



PERFORMANCE-BASED ASSESSMENT IN SCIENCE AT ELEMENTARY SCHOOL LEVEL

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Abstract- *The purpose of the study was to describe the effective use of performance-based assessment in the science classrooms. Performance-based assessment has the potential to develop scientific skills in learners. Performance-based assessment focuses on assessing and developing the problem-solving skills, application of knowledge, critical thinking skills and meta-cognition of the learners while they perform different types of task. Performance based assessment in science develop different process skills in learners like observation, inferring, experimentation, classification, measuring and communication. These skills ultimately improve the achievement and learning of students in science. An attempt has been made in this paper to design a performance-based assessment in science at elementary school level. The study will be helpful for teachers and students in their teaching and learning science at the elementary level.*

Keywords- *Performance based assessment, Science classroom, Elementary school level.*

Introduction

Assessment is an essential tool that helps to know the progress of learners and the difficulties that hinders the growth of the learners. To understand the hindrances of learners' performance, teachers change their instructional strategy in the classroom. Science is a systematized body of knowledge, an attitude, and a process. It gained through the experience, observations, explanation, experimentation and different activities. The position paper on science teaching is endorsed by a vast amount of research on science education, promotes a hands-on or inquiry-based approach. This is widely acknowledged only on theoretical level and paper pencil test is used to assess the progress of students. Only a paper-pencil test is not a valid indicator for the development or growth of the learners' progress. These tests are easier to generalize but do not reflect the students' actual performance in their real life. In traditional assessment, students have limited choices and cannot acquire comprehensive skills. This approach is more theoretical and may not promote healthy learning and a comprehensive atmosphere in science learning. The science classroom provides freedom to students to interact and experiment with things. They get significant learning experience and enhance their science process skills, which is essential for imbibing the spirit of scientific literacy. But in science classroom there is lack of coordination

between what students learn and what teachers asked them to present. The science syllabus may not be congruent with the assessment, focusing on facts and comprehension, whereas the science syllabus focuses on solving the problem and investigating (Okey, 1995). Therefore, in the present situation, there is a need to change the assessment process and techniques just as instructional strategy in the classroom so that learners can develop 21st-century skills and other higher-order thinking skills. Assessment should be done this way so that learners can monitor or observe their limitations and progress and try to cope with them. NEP-2020 also emphasizes that assessment focuses on the national and local level curricula with relevant higher-order thinking skills and application of knowledge in real-life situations rather than rote memorization. Therefore, School boards should undertake a shift or bring a change in the assessment pattern to other alternative assessments to meet the requirement of 21st-century skills. Therefore, there is a need to change the assessment process where the teacher only works as a facilitator. They must focus on knowing why, when, where and how to apply their knowledge in the problematic situation rather than knowing what and how. Learners' critical reflection assists them in attaining and demonstrating adequate teaching proficiency (Kemp, Jefferson and clay 1991; Kemp 1992a).

Due to limitations of traditional teaching and learning, performance-based assessment in science has been advocated as a technique to support students in developing transferable and practical scientific skills. Additionally, it helps students to overcome their reluctance and gain knowledge and comprehension of the science epistemological field (Naah, et. al.2018)

Performance- based Assessment

Demonstration of knowledge, understanding and skills by developing material or performing task is the basic element of performance based assessment rather than choosing the options. Performance assessment refers to testing that requires a student to perform tasks designed to demonstrate specified knowledge and skills. These tasks may be activities in which students solve a problem, identifies a malfunction, make a decision or implement a decision or solution (Tuckman, 1988). Since it requires performance tasks in which students construct their knowledge and focus on solving problems rather than choosing answers or select option. Performance assessment gives a base to evaluate the effectiveness of the process during performance tasks as well as the product resulting from performance tasks. For e.g. - During the demonstration what approach and procedures follow and after completing what result did get. There are several methods and techniques, which are associated with assessment. Sometimes meaning of those terms overlaps, but the meaning associated with terms differ. Performance assessment and authentic assessment sometimes used interchangeably. The performance, which is used to assess the progress and learned behavior of students, is considered as authentic. A task that depict the background difficulties and standards of the field in which it is assigned is said to be authentic (Wiggins, 2011). However, performance-based assessment and authentic assessment are not the same since authentic assessment pertains to the context in which an answer is delivered, whereas performance evaluation relates to the sort of student reaction that would be studied. Students perform or display desirable behavior in a real-world context as part of an authentic assessment. For e.g.- Test to know the drawing skill of students comes under performance based assessment because in this test they are only asked to perform specific skill which are assessed but when they are asked to prepare working model of village life, different sources

of water pollution etc. comes under authentic assessment because this relate to their real life.

Performance assessment and Science learning

Influence of Content knowledge on skill development is measured as a paramount in science (Duschl et. al, 2007). Content knowledge includes knowledge of facts, concepts, theories and principles (OECD, 2017). The content knowledge level substantially influences skill development (Eberbach and Crowley, 2009), which ultimately influences the quality of students inquiry performance (Duschl et. al, 2007). Performance assessment is supposed to be a valid indicator to assess the science process skills, which helps to improve students' learning (Shavelson et. al, 1991). In Science, Performance assessment encourages students to indulge in hands-on activities to solve problems. It helps students to plan and execute the whole activity or tasks and provide rationale behind its own actions. The appearance of strategic and procedural knowledge is evidence in the performance assessment. It helps in assessing the process and product of the tasks, which directly focus on acquiring content knowledge and skills (Parker & Gerber, 2002). Performance assessment helps students to develop different process skills of science like interpreting, inferring and predicting, which precedes to achievement of students (Anthony-krueger, 2001). It helps to assess and develop observational skill (Tachie, 2001). It encourages and motivates students to be more successful in learning (Sumardi, 2017). Performance task develop students self-efficacy in science learning so that students think, behave and feel in science learning that ultimately influence decision-making and problem solving skill in science (Villarta & Gagani, 2021). Performance assessment improve student's metacognition skills by engaging in different tasks and activities through planning, organizing, interpreting, and making judgment on the basis of evidence.(Omidi & Sridhar, 2012).

