Development of a Mobile Observatory as a Game-Changer for Middle School Environmental and Space Science Education

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MESO Program Goals

Create and deploy mobile S.T.E.M. lab to engage middle school students in environmental and space science education & research.

Increase student and teacher understanding and appreciation of the relationship between atmospheric and solar activity to weather events in their communities; how human influences affect climate.

Promote environmental stewardship, increasing student capacity for informed environmental decision-making on local & global scales.

Train teachers to implement "Global Learning and Observations to Benefit the Environment" (GLOBE) program at Colorado middle schools with large ethnic student populations typically under-represented in STEM degree programs and career fields.

Engage students in place-based hands-on science investigations, feeding findings into an international data-base; helping them make the connections between scientific investigations, real-world issues, and related higher education/career choices.

Engage community members to help create a community culture that embraces environmental stewardship.

Target Population and Demographics*

Hispanic	White	African American	Asian/ Pacific	Native American	Multi-Ethnic	Ethnicity Unknown	TOTAL
1022	797	77	21	159	37	50	2,163
47%	37%	4%	1%	7%	2%	2%	100%

Reading Proficiency: 586 Students (57%) **Male: 1130 (52%)**

Math Proficiency: 405 Students (40%) **Female: 1032 (48%)**

Free/Reduced Lunch: 1,548 (72%)

*Proposed Pilot Program Schools: Jack Swigert Aerospace Academy (Colo. Springs)

Lamar Middle School (Lamar) Ortega Middle School (Alamosa)

Cortez Middle School (Cortez) Lake County High School (Leadville)

Proposed MESO Components

1) GMC recreational vehicle modified with roll-off roof, drop-down telescope mount; 2) 14" open truss **optical telescope and mount**; 3) 9" **H-alpha solar telescope** w/digital camera/telescope attachment; 4) *Iota Pro* projection system w/6m **inflatable planetarium**; 5) 24" **digital globe** with courseware; 6) **weather station**; 7) *All Sky Infrared Visible Analyzer* **atmospheric monitoring device** w/IR camera; 8) solar power; and 9) satellite communications.

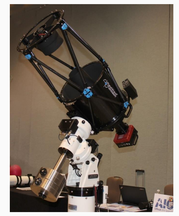
Mobile Earth & Space Observatory (MESO)

The Mobile Earth and Space Observatory (MESO) is a "science center on wheels," designed to engage and excite students, teachers, and community members with hands-on education and research activities focused on weather, climate, space sciences, renewable energy, and scientific instrumentation. Geared to middle school students in demographics underrepresented in STEM higher education programs and related career fields, curricula will align with science education standards to deliver both formal and informal STEM education.

Proposed MESO Operating Model

- MESO scientist educators will provide **teacher professional development** during the summer prior to deployment
- MESO team will **collaborate with teachers to** plan Earth & Space Week, **define pre-, trans-, and post-deployment teacher tasks**
- Middle school students will connect with MESO during the week; **culminating activities will focus on 8th grade** students
- MESO will be **available after school** for students wanting more
- A **weekend Earth and Space Science festival** will engage parents, family members, and the public in **informal education showcasing students** who share what they learned

MESO Key Components



14" optical telescope

9" Hydrogen-alpha solar telescope

6m/19.5ft inflatable planetarium dome

digital globe with courseware

GMC Recreational Vehicle

Proposed Curriculum

- A GLOBE trainer will present **in-service to participating teachers** prior to the start of the school year.
- A **teacher resource guide** will outline classroom activities and evaluation to be presented pre-, trans-, post-deployment.
- Curriculum will be **drawn from GLOBE, NOAA and NASA resources** aligned with Colo. middle school science standards.
- **Scientist-educators** from science education non-profit BSCS, NASA, NCAR, NOAA & DMNS **will enhance/refine curriculum**.

Evaluation

- Jack Swigert Aerospace Academy will be **Beta test site**.
- MESO team will conduct a **needs assessment charrette/ survey/interviews with school, community leaders.**
- Students/teachers/community members complete questionnaires to **assess prior knowledge and attitudes**.
- Post-deployment questionnaires gauge **changes in knowledge and attitudes**. Evaluation is by **external evaluator**.
- A **board of scientist-educator advisors** examines activities, reports on factors impacting implementation and timeline.
- MESO Board directs adjustments from "lessons learned" for implementation /evaluation on subsequent deployments.

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