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A New Approach of Science Learning of Bio Science for Sustainable Development

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***Abstract*: Raising awareness about sustainability is an urgent need for the last few decades. In recent issues of noteworthy journals, natural scientists have argued for the improvement of science education [1–4]. It is acknowledged that science education can works as an important context for educating sustainability. Nowadays current society is faced with a multiple environmental challenge. Our aim of this paper is to provide youth with an opportunity to investigate water within their personal lives, their community and the world through specialized curriculum so that they can explore it at their level best.**

***Keywords*: Water foot print, sustainability, constructivist approach.**

1. Introduction

Science educators have struggled for decades with the question of how to design and evaluate curricula through which scientific knowledge does not end up in isolated, artificial settings such as tests, but leaves sustainable traces in students' daily lives. The year 2014 marks the end of the United Nations Decade of Education for Sustainable Development (ESD). In the last decade, there has been a paradigm shift in the teaching learning process. Mere transfer of knowledge from teacher to student is no longer the norm. Classroom has become more student centric and educators these days focus on knowledge creation through teaching learning process (Chanchal Maity and Mrinal Mukherjee, 2021). As because of the creation of knowledge by the student is associated with more cognitive engagements and gives greater sustainability of teaching-Education India Journal: A Quarterly Refereed Journal of Dialogues on Education, A UGC- CARE List Journal, ISSN 2278-2435, Vol. 10, Issue-2 May-2021. Page 58 learning (Fischer &Hanze, 2019). The constructivist approach towards learning captures all these elements of cognitive engagements. It is best suited for early and middle group students. Apart from this the approach of this child centric education is to diffuse learners in the process of knowledge construction (Alanzi, 2016).

All educational domains and levels, including primary and secondary science education, have been working to contribute to education enabling younger generations to become responsible citizens and promote sustainable development in our world. What teachers think, believe and know affects their teaching. These factors are therefore important when it comes to effectively and successfully reforming teaching practices. One day while teaching science in class seven about water its availability, storage and uses some questions arise on behalf of the students like being a natural resource who has access to clean water? What can we do to ensure clean water for future generation? Keeping in mind these questions, I have decided to study this particular topic in a project-mode. The project was selected by the students as: Understanding water in our school campus.

2. Methodology

First of all, a learning module have been developed based on the following objectives. To find the source of water, its storage, uses and disposal in our school campus, of what quality is the water? Can rain water be a viable source?

The children started working following a detail discussion on methodology. At first, they draw a school map showing the source of water in school campus, its storage, and uses in each floor. Our school has six tanks for water storage of same capacity. Water usage estimation was performed in two ways through survey of the whole school including students, staff, and sub staff and at the same time measuring the amount of water in each tank at the very beginning of the school and at the end of the school. Volume of these cylindrical tanks was measured by calculating the area of the base using the equation πr2. Then area of the base multiplied by the height of the cylinder to find the volume.

V= πr2h (r is the radius of the circle, h is the height of cylinder).

For water usage estimation, capacity of a particular bucket and a mug was measured using a one-liter bottle. Then flow rate of each tap is measured using a stop watch to find out the amount of water used for washing and drinking. Regarding water usage leakage of taps is an important factor. Using a mug and stopwatch how much water is lost due to leakage is found at different location. To understand the quality of water we take two samples one is our supplied water and another is rain water to perform the test for turbidity, hardness, pH of the sample water and test for bacterial content using microscope.

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3. Results

It has been found that everyday 4254. 35lt.of water is stored in our tank of which 2893.13lt of water is used for drinking, washing, mid-day meal preparation, gardening and in toilets. Water loss due to leakage of taps is 42.48lt/day. From survey data it has been found that maximum consumption of water for drinking and toilets was during tiffin hours (Fig 2).They have also calculated their average individual water footprint (Fig 1) and also class wise (Fig 3). From water quality testing it has been revealed that of the two samples the hardness, turbidity and presence of bacterial content in rain water gives satisfactory results than normal supplied water by corporation. We have already a rain water harvesting system in our school that can store 132.98klt. of water annually, which is mainly used in dish washing purpose of mid-day meal preparation. But total roof top capacity of our school is 413.91sqm and thus potential rainfall harvested can be 574.50klt/annum approximately (Average annual rainfall of Kolkata is 1735mm). The result supports the usefulness of rain water as safe drinking water in upcoming days.