Designing a performance- based Assessment

Four significant steps should be considered while designing the performance assessment (Stiggins, 1987). These four steps are as follows-

1. To clarify the reason for the assessment- Assessment has its own purpose and the teacher knows how it should be used. So teachers have a clear picture of designing assessments.
2. To define the performance to be evaluated – It involves specifying the skills or content along with the content and type of the performance of students to be assessed.

- 3 Designing the exercise – Teachers design performance tasks to keep in mind the learning objectives of the assessment of given topic. For example, what procedures will be used to demonstrate the students' learning?
- 4 To plan the scoring procedure for the students- Criteria of scoring procedure is to be prepared to evaluate the learners' performance. Here teachers set standards for assessing performance-based assessments. For example, how they will consider being excellent and acceptable? Therefore, use rubrics to assess the whole performance task process and use a rating scale to assign how many points or marks must be given.

Outline of a Performance- based assessment in Science

Name of the activity- Indication of Acid and Base Class- 7th

Subject–Chemistry

Time – 15 to 20 min.

Chapter-Acid, Base and Salt

Topic- Test of Acid and Base

Overview - Students learn about descriptions of indicators and how to distinguish between acids and bases using indicators. They next decide whether the unidentified solutions are bases or acids.

Aim of the Activity- Students will be able to conduct experiment through proper use of materials, able to describe, explain using observation through their cognitive skills. They will be able to differentiate between different solutions, able to provide rationale and justification on the basis of evidence.

Materials required- Acid solution like vinegar, juice of citrus fruit, unripe mango, grapes etc., Base solution like soap solution, milk of magnesia, lime water, window cleaner etc., and water solution in separate bottles, Blue and Red litmus paper, plastic cups, paper towel, Natural indicators- turmeric paper and hibiscus flower , Disposal pipettes. Transparent plates

Note- The teacher shows the sample of acid and base solution at the beginning of the task but the whole materials are to be shown until and unless students have to perform the task. They will not have any information regarding whether solution is acid, base or water while performing the task.

Preparation of equipment before task- Label solutions A, B and C to acid solution, base solution and water respectively. Label the small paper cups with a, b, and c

Additional Information-

Red litmus paper- turns blue in basic solution

Blue litmus paper- turns pink or red in acidic solution

Turmeric paper- turns pinkish red in basic solution

Instruction by the teacher-

1. Do not touch or taste any solution. Be safe during the task.
2. Arrange three rows and put three small cups labeled with a, b, and c in each row.
3. In each of the three rows, put one or two drops of solution A, B, and C into the cups labeled with a, b, c respectively.
4. In each row, soak the one end of different pieces of litmus papers and solution.
5. In the first row soak the one end of different piece of red litmus paper and instantly put the litmus paper on the transparent plate. Immediately note down the changes in the litmus paper.
6. Repeat the above steps with the blue litmus paper in second row and Turmeric paper in the third row, respectively and note down the changes.
7. At last, wash the plates and dry with paper towel and put all the garbage into dustbin

On the basis of above experiment, answer the following –

1. Which solution is acidic? Justify your answer on the basis of the changes during experimentation.
2. Which solution is basic? Justify your answer on the basis of changes during experiment?
3. How can you prepare China rose solution?
4. What changes will happen if China rose is used in place of litmus paper?
5. To test the presence of acid and base in any substance what procedure will you use?
6. Perform the above activity with limewater, unripe mango, grapes and window cleaner with China rose solution. What difference will you get?
7. How will you prepare limewater solution?

Performance assessment Criteria- The performance assessment criteria can be formed on the basis of individual performance or group performance. It can be determined on the basis of the purpose of assessment. The performance of students may be assessed by teachers, peers, self and other experts. Checklist, rating scale, portfolio, rubrics, anecdotal record etc. can be used as a score recording method.

Peer Assessment- It involves assessment of other students while they are performing the task individually or in the group on the basis of given criteria. It helps to improve students' performance while they are given feedback from the peers.

Self- Assessment- It involves assessment of students by their own following some criteria. It helps to know their own weakness and strength. It motivates students and takes charge of their own learning.

Assessment by teachers- It involves assessment of students by the teachers from observation of tasks performed by students individually or in group like presentation, role- play, project, assignments, exhibits, debates and other activities etc. after giving instruction in the class. When peer assessment and self-assessment are combined with teacher assessment, it becomes a comprehensive assessment procedure that helps learners to become self- directed, self- reflective and analytical.

Conclusion- Performance assessment in science is beneficial for students as well as teachers. For students, it helps to demonstrate and imbibe different skills that help students to motivate and make them confident. It is the need of the present situation to develop 21st century skills in learners so that they are able to compete worlds wide. Performance based assessment is one of the way which assess not only the progress of students but also develop different scientific capabilities. It also helps teachers to change their instructional process according to assessment. It provides deeper insight for teachers to fulfill learning needs of students.

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