

Stephanie Nodelman

STEM Leadership Seminar

SCED 545

Integrating STEM into our Classrooms

II. I presented four PDs for teachers during the course of this class

Langtree Charter Academy is located in Mooresville, NC and has about 1600 students in K-12. We follow NC Essential standards in Science and Social Studies, we follow Common Core for Reading and Math. The school uses curriculum texts and has very few technology devices.

1. *September 26th* – Weather for grades 2nd and 5th grade teachers- all 12 teachers from the grade levels attended
2. *October 26th* - NASA Earth/Moon/missions resources – 1st, 3rd, 4th grade teachers, met each grade separately and 22 teachers from the three grade levels attended throughout the day

CSUSA Impact20/20 Conference in Ft Lauderdale, Florida. CSUSA is a charter school system that started in Florida, it has since branched out into Indiana, Georgia, North and South Carolina. The district hosted its first conference this year with the goal to improve the teaching quality within the multi-state district.

3. *October 15th* – the E in STEM Ed – incorporating engineering into our classrooms, 37 teachers and administrators from throughout the CSUSA school system attended this break out session.
4. *October 16th* – 21st Century Learning – teaching 21st century learners with the resources in your building, 44 teachers and administrators from CSUSA school's attended this break out session.

III. Standards Addressed during the Professional Developments

1. September 26th – 2nd and 5th grade science standards
 - a. **Second Grade:** 2.E.1 Understand patterns of weather and factors that affect weather. 2.E.1.1 Summarize how energy from the sun serves as a source of light that warms the land, air and water. 2.E.1.2 Summarize weather conditions using qualitative and quantitative measures to describe: • Temperature • Wind direction • Wind speed • Precipitation 2.E.1.3 Compare weather patterns that occur over time and relate observable patterns to time of day and time of year. 2.E.1.4 Recognize the tools that scientists use for observing, recording, and predicting weather changes from day to day and during the seasons.
 - b. **5th grade:** 5.E.1 Understand weather patterns and phenomena, making connections to the weather in a particular place and time. 5.E.1.1 Compare daily and seasonal changes in weather conditions (including wind speed and direction, precipitation, and temperature) and patterns. 5.E.1.2 Predict upcoming weather events from weather data collected through observation and measurements. 5.E.1.3 Explain how global patterns such as the jet stream and water currents influence local weather in measurable terms such as temperature, wind direction and speed, and precipitation
2. October 26th – 1st, 3rd, 4th
 - a. **1st grade:** 1.E.1 Recognize the features and patterns of the earth/moon/sun system as observed from Earth. 1.E.1.1 Recognize differences in the features of the day and night sky and apparent movement of objects across the sky as

- observed from Earth. 1.E.1.2 Recognize patterns of observable changes in the Moon's appearance from day to day.
- b. **3rd grade:** 3.E.1 Recognize the major components and patterns observed in the earth/moon/sun system. 3.E.1.1 Recognize that the earth is part of a system called the solar system that includes the sun (a star), planets, and many moons and the earth is the third planet from the sun in our solar system. 3.E.1.2 Recognize that changes in the length and direction of an object's shadow indicate the apparent changing position of the Sun during the day although the patterns of the stars in the sky, to include the Sun, stay the same.
 - c. **4th grade:** 4.E.1 Explain the causes of day and night and phases of the moon. 4.E.1.1 Explain the cause of day and night based on the rotation of Earth on its axis. 4.E.1.2 Explain the monthly changes in the appearance of the moon, based on the moon's orbit around the Earth.

IV. Summary of Project

After presenting my course syllabus to my principal, he and I decided that providing quality professional developments to teachers should not just occur during this semester but continue throughout the year. My goal was to find out the type of professional development the teachers at my school want/need the most and find ways to provide them options throughout the year based on what they need. I was able to take what I have learned over the coursework of my master's program and incorporate the ideas of STEM education and NASA resources into professional development for our teachers. Throughout the school year teachers will be able to select PD topics to attend based on their interests, grade levels and units being taught. As a teacher of 15 years I longed for relevant and useful professional developments. I took this to heart when I developed my plans. I wanted to make sure teachers could take the resources into their classroom and use them seamlessly. In early October my principal approved for me to go to our charter school national conference and present to the administrators and teachers from all the other CSUSA charter schools. The work at my school will continue throughout the rest of the school year.

V. Pre-questions Survey List

1. What are you expecting to learn from this PD training?
2. How would you rate your own knowledge of weather/Earth?
3. What resources would you need to be prepared to teach your Earth Systems unit?