4. Discussion

From their work the students independently came into conclusion that our school requires 1055.99klt of water per annum which mainly comes from groundwater source supplied by Kolkata Corporation. If this demand is meet up by rainwater harvesting system, we can easily save up to 54.4 % of water that obviously helpful to groundwater recharging process. Moreover, from this project it reveals that 23% grey water (used for washing) and 57% of black water (kitchen and toilet) are generated per day. Black water utilization is beyond our scope but we can easily use 23% of grey water for gardening purpose and can save up to 7% of groundwater supplied by corporation.

5. Validation

On completion of the project the students presented the project in the class. Finally, 30 min.

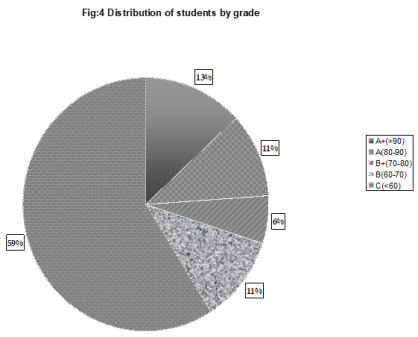

Fig. 1. Distribution of students by Grade

MCQ test, comprising one correct and two incorrect answers was conducted for all the students of the class. Result reveals that 59% of the students achieved 'C' grade, 11% achieved 'B' grade and that of rest 30% varied from A+ to B+. In fact, these 30% of students achieve excellent to good. This gives on impression that hand-on –work in field through project enriched the students in better understanding the topic as well as, in-depth and joyful learning besides development of confidence.

6. Annexure

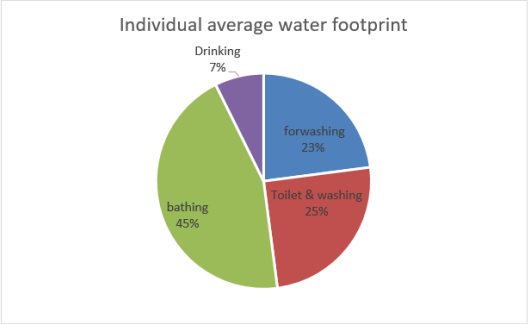

Fig. 2. Showing individual average water footprint of the students

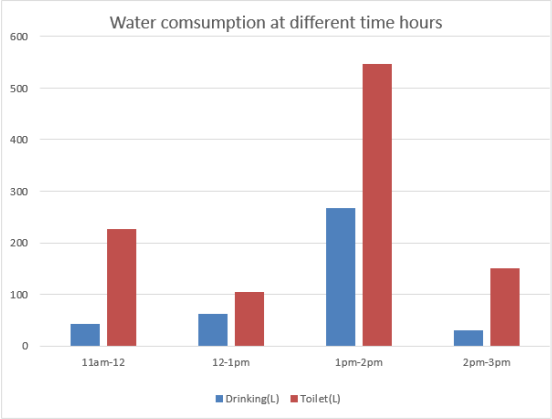

Fig. 3. Showing water consumption at different time hours in the school

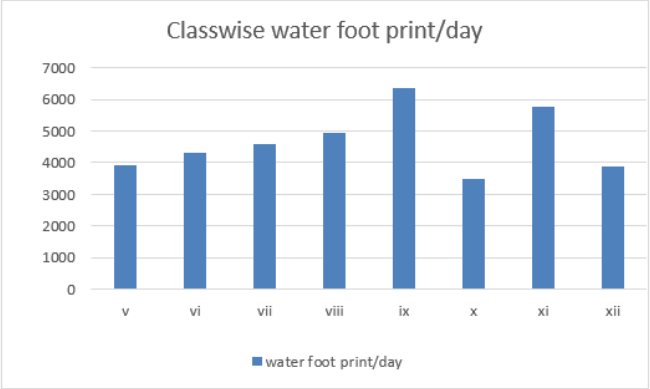

Fig. 4. Showing water footprint per day in different classes

7. Conclusion

This paper presented an overview of a new approach of science learning of bio science for sustainable development.

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