Investigating Microbial Communities Using Aquaponics
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As a science teacher in today's public school system, I strive to provide the best possible educational experiences for my students. With lack of funding and resources in the classroom, this goal often seems unattainable. The C-MORE GEMS grant program provided me the opportunity to turn this vision into a reality by funding an indoor aquaponics system for my 7th and 8th grade students. Two identical, independent systems allowed students to properly control one, while manipulating variables of their choice on the other to see changes in productivity.

Aquaponics, which involves combining aquaculture (i.e., fish) and hydroponics (growing plants in water), was a new concept to most of my students. Prior to the actual "gardening" involved, students spent weeks learning about the living requirements for plants and fish. They also realized the importance of microbes regulating the Nitrogen levels in the aquaponic system through Internet research and C-MORE's Plankton Science Kit.

One of the main goals I had for this project was to create problem-solving opportunities. The entire system was assembled by the students (with the exception of gluing PVC light frame). If there was a problem with something not lining up, fitting, or running correctly, the students consulted with their peers to agree on the best solution. Every experiment in the system was also designed and conducted by the students. These experiences to explore their creativity provide students with valuable problem-solving skills not found in any textbook.

The GEMS grant allowed me to purchase an array of variables for students to explore in their aquaponics ecosystem. A complex fluorescent lighting system allowed students to manipulate intensity, height, and duration of lights affecting plant productivity. We also had opportunities throughout the year to manipulate the biomass (# of fish) in our experimental tank to see the effects on plant growth. Students found it very interesting that the amount of biomass in the tank had a direct impact on plant growth. Additional experiments conducted by students involved finding which starting soil sprouted seeds fastest, which brand of seeds had a higher sprouting percentage, and growth comparison between aquaponics vegetables and our school garden's vegetables.

The most rewarding part of this project came toward the ending of the school year. Once the students figured out the optimal growing conditions based on their experiments throughout the year, our Manoa lettuce was growing out of control. Students took great pride in eating and sharing their harvest once a week with other teachers/staff around campus. Without the funding for this type of project, I would not have been able to provide the priceless experiences these students gained.