

# **Teaching to Young Students about Plasma Science and Rocket Science**

**By Keon Vereen**

In an age where everything is becoming more and more technologically driven, a stronger emphasis has been placed on increasing the Science, Technology, Engineering, and Mathematics (STEM) workforce so that the US can continue to compete globally. As a result, STEM education is gaining more traction within educational circles. These are all positive developments. I still believe that there should be even more emphasis placed on empowering our youth in early childhood education to understand the importance of STEM. These students are highly impressionable without rigid ideologies. These young students are already scientists. They are fearless with a willingness to question everything and everyone. More importantly, we as citizenry can and must educate them so that they find their own voices with the willingness to innovate and critically think early on.

Since I strongly believe in the importance of STEM education, I had the opportunity to represent UW SACNAS and the University of Washington as I taught to young students about plasma science and rocket science. My outreach efforts were conducted at the Denise Louie Education Center, the Concord YMCA, and the Center for Linguistic and Cultural Democracy.

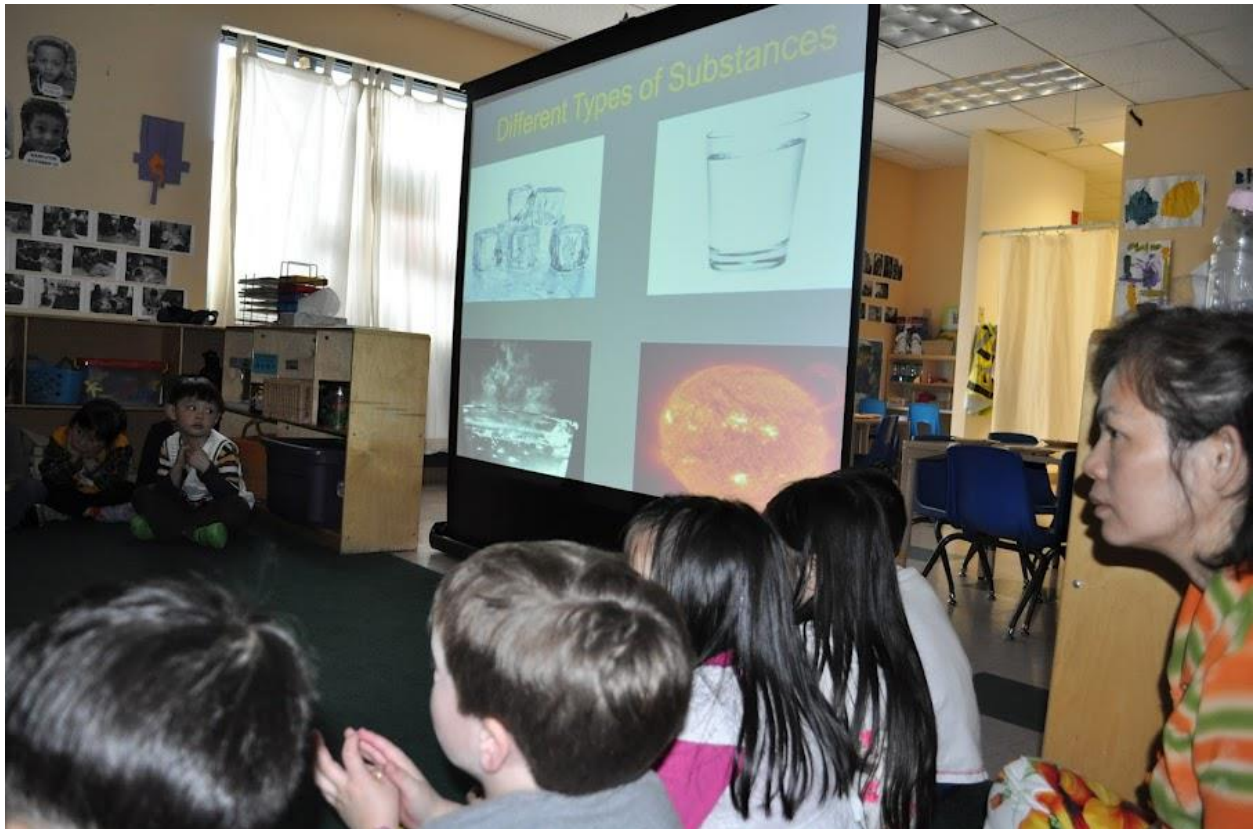
## **Denise Louie Education Center (DLEC): April 3, 2012**

I had the distinct privilege of spending some time with the students, staff, and educators at the Denise Louie Education Center (DLEC) located in the International District. The overall mission of DLEC is to promote school and life readiness by providing multi-cultural early learning services to needy families and their children. I thoroughly enjoyed the challenge of teaching science to a class of 3 to 5 years old from very diverse backgrounds. Since some of these students were learning English for the first time, it meant that my words had to be concise, clear, and straightforward. With the help of lead teacher Brandon Blake, “master facilitator as I called him”, we were able to facilitate information about plasma science and advanced rocketry. Specifically, our discussion was about the substance of stars that fuels rockets. Brandon, also from Florida, had already familiarized his class about space and rocketry prior to my arrival. Since rocketry had been formally introduced, we focused primarily on understanding plasmas.

