27.3% occasionally faces such discussion followed by 19.2% mostly, 10.0% usually and 7% often respectively. About 35.5% of the respondents never involved in self assessment of the known/studied concept. 25.7% of them occasionally self assess themselves followed by 16%, 14.7%, and 8.2% of those assessing themselves usually, mostly and often respectively. About half of the respondents were fully agreed with Memorisation of the more concepts and understandings of the scientific hypotheses and facts as a tool to do better in the field of Science. About 10% of the respondents were agreed with memorization of the more concepts and understandings of the scientific hypotheses and facts as a tool to do better in the field of science. About one third of the respondents could not state on agreement with memorization of the more concepts and understandings of the scientific hypotheses and facts as a tool to do better in the field of science. Negligible number of respondents were fully disagreed with the statements. The Teacher Survey Questionnaire asked Science Teachers to rate the relative weightage for assessment practices used in Science Teaching emphasised the learning outcomes, strategies and purposes for assessment in teaching and learning activities. Table 2 summarises the Science teachers ratings of the average percentage weightage for assessment of different Learning Outcomes.

Table. 2 Percentage weightage for assessment of various learning Outcomes as observed by Science Teachers. (N=60)

What do you Assess?	Mean Percent	Std. Deviation
Understanding of Science content.	41.16	8.79

Science Skill and Processes.	32.83	6.20
Science attitudes.	26.66	7.17

On Average Science teachers gave a higher assessment weightage for understanding Science Content (41%); than for Skills and processes (33%) and for Attitudes (26%). Table- 2 summarises Science teachers average percentage weightage for various assessment practices.

Table. 3 Percentage weightage for Various Assessment Practices as observed by Science Teachers. (N=60)

How do you assess?	Mean Percent	Std. deviation
Written Test.	37.00	7.65
Assignments/ Projects.	13.83	4.92
Practical Work.	22.16	9.35
Quizzes.	13.15	4.14
Concept Mapping.	13.33	3.60

Data in table- 3 revealed that on average Science teachers gave a higher assessment weightage to Written test (37%); than for Practical work (22%). The weightage given to Assignments, Quizzes and Concept mapping were 13% each respectively. Table- 4 summarises Science teachers mean percentage weightage for various Assessment purposes.

Table. 4 Percentage weightage for various assessment purposes. (N=60)

Why do you Assess?	Mean Percent	Std. Deviation
For grading and reporting.	48.16	8.07
For student feedback on their learning.	31.75	8.72
For identifying students' misconceptions.	20.09	5.67

Table- 5. Summary of Response on Assessment Practices. As given in School Information Blank.

Sl. No.	Item	Mean	S. D.					
				1	2	3	4	5
1	Total number of test and terminal examination in a year.	1.733	.7988	46.7	33.3	20	*	*
2	Type of Question paper used to evaluate science subject.	1.466	.639	60	33.3	6.7	*	*
3	Way to evaluate Science Subject.	1.60	.910	66.7	6.7	26.7	*	*

4	Way for searching talented Students.	1.466	.743	66.7	20	13.3	*	*
5	Arrangement to talented Science Students.	1.466	.743	66.7	20	13.3	*	*

From the Table- 5. presenting data on assessment practices as collected by School Information Blank, revealed the following.–

As far as the number of test and terminal examinations in a school per year, less than 3 in 47% of the schools, and 3 to 6 in 33% of the schools respectively. As far as the question papers used to evaluate science subject in schools, 60% of the school preferred the teacher made one, 33% of the schools preferred Standard one, and 7% of the school preferred general, respectively. As far as the way preferred to evaluate science subjects in a school, 67% of the schools use written test, 33% of the schools use Oral test, and 7% of the schools use the practical test. As far as the way preferred to search the talented students, 67% of the schools use Class teaching, 20 % of the schools use science based activity, and 13% of the schools use to guide students outside of class, respectively.

Based on Science Classroom Observation made in three schools the researcher found the assessment practices satisfactory in Private managed School and in Central Govt. Owned School(*Navodaya Vidyalaya*) and unsatisfactory in State Govt. owned School.

The qualitative analysis of data collected from Focus Group meeting and Interviews suggested the assessment practices in Science teaching and learning process in secondary schools that there is lack of effective coordination, monitoring and evaluation of Science activities; a need to modify the content burden curriculum to a curriculum emphasizing on practical approaches with more than hands on practice.. ; science classes seems to be more theoretical; even in laboratory it is more theoretical.

Conclusion:

Science, at Secondary level is presented as traditional, disciplined and content burden manner whereas at lower level, that is taught has no relevance to the needs and interests of the students. Quality Science teaching and learning requires more constructive and reflective approaches such as hands on activity, actively engagement of students in scientific inquiry. The regular monitoring of the students’ learning outcomes will enhance the Quality of teaching and learning process. In actual Science teaching and learning, the assessment is

typically summative, norm referenced and focused on content. These traditional assessment practices remain one of the most significant barriers to science teaching and learning in secondary schools, where teachers are required to prepare students for the term-end examination, instead of making formative assessment practices more common. Thus, there is an urgent need of more innovative formative assessment practices in schools, particularly at secondary level to improve the science teaching and learning. Assessment practices and assessment skills are two different but conjoint constructs. First one relates to assessment activities, and last one reflects an individual's perception of their competencies in conducting those activities. The assessment practices should be reflective in nature and the assessment practices and assessment skills among science teachers should be improved.

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