I. Project Summary

The MESA to Mesa Program provided transportation scholarships for field trips to NCAR for educators serving students from under-represented populations in the greater Denver Metro area, especially targeting Colorado Math, Engineering, Science Achievement (MESA) students and educators. In addition to MESA students, target institutions were defined as those with student populations in which 50 percent or more of the students were from populations under represented in the geosciences (Hispanic, Latino, African American, Native American).

The program was coordinated through the involvement of two NCAR entities, the Visualization and Enabling Technologies program within NCAR’s Computational and Informational Systems Lab (CISL) and the NCAR Office of Research Relations. The third internal collaborator was the Office of Education and Outreach within UCAR Corporate Affairs.

Funds totaling $9654 were awarded through the NCAR Diversity Committee for the period June 1, 2010 through May 30, 2011. Engaging field-trip experiences were offered to twelve schools, with an additional six schools involved in NCAR’s Science is Everywhere outreach program for fourth- and fifth-grade students that included a Saturday of hands-on science and a subsequent family event at the NCAR facility last March.

The content of the MESA to Mesa field trips focused on promoting an understanding of the nature of science and the importance and interdependence of three of its components:

1. A scientific question, problem, or idea;  
2. Experimentation, observation, data gathering (field campaigns); and  
3. Data analysis, computational computing/modeling, visualizations.

While the focus was the same for all age groups, the content varied greatly to ensure developmentally appropriate content for different age groups.

Lastly, it should be noted that although the grant award period was from June 2010 to May 2011, information was provided to teachers specifically for transportation scholarships for the 2010/2011 school year beginning in September. By November 1, 2010, funds were fully committed with reservations booked through May 2011. Marketing materials were eliminated online immediately after funds were fully allocated. Consequently, accurately quantifying the true demand and interest remains an unknown.
II. Project Reach

Number of Teachers Served: 38
Adult Chaperones other than Teachers: 76
Number of Students Served: 662
Percentage from non-white ethnicity: 65 percent (see end statement)

Student Grade Levels:
Elementary: 476
Middle School: 171
High School: 15

Science Is Everywhere Family Night at NCAR, Attendance: 155

18 schools were served on 16 different visit dates:

<table>
<thead>
<tr>
<th>Visit Date</th>
<th>School and School District</th>
<th>% Non-white</th>
</tr>
</thead>
<tbody>
<tr>
<td>9/14/2010</td>
<td>Yuma Middle School (6th), Yuma School District (54%)</td>
<td></td>
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<tr>
<td>9/27/2010</td>
<td>Coronado Hills Elementary, Denver, Adams 12 (88%)</td>
<td></td>
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<tr>
<td>11/30/2010</td>
<td>Erie &amp; Longmont High School, SVVSD MESA (28%)</td>
<td></td>
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<tr>
<td>12/14/2010</td>
<td>Central Elementary (4th &amp; 5th), Longmont, SVVSD (70%)</td>
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<tr>
<td>1/31/2011</td>
<td>Castro Elementary (5th), Denver, DPS (93%)</td>
<td></td>
</tr>
<tr>
<td>2/3/2011</td>
<td>Castro Elementary (5th), Denver, DPS (93%)</td>
<td></td>
</tr>
<tr>
<td>3/12/2011 &amp; 3/19/2011</td>
<td>Burlington Elementary (4th &amp; 5th), SVVSD MESA (35%)</td>
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</tr>
<tr>
<td></td>
<td>Centennial Elementary (4th &amp; 5th), SVVSD MESA (30%)</td>
<td></td>
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<tr>
<td></td>
<td>Columbine Elementary (4th &amp; 5th), SVVSD MESA (84%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Indian Peaks Elementary (4th &amp; 5th), SVVSD MESA (77%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Loma Linda Elementary (4th &amp; 5th), SVVSD MESA (70%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Spangler Elementary (4th &amp; 5th), SVVSD MESA (86%)</td>
<td></td>
</tr>
<tr>
<td>3/14/2011</td>
<td>Rocky Mountain Elementary (2nd), Longmont, SVVSD (87%)</td>
<td></td>
</tr>
<tr>
<td>3/22/2011</td>
<td>Castro Elementary (4th), Denver, DPS (93%)</td>
<td></td>
</tr>
<tr>
<td>3/23/2011</td>
<td>Castro Elementary (4th), Denver DPS (93%)</td>
<td></td>
</tr>
<tr>
<td>4/19/2011</td>
<td>Northridge Elementary, Longmont, SVVSD (82%)</td>
<td></td>
</tr>
<tr>
<td>5/2/2011</td>
<td>Sunset Middle School, SVVSD MESA (31%)</td>
<td></td>
</tr>
<tr>
<td>5/9/2011</td>
<td>Erie Middle School, SVVSD MESA (20%)</td>
<td></td>
</tr>
<tr>
<td>5/11/2011</td>
<td>Frederick Elementary (4th &amp; 5th), SVVSD (60%)</td>
<td></td>
</tr>
<tr>
<td>5/18/2011</td>
<td>St. Theresa’s (6th-8th), Denver Catholic Archdiocese (70%)</td>
<td></td>
</tr>
</tbody>
</table>