VI. Brief Description of the Actual Professional Development Training

During the Weather training for 2nd and 5th Grade teachers I was able to show them resources and lesson plans from the NASA websites they would be able to use with their students. We also discussed how to use our technology and weather stations around the school. I was able to show them the Earth section of the NASA website and we explored the many resources for weather and climate from the website.

On October 26th I met with the 1st, 3rd and 4th grade teachers. I was able to show resources from my class physics of the Earth, Moon and Sun. The hardest part of teaching the rotation of the Earth, Moon and Sun to elementary schoolers is their ability to comprehend from pictures. The physics class gave us simulations and animations of the objects moving through space. I was also able to show them the lesson plans and units they can use with their students.

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On October 15th I presented at a conference to administrators and teachers from our charter school district. I presented the NASA engineering design process and modeled how to use the created NASA units to incorporate more engineering into their lessons. The participants used the NASA engineering design process to create a bridge to connect two cities using only tape, cups and straws.

On October 16th I presented again at the same conference, and the professional development topic was how to reach the 21st century learner. I presented my top 10 ways to incorporate 21st Century skills into the classroom. I was able to show resources from the Methods in STEM and the E in STEM classes from earlier in the program.

VII. Brief Outline of the Activities in the Pick-up Unit

1. Weather
 - a. Explore Nasa.gov for educator resources for our weather unit
 - b. Explore weather wiz kids website
 - c. Give teachers a chance to work with their teams to develop their weather units using the new resources
2. Earth/Moon/Sun
 - a. Explore Nasa.gov for educator units and lessons for space
 - b. Explore age appropriate units for each grade
 - c. Give teachers a chance to work with their teams to develop their space units using the new resources

VIII. What NASA data did you include?

1. [Www.nasa.gov](http://www.nasa.gov)
2. <https://www.nasa.gov/audience/foreducators/k-4/index.html>
3. <https://www.nasa.gov/audience/foreducators/5-8/index.html>
4. <https://www.nasa.gov/topics/earth/index.html>
5. <https://www.nasa.gov/topics/solarsystem/index.html>
6. <https://www.nasa.gov/subject/3127/climate/>

IX. Follow-up Activities & Post-questions Survey List

Teachers were to start their units in mid-November and they last until January. While teaching a few teachers will report back on the resources I showed during the professional developments to see if they were worth while for our elementary kids. I will also be working on getting materials for us to complete the lesson plan/experiments from the NASA units.

Post Survey Questions:

1. What were you expecting to learn from this PD training?
2. How would you rate your own knowledge of weather/Earth after this PD?
3. What resources would you need to be prepared to teach your Earth Systems unit?
4. Were the resources given during the PD easy to follow and age appropriate?
5. How would you rate your presenter 1 to 5, 5 being best?
6. What could be done to make this presentation more meaningful to you?

X. Outcomes.

- a. Teachers felt the resources and unit plans were easy to follow and implement in their classes. The 4th and 5th grade are currently developing ways to give students a research

scavenger hunt using the websites to find information on their topics when they have technology days. They felt the resources were age appropriate and would keep students' interest during lessons.

- b. The teachers felt this PD was worthwhile – it was given 4.8 out of 5 stars average from all the teachers that attended. They flow of the PD was easy and they commented that they received a lot of usable resources for their classrooms.
- c. The PD sessions were successful, and the teachers know that they can use me for a resource when planning their lessons and units. I felt this opportunity was a great step for me to show the other teachers that I have a lot of knowledge to share with them. It also helped me get over some nerves of presenting in front of crowds.
- d. By having to lead professional developments in my school I was able to take a lot of our reading and use them to create a PD with relevance and intention. I was able to take what I read from Kaniuka's "...How teachers change school reform.." reading to help develop our school's plan to integrate more STEM into our curriculum. Like the reading suggests, if we take a small sample of teachers and train them in the ideas of STEM ed, it will cause a ripple effect in our school. When we are allowing teachers to select their own PD sessions it is with the intention that the teachers will then go back to their teams and share what they have learned during their PLC meetings. While creating my own sessions to present I was able to use Desimone's article, "A primer on Effective Professional Development" and the 5 points addressed in that article to make sure my sessions were content focused, included active learning, allowed collective participation, that there was a coherence from start to finish and the duration was meaningful, not just taking up time for the sake of taking up time.
- e. Our teachers will be selecting PD from a menu for the rest of the year. I will be offering STEM and other PDs in this same format to give teachers meaningful PD that they have been craving and asking for.
- f. Reflection: I feel that being in the Endeavor Masters program has allowed me to take what I know as a teacher and use new strategies to become a leader in my school. I will always be an advocate for STEM ed but I have gained a sense of self confidence and empowerment during this masters program that I needed to be able to present in front of other teachers and show my principal that I can be apart of leadership in my school. I am very grateful for all my professors over the past two years. I know I still have a lot to learn, but these past few months have helped me get over the first hurdle... Now I feel like I can be a part of what helps progress my school and its students instead of just sitting in the background.