### Structure:

I taught the lesson primarily on PowerPoint using only still images and videos. I made sure to ask questions that would require the students to critically think. I always reiterated that there were no wrong answers so that everyone felt included in the process as we were all learning.

We started out with a discussion about what are the different types of substances (e.g. solid, liquid, gas, and plasma). A slide of us discussing the different substances was shown in the photo below. From this slide, everyone recognized these images and gained an understanding about the different states of matter. Most of the students were able to identify ice cubes, water, and boiling water based on their sight and touch perceptions. The students recognized the sun, but didn't know that it was the fourth state of matter i.e. plasma.



In order to understand more about our sun being plasma, the class engaged in a series of conversations about our sun, why it is plasma, and what plasma looks like in real time using videos from the Solar Dynamics Observatory (SDO). In the videos, one of which was shown in the photo below, Brandon and I asked the students what they saw and why they thought a particular phenomenon occurred. Based on their observations, the students were able to identify spots and loops on the sun which represented sunspots and the magnetic coronal loops.



After going through a series of videos from SDO, I wanted the class to evaluate whether or not using plasma as fuel would be more efficient than traditional chemical rockets. Brandon and I had mentioned to the class that the first three states of matter have been traditionally used for chemical rockets. A video was shown where we asked the students who would win the race. Before the start of the video, we took a tally. Half of the students chose chemical rockets and the other half chose plasma rockets. Who do you think one the race? Some of the students soon realized that it was similar to the tortoise and the hare race. The class was so filled with excitement (Brandon and I alike) that we watched it again to make sure everyone understood why the plasma rocket won the race.

Since the plasma rocket won the race, we wanted to show the class what a future mission to Mars and deep space would look like. Our young scientists at the end of the presentation felt that if they stayed interested in science then they could contribute to the development of advanced rockets. We had a number of them saying that they wanted to become astronauts and go to Mars. Here was a pretty cool photo of the group with the hands held high and all smiles.



At the end of the presentation, I wanted the class to put into practice what they had learned. The class participated in two activities displaying their knowledge from the lesson. The two activities were playing with a plasma globe and building their own suns using sugar cookies.

Plasma Globe:

A plasma globe is a device that contains a mixture of gases that display an array of light illuminated when electrical power is supplied. All of the students had the opportunity to play with the plasma globe and make observations once they touched it.



### Solar Cookies:

For the solar cookie activity, each student recreated the dynamics seen on the surface of the sun. Each student was given licorice, skittles, vanilla frosting, sprinkles, and a sugar cookie. In the bottom left photo, the students were hard at work creating their own suns. Each student did an amazing job remembering the information we had discussed. A recreation of the sun can be shown from the student in the bottom right photo.



After completing the activities, we decided to take a group photo of all the scientists. Special thanks to Brandon Blake and the DLEC for helping me put on a successful lesson.



### **Concord YMCA: April 18, 2012**

I talked with about twenty elementary students at the YMCA\Concord Elementary in West Seattle. I did a similar presentation as I had done with the DLEC, except this time I introduced more about rocket science with these students. The race between the chemical rocket and the plasma rocket was a major hit with these students as well. Based on my experience working with the preschoolers, I decided to come up with a more interactive activity session using the plasma globe. I brought in props such as fluorescent light bulbs and asked the students what they thought would happen. Applying what they learned from the lesson, the students told me that the light bulbs should light up when placed close to the plasma globe. Some of the students mentioned that the gas inside the bulbs would be excited when approaching the globe. I was really impressed. My main objective was to empower these students to think critically and after one lesson with them I witnessed the transformation.

### **Center for Linguistic & Cultural Democracy (CLCD): April 18, 2012**

I talked with home-schooled 8 year olds at the CLCD located in South Seattle about plasma science and rocket science. Since this was a smaller group, I had the opportunity to also discuss

general science and engineering topics. I also interacted with the parents and discussed topics to consider when educating their children.

I would like to give a special thanks to Dr. Sharon Cronin for helping me coordinate the events at the Concord YMCA and the CLCD.