School Districts Represented:
- Adams 12 Five Star School District
- Denver Catholic Archdiocese
- Denver Public Schools
- St. Vrain Valley School District
- Yuma School District

Overall:
- 65 percent of students served were of non-white ethnicity;
- 51 percent of MESA students served were of non-white ethnicity;
- 80 percent of students served that were not affiliated with SVVSD MESA were of non-white ethnicity.
III. Project Objectives and Outcomes

The grant was solicited in 2010 to fulfill six objectives, each of which is listed below.

1) To engage students in the process of doing science and to the tools of science, focusing specifically on modeling and the computational sciences through visits to the CISL Machine Room and the VETS 3D Visualization Lab.

**Outcome:** Each of the twelve school groups that received a transportation scholarship participated in hands-on activities designed to enhance student knowledge of the nature of science. They then applied concepts introduced in the classroom to an NCAR field campaign as an illustration of the scientific process. Lastly, students were introduced to computational modeling and the 3D Visualization Lab. They learned that questions asked and answered through field campaigns can advance scientific knowledge and help us build, validate, and continually improve scientific models of various Earth processes. The NCAR supercomputers and the following visit into the 3D Vis Lab brought the classroom component to life for the students.

2) To provide the target audience and their teachers with information on scholarships, programs, educational resources, and opportunities designed specifically for them in the atmospheric or related sciences, such as SOARS, HIRO, the American Meteorology Society’s (AMS) HS Diversity Scholarship, and other programs or resources offered through our member and affiliate universities.

**Outcome:** Middle and high school students received this information from an EO educator in the NCAR classroom while teachers at all levels were given printed material in an “end of visit” packet.

3) To expose students to careers in the atmospheric sciences and to staff members with whom they can identify with culturally.

**Outcome:** As a beginning component of the Nature of Science module for fourth- and fifth-grade students, they were asked to name any scientists they knew as well as draw a scientist. A discussion followed as to the importance of science in our lives with images of ethnically diverse people involved in science careers. With middle- and high-school students, a video of SOARS proteges and staff from under-represented populations was highlighted (http://www.youtube.com/watch?v=gGTxG4_NjiA) showing various ethnicities at work at NCAR as one component of their visit. The importance and value of a diverse staff was consistently reinforced.

4) To ensure that our educational programs are accessible to students from all socio-economic groups and that they outwardly target and market to populations
that are under-represented, especially during years when K-12 educational budgets in Colorado are severely limited.

**Outcome:** As noted in the grant application, K-12 educational budgets in Colorado were severely limited in 2010/2011, which resulted in a reduction of field trip opportunities for students. In recent years, field trip records confirm a higher proportion of private and mid to high socio-economic schools visiting NCAR. The NCAR Diversity Grant provided funds for 662 students to visit NCAR who otherwise would not have had the opportunity. As noted in the Program Research section, 80 percent of non-MESA students served through the grant, and 65 percent overall, were of non-white ethnicity. Of the schools that visited us using MESA to Mesa transportation funds, 17 of the 18 self reported that they could not have done so otherwise. For 15 of the 18 schools that visited, it was their first field trip to NCAR.

5) To ensure that our commitment to a diverse workforce is evident and tangible within all our programs reaching external audiences.

**Outcome:** It is a stretch to assume that a field trip alone can attract a student into the atmospheric or computational sciences, however, a positive science experience and an understanding of the nature of science is a worthy first step.

**IV. Measures of Progress and Success (Per Survey Responses from teachers)**

<table>
<thead>
<tr>
<th>Field Trips</th>
<th>Ranking/Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Ease in scheduling visit and applying for grant</td>
<td>4.75 out of 5</td>
</tr>
<tr>
<td>2. Field trip was engaging, hands-on, age appropriate</td>
<td>4.68 out of 5</td>
</tr>
<tr>
<td>3. Vis Lab was engaging, age &amp; length appropriate</td>
<td>4.7 out of 5</td>
</tr>
<tr>
<td>4. Would you have been able to bring you class to NCAR w/o the transportation grant funds?</td>
<td>Yes: 1</td>
</tr>
<tr>
<td></td>
<td>No: 17</td>
</tr>
<tr>
<td>5. First time visit to NCAR</td>
<td>15 of 18</td>
</tr>
</tbody>
</table>

61% heard about the grant through their District or MESA Leadership; 22% heard about the grant when scheduling or when visiting NCAR; 11% heard about it through the NCAR Website Field Trip page.

