Exploring the Microverse With Elementary Students - Microscope & Magnifying STEM Activities in Elementary Education

College of Education

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Introduction

While many elementary students across Canada and the United States study objects in the night sky such planets, moons, and asteroids that are largely invisible without the aid of a telescope, the same cannot be said for the microverse. In fact, while there are specific curriculum standards in many states, provinces and territories, STEM standards related to study and use of microscopes are quite rare before the fifth grade (Grade 5 in Canada). This poster describes the development of an experimental microscope lab and activities for students and families who participated in a STEM night at a local elementary school in Southwestern Utah. Key findings from this experimental program were shared with officials within district and state STEM education agencies for possible future expansion and inclusion of microscope activities, lessons and educational standards for elementary students in Utah.

The Microverse and STEM/SEEd Education

As a corollary to the macroverse which includes educational standards and learning activities related to the solar system and beyond, for the purpose of this educational poster, the microverse represents the other end of the spectrum. Within this context, the educational STEM microverse includes standards and learning activities related to small and microscopic objects such as having students observe fine details of common objects such as feathers, shells, grains (sand, salt, seeds, etc.). The introduction to common biological cells using simple compound microscopes would begin in the 3rd Grade (or Grade 3).

STEM Mysteries and Detectives Night at School

The *Microworlds Learning Lab* was set up in one of Coral Cliffs classrooms and initially shared with students and families at a school STEM night. At this event, students and families could explore each of the stations described in the central panels. The authors of this poster also demonstrated to teachers how to use the learning activities designed for the school. During the two weeks the learning lab was available, the school's STEM teacher taught lessons to elementary students using the STEM equipment and activities the UTU education majors (and authors) created.

K-5 Grade Stations & Activities

At the kindergarten level, students were encouraged to use magnifying lenses in order to observe and draw small and fine details of everyday common and natural objects.

1st and 2nd graders started with magnifying lenses similar to kindergarten experiences but then progressed to the use of a simple stereoscope to study objects in greater detail and solve mysteries involving fingerprints and shoeprints.

3rd and 4th graders used microscopes to observe, describe and draw common cells found in nature and other objects like leaves, hair, and feathers in microscopic detail.

5th graders used simple compound microscopes to stain and identify the nucli of onion cells, which contain DNA. To learn the function and form of DNA, elementary students created tasty models of the double helix with licorice, jellybeans, and toothpicks. This helped them learn that certain molecules work together to code proteins that control cells and build our bodies.

STEM Partnerships and Language Support

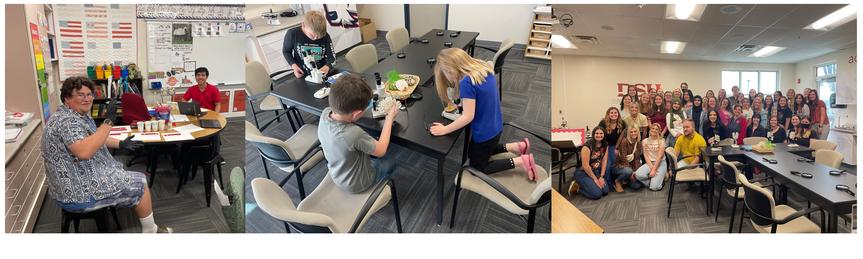
Because universities have more resources in STEM, their partnerships with schools benefit students and teachers at the school. These programs also provide university students with opportunities to develop STEM communication skills which are important in their future careers. UTU students also translated the STEM programs for families as a form of multicultural inclusion.

Significance of Microworld's at the Elementary Level

STEM educators and researchers have long noted the value early exposure and exploration of nature using the tools of science such as microscopes within developmental and constructivists frameworks (Toobin, 2009; Storksdieck, 2015; Veeraraghaven & Silverstein, 2021). For elementary students, the ability to use magnifying lenses, stereoscopes and microscopes (many for their first time) allowed participants to examine common everyday and natural objects in new ways. The use of microscopes also allowed students the opportunity to explore and understand the diversity of life as it relates to cells and other microscopic organisms. In addition, as part of the process of designing *Microworlds* activities for elementary students, middle school science teachers were consulted to see if these learning activities would be beneficial for students to engage in. The middle school teachers felt that this kind of experience could be very useful for, not only the students, but also teachers. A workshop like this is beneficial for students because it created a fun activity where students can learn and gain experience using microscopes. This exposure is especially useful for middle school teachers when students are learning about and working with microscopes in the science labs. The students' background experience from *Microworlds* would help prepare students for more advanced microscope activities.

Limitations and Future Research

Despite largely positive responses by students, staff and family members, there were limitations to the use of the *Microverse Learning Lab* at the school. These included the limited size of the classroom, number of microscopes, and magnifying lenses available to students and family members during the event. Teachers had questions about the use of microscopes and the learning activities our team created that could be addressed in future professional development workshops. The lab also needs options for supporting students with visual exceptionalities in the future as well. Despite these challenges, we feel the microverse activities had educational value for development and possible future use by other elementary schools in the district. Given that these are novel elementary STEM activities, further research on the integration of microscope lessons and activities for K-5 Grade students is also needed.



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