NASA in the Classroom: Reimagining Montessori's Cosmic Education

I selected this topic because I feel that I've learned a great deal and become a better teacher through my coursework with Endeavor. I believe it's important to share what I've learned with my colleagues so that their students may benefit. I want to encourage my colleagues to utilize the resources I've learned about in this program and help them develop an understanding of the NGSS so they can be more deliberate in their science instruction.

The resources and standards I've chosen correspond with a portion of the Montessori science curriculum entitled, "Cosmic Education." Cosmic Education was introduced by Maria Montessori in 1935 as part of her Advanced Method for teaching older children about Earth and space science concepts. In, *To Educate the Human Potential*, Montessori explains:

> "If the idea of the universe be presented to the child in the right way, it will do more for him than just arouse his interest, for it will create in him admiration and wonder, a feeling loftier than any interest and more satisfying" (Montessori, p. 6, 1948).

To present the universe to the child, Montessori developed a "great lesson" entitled, "The Coming of the Universe," which is a story describing the Big Bang. This lesson was Montessori's way of using phenomena to create a sense of wonder and encourage further exploration and inquiry to develop the child's understanding of Earth and space science concepts, as well as develop a sense of responsibility as an inhabitant of our planet.

Montessori was a trailblazer and an innovator in the field of education. I believe she would certainly be an advocate for employing the latest scientific resources for advancing the education of children. Unfortunately, many of my colleagues continue to use materials and practices that are outdated and no longer have the same impact on student learning that they once had. For this reason, it's crucial for all elementary and middle school Montessori teachers to expand their knowledge base and utilize tools which will promote deeper understanding of the science concepts essential for 21st century learning.

From the course, NASA Physics for Real Beginners, I'll share curriculum, resources, and knowledge of the NGSS to encourage them to evolve in their teaching practices. These resources correspond with the concepts related to Montessori's great lesson and are well suited for differentiation in a multi-age classroom.

Integrating NASA Assets and/or Content:

Concepts and resources from my coursework will be introduced, such as:

History of Astronomy, understanding universal gravitation, Earth, moon, sun relationships, Kepler's Laws of Orbital Motion, Exoplanets

Online Resources include:

- NASA Space Place
- NASA STEM Educator Professional Development Collaborative
- NASA JPL Education/Teach
- Exoplanet Travel Bureau
- Teach Astronomy.com

Proposed Audience

My proposed audience will consist of a group of Montessori educators trained and/or credentialed in elementary or middle school Montessori programs; grade levels 1-8. In addition to the teachers in my own school, I have reached out to other Montessori schools to invite their elementary and middle school teachers to participate.

Participants in my school include 2 lower elementary teachers (grades 1-3), 3 upper elementary teachers (grades 4-6), and 2 middle school teachers (grades 7-8). The total number of children from these 3 programs is 66.

In addition to the proposed audience described above, I would like to reach a larger audience by also submitting an article to the monthly periodical, Montessori Life, which is distributed to over 16,000 members of the American Montessori Society. As a member of the AMS, I would be able to submit an article for peer review and possible publication. Time could be a constraint in this portion of the proposal, as I'm not familiar with how long the approval process would take.

STEM Concepts or Learning Goals - NGSS and CCSS

The coursework and NASA resources I plan to use address the following standards:

NGSS

ESS1: Earth's Place in the Universe, ESS1.A: The Universe and Its Stars, ESS1.B: Earth and the Solar System, ESS1.C: The History of Planet Earth

Science and Engineering Practices: Developing and using models

CCSS.ELA - Anchor Standards:

Key Ideas and Details, Integration of Knowledge and Ideas, Text Types and Purposes, Production and Distribution of Writing, Research to Build and Present Knowledge, Comprehension and Collaboration, Presentation of Knowledge and Ideas

CCSS.Math Domains:

Measurement and Data, Geometry, Ratios and Proportional Relationships, Statistics and Probability

Plan for implementation/how long/when

I'll send an email to teachers inviting them to either attend the seminar in person or access the Powerpoint through a link in the email (if distance is an issue). Those attending in person will view 3 live presentations, each lasting approximately 1 hour. If possible, we will meet during the school day while students are having lunch and recess. Otherwise, seminars will be scheduled for after school.

Pre and Post Survey

Teachers will complete a survey prior to participation. Survey questions will include inquiry about access to technology, current methods used to teach Earth and space science content, if and how they integrate curricular concepts, and their knowledge of NASA resources.

A post survey will include questions pertaining to the teachers' opinions and perceptions of the ideas and content presented, and what they feel is most valuable to them as a teacher. They will be asked how they will use the resources in their classroom, and if they feel they have a sense of understanding of NGSS, and whether they will use it to guide their instruction.

Outcomes or expectations

One of the outcomes or expectations for this PD is that teachers will explore and utilize the resources in their classrooms in order to promote deeper student engagement and understanding of ESS concepts through the use of NASA/STEM resources. Further expectations include the ongoing analysis and use of NGSS to guide instruction.

Follow up procedures

I’ll be available through email and in person to answer questions, help with issues related to implementation, and provide encouragement.

Data collection methods to determine success

I’ll ask teachers to respond to a questionnaire after they have completed at least one lesson using resources introduced in the PD. Success of the PD will be determined by the teachers’ reflective responses about how implementing these resources impacted student engagement, participation, and learning, as well as if they think it improved their own teaching practices. I would also like to learn how they used the resources in their classrooms and if they believe that the NGSS and NASA resources align with Montessori curriculum.

Montessori, M (1948). *To Educate the Human Potential*. Oxford, England: Clio Press