**Science Is Everywhere Student Event, 3/12/11**

<table>
<thead>
<tr>
<th>Ranking/Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I enjoyed the Radar and Wild Weather workshop.</td>
</tr>
<tr>
<td>2. I now understand how radar works.</td>
</tr>
</tbody>
</table>

**Science Is Everywhere Family Night, 3/19/11**

<table>
<thead>
<tr>
<th>Ranking/Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Overall Ranking (4 excellent to 1 poor)</td>
</tr>
<tr>
<td>2. Today’s event increased our interest in science?</td>
</tr>
</tbody>
</table>
VI. Value of Program

The MESA to Mesa program was designed to specifically address the fact that school visits to NCAR have become less diverse in recent years under current budgetary woes within the education system. As a consequence of the NCAR Diversity Grant, 662 upper elementary through high school students visited NCAR and learned about the nature of science, and the atmospheric and computational sciences specifically. The cost of the program equates to $15 per student. If all people participating in the student field trips are included (students + adults), the cost equals $10.36 per person.

VII. Recommended Changes

Providing funds to broaden participation and ensure a more diverse populace on field trips is a value unto itself. Coupling these funds with a program focused on research campaigns and computer science’s role in NCAR’s work provided a valuable collaboration for the three internal programs involved. Despite the intrinsic value of ensuring broader participation, the following suggestions represent both extension ideas and recommended changes:

1. **Focus on a Specific Age Group in a Given Year.** It was necessary to develop various module components due to the breadth of the ages served with the MESA to Mesa grants. A more focused age group would have resulted in less diffusion of time and greater staff expertise on one particular module. If grant applications continue across grades, consider a different module for each grade level based specifically on the state science standards.

2. **When/if high school students are the focus, do not assume applications will emerge.** Market directly to diverse schools and their extracurricular clubs (i.e. robotics, programming, science bowl clubs). This is also encouraged with middle and high schools as both find field trips difficult to schedule during school hours.

3. **Establish policies for the number of grants allowed per school or maximum cost to be reimbursed.** One school had both their fourth and fifth grades apply for grants. The Committee felt this was fine, but it does prevent other worthy schools from obtaining needed funds. Also, parochial and/or private schools often have to charter buses. Consequently, their transportation costs are significantly higher.

4. **Establish methods for continued engagement and/or connection.** Field trips tend to be once a year events. Develop a Website, blog, or quarterly electronic publication where engaged students from diverse backgrounds and/or their teachers can maintain a connection to science and science careers and ideally foster a supportive network. Tie this to SOARS, HIRO and other diversity programs.
5. **Engage the participation of NCAR’s diverse workforce** by using Skype, other Web 2.0 technologies, or pre-shoot video of staff, especially with MS and HS students. In a perfect world, we would have engaged staff more. We will look for more meaningful ways to do so with future students representing diverse populations.

Thank you.

Report submitted by:

Teri Eastburn – Office of Education and Outreach, Public Visitor Program  
Tim Scheitlin, PI – CISL VETS  
Carol Park – NCAR Office of Research Relations
### Mesa to Mesa FY10 Diversity Proposal Funds (7/1/11)

<table>
<thead>
<tr>
<th>Proposal Item #1 - Salary Support - VisLab (McVeigh)</th>
<th>Budget</th>
<th>Actuals</th>
<th>Remaining Funds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salary</td>
<td>543</td>
<td>260</td>
<td></td>
</tr>
<tr>
<td>Benefits</td>
<td>282</td>
<td>133</td>
<td></td>
</tr>
<tr>
<td>Overhead</td>
<td>405</td>
<td>195</td>
<td></td>
</tr>
<tr>
<td><strong>Total VisLab Salary Support</strong></td>
<td>1,229</td>
<td>588</td>
<td>641</td>
</tr>
</tbody>
</table>

| Proposal Item #2 - Materials                          |        |         |                 |
| Modeling Education Packets and consumables            |        |         |                 |
| **Materials + O/H**                                   | 373    | -       | 373             |

| Proposal Item #3 - Transportation Scholarships        |        |         |                 |
| Yuma Middle School                                    | 599    |         |                 |
| Coronado                                              | 386    |         |                 |
| Rocky Mtn Elem                                        | 250    |         |                 |
| Castro Elem                                           | 420    |         |                 |
| Erie High                                             | 250    |         |                 |
| St. Therese                                           | 600    |         |                 |
| CU Science Discovery                                  | 200    |         |                 |
| Mesa to Mesa                                         | 1,441  |         |                 |
| Northridge Elementary                                 | 110    |         |                 |
| Central                                               | 191    |         |                 |
| Erie MS Mesa                                          | 222    |         |                 |
| Castro Elem                                           | 420    |         |                 |
| Fredrick Elementary                                   | 454    |         |                 |
| Sunset Middle - St. Vrain                             | 192    |         |                 |
| **Total Transportation + O/H**                        | 8,051  | 8,592   | (541)           |

| Total Funds Remaining                                  | 9,653  | 9,180   | 473            |