GROWING IN STEM: HANDS-ON EDUCATION VIA TOWER GARDENING

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Abstract

Sole use of a textbook as the primary source of learning in the middle school setting has been linked to potentially limit students' conceptual understanding of complex content (Driscoll et al., 1994), while the positive impact of hands-on learning has been well documented (Ekwueme et al., 2015; Satterthwait, 2010). Ideally, when a textbook is used in conjunction with content applied in a hands-on manner, student engagement and understanding of standards-based content are increased. In a grant funded collaboration between the Northeast Indiana STEM Education Resource Center housed at Purdue University Fort Wayne and an East Allen Community Schools middle school science classroom, a vertical tower garden was purchased and used by students under the guidance of their teacher to learn plant-based science content. This research brief examines some of the many benefits and ways integration of a tower garden in the classroom allowed student appreciation of science to grow.

Placing Plant Production in the Hands of Middle School Students

A vertical tower garden is a garden with a small horizontal footprint where water is pumped upward and, due to gravity, trickles down over plant roots growing in pods placed sequentially in a standing tower. This is referred to as an aeroponic system to differentiate this structure from hydroponic models. The tower used in this case came with LED grow lights and a water pump connected to a timer so that both the amount of light and degree of moisture applied to plants could be easily controlled. Also supplied in the kit were seeds, plant nutrients, and pH testing supplies. Under the guidance of their teacher, middle school students were placed in charge of determining the optimum environment for plants to grow in a classroom garden through experimentation. As suggested by the National Science Teachers Association, the teacher served as a guide-on-the-side, instead of a sage-on-the-stage, while avoiding becoming a slack-in-the-back (Nowak & Plucker, 2002).

Over the course of an academic year, students journaled and tested N-P-K fertilizer ratios, pH, lighting, and watering cycles with different species of plants and herbs. Through peer and teacher discussions of experimental data, they determined a range of optimal conditions where plants thrived. Harvesting proved fruitful as students were treated to fresh produce grown in their classroom and herbs were used by peers in a food science course for creation of different chicken wing sauces. Students not involved in the project commented that sounds from the garden were relaxing. Those involved in the project have enrolled in more STEM courses than their peers which reinforces that growing and harvesting live plants helped students grow an appreciation and love of integrated STEM subject areas.

References

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