XI. Appendix: Classroom Activities/Unit with Assessment

Weather and Climate Resources

- <https://climatekids.nasa.gov/menu/weather-and-climate/>
- https://www.nasa.gov/pdf/62323main_ICS_Weather.pdf
- https://www.nasa.gov/pdf/62317main_ICS_Clouds.pdf
- https://www.nasa.gov/pdf/62319main_ICS_Energy.pdf
- https://www.nasa.gov/pdf/62325main_ICS_Winds.pdf
- https://www.nasa.gov/pdf/62321main_ICS_Precipitation.pdf

Earth/Moon and Sun

- <https://www.jpl.nasa.gov/edu/teach/activity/modeling-the-earth-moon-system/>
- <https://solarsystem.nasa.gov/planets/earth/in-depth/>
- https://www.nasa.gov/mission_pages/voyager/multimedia/pia17046.html
- <https://solarsystem.nasa.gov/moons/earths-moon/overview/>
- <https://starchild.gsfc.nasa.gov/docs/StarChild/questions/question31.html>
- <https://sservi.nasa.gov/articles/video-earth-at-night/>
- http://eyeonthesky.org/lessonplans/05sun_daynight.html

- **Connect to the Moon**
Provides a wide variety of activities and resources for the K-12 classroom tied to the Moon.
<http://www.lpi.usra.edu/education/lprp/>

- **Design Squad**
Created by PBS in partnership with NASA, there are many educators guides here, and one specifically relating to the Moon.
<http://pbskids.org/designsquad/parentseducators/guides/index.html>

- **Tour of the Electromagnetic Spectrum Booklet**
Booklet introduces electromagnetic waves, their behaviors, and how scientists visualize these data. Each region of the spectrum is described and illustrated with examples of NASA science.
http://missionscience.nasa.gov/ems/TourOfEMS_Booklet_Web.pdf

- **Tour of the Electromagnetic Spectrum Videos**
These videos introduce middle- and high school-age learners to the electromagnetic spectrum.
http://missionscience.nasa.gov/nasascience/ems_intro.html

- **GRACE**
A NASA mission that stands for Gravity Recovery and Climate Experiment and presents many applications useful for teaching gravity and Earth Science.
Education page: <http://www.csr.utexas.edu/grace/education/>
Activities: <http://www.csr.utexas.edu/grace/education/activities/gravity.html>

- **CERES Project**
A team of master teachers, Montana State University faculty, and NASA researchers have created a series of web-based astronomy and astrobiology lessons for the CERES Project.
<http://btc.montana.edu/ceres/html/EdActivities.html>

- **Microgravity Educator Guide**
http://www.nasa.gov/audience/foreducators/topnav/materials/listbytype/Microgravity_Teachers_Guide.html

- **3, 2, 1 Lift Off! Educator Guide**
http://www.nasa.gov/pdf/58149main_3.2.1.Liftoff.pdf
- **Human Orrery**
Students act out a kinesthetic model of the solar system in 3 dimensions: 2 of space and one of time.
<http://kepler.nasa.gov/files/mws/HumanOrrerySSSmsGEMS.pdf>
- **Orbit and Spin**
An exploration activity for younger students that explores the relative sizes, distances, orbit, and spin of the Sun, Earth, and Moon
http://pluto.jhuapl.edu/common/content/activities/orbit_and_spin.pdf
- **Lunar Nautics Educator Guide**
http://www.nasa.gov/audience/foreducators/topnav/materials/listbytype/Lunar_Nautics_Designing_a_Mission.html
- **On the Moon Activity Guide**
NASA and Design Squad teamed up to create this guide that offers six hands-on engineering challenges in the context of NASA's moon missions.
http://pbskids.org/designsquad/parentseducators/guides/activity_guide_moon.html
- **Amazing Space Online Explorations**
Lessons, online activities and hands-on activities relating to Hubble Telescope and space. Telescopes From the Ground Up activities included here.
<http://amazing-space.stsci.edu/eds/tools/type/explorations.php.p=Teaching+tools%40%2Ceds%2Ctools%2C>
- **Educator Resources: The Moon**
Resources for the Moon
http://www.lpi.usra.edu/education/resources/s_system/moon.shtml

Interactive Applications

- **Kepler Mission**
A clickable interactive graphic describing the mission:
<http://kepler.nasa.gov/multimedia/Interactives/HowKeplerDiscoversPlanetsElementary/flash.cfm>
- **Kepler Explorer App**
Discusses an application you can download to your iPad or iPhone that allows you to explore the data gather from the Kepler Mission visually.
<http://news.ucsc.edu/2012/04/kepler-explorer.html>

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- **Ask-an-Astrophysicist**
Questions are answered by scientists within the Lab for High-Energy Astrophysics at NASA/GSFC.
http://imagine.gsfc.nasa.gov/docs/ask_astro/ask_an_astronomer.html
- **Weight calculator for different celestial bodies**
<http://www.exploratorium.edu/ronh/weight/>
- **International Space Station**
A great interactive about the how astronauts live aboard the ISS and general ISS information
<http://www.nasa.gov/externalflash/ISSRG/index.html>
- **NASA Image of the Day Gallery**
<http://www.nasa.gov/multimedia/imagegallery/iotd.html>
- **NASA's Alien Earths**
Build your own solar system!
http://www.alienearts.org/online/interactives/planet_families/index.php
- **Kepler Exoplanet Simulation**
Interactive that allows students to look for habitable planets and also apply Kepler's third law.
<http://kepler.nasa.gov/ed/xo/index.html>
- **Shoot a Cannonball into Orbit**
<http://spaceplace.jpl.nasa.gov/en/kids/orbits1.shtml>
- **University of Colorado Phet**
This site generally has wonderful applets and teacher resources. One that we looked at in class has students land a lunar module.
<http://phet.colorado.edu/en/simulation/lunar-lander>

Video

- **The Constant Pull of Gravity**
This brief NASA video segment illustrates how gravity plays an important role in everyday life. Footage shows various sporting activities that require gravity, such as skydiving, bobsledding and white-water rafting, as well as the use of common objects.
http://www.nasa.gov/audience/foreducators/topnav/materials/listbytype/The_Constant_Pull_of_Gravity.html

- **NASA Brain Bites**
Short video about gravity and falling objects in a vacuum.
http://science.nasa.gov/science-news/science-at-nasa/2005/10feb_brainbites/
- **What Is Microgravity?**
This short NASA video explains what microgravity is and how it can briefly be created on Earth.
http://www.nasa.gov/audience/foreducators/topnav/materials/listbytype/What_Is_Microgravity.html
- **Drinking in Space**
Video clip from the ISS illustrating adhesion properties of water, but also challenges of drinking in microgravity.
<http://anon.nasa-global.edgesuite.net/anon.nasa-global/ccvideos/126cupdemo.asx>
- **Gravity on Earth Versus Gravity in Space: What's the Difference?**
This short NASA video explains why objects seem to float in space and helps students visualize how objects orbit.
http://www.nasa.gov/audience/foreducators/topnav/materials/listbytype/Gravity_on_Earth_Versus.html
- **Hubble's Universe Unfiltered Vodcasts**
This short NASA video explains why objects seem to float in space and helps students visualize how objects orbit.
http://hubblesite.org/explore_astronomy/hubbles_universe_unfiltered/

Audio Files

- **Phone Dr. Marc**
Audio file that answers the question "Why is Earth rotating?" and also discusses the Moon and its formation and gravitation.
http://spaceplace.nasa.gov/en/kids/phonedrmarc/2003_march.shtml
- **What Neil and Buzz left on the moon**
Audio file that explains the mirror that is on the Moon and how it is used to study the Moon's movement and gravitation.
http://science.nasa.gov/headlines/y2004/21jul_llr.htm

Reference Materials

- **Dwarf Planets**
A New Way of Thinking about an Old Solar System
http://solarsystem.nasa.gov/docs/TG_dwarf_planet.pdf

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- **More on Circular Motion**
<http://imagine.gsfc.nasa.gov/YBA/cyg-X1-mass/more-circular.html>
- **Information on All NASA Missions**
<http://nasascience.nasa.gov/missions>
- **Orbits 'R' Us**
A great animated reference
http://spaceplace.jpl.nasa.gov/en/kids/goes/goes_poes_orbits.shtml
- **Solar System Exploration: Planets**
NASA site that has tons of information, activities and multimedia related to the Solar System and planets.
<http://solarsystem.nasa.gov/planets/>
- **Next Generation Science Standards**
The new science standards, available for states adoption.
<http://www.nextgenscience.org/>

XII. Include the names and contact information of four educators who attended the PD.

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