

Global Climate Change Education Project (GCCE)

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PROJECT DESCRIPTION

The Global Climate Change Education (GCCE) project is Congressionally-directed with a broad focus of improving research and education in global climate change through competitive awards that improve global climate change and Earth system science education at the elementary, secondary, and undergraduate levels. First directed in the FY08 appropriation at approximately \$8.5M, GCCE was appropriated \$10M in FY2009 and \$10M in FY2010. GCCE has been designed to be consistent with the recommendations of the National Research Council's report *Earth Science and Applications from Space: National Imperatives for the Next Decade and Beyond* and the report of the National Academies, *Rising Above the Gathering Storm*. These reports highlight the need to continually advance our understanding of our Earth system, utilizing Earth observation data when available, and to enhance our science and technology capabilities through research and K-12 science and mathematics education, respectively.

The goals of GCCE are to *increase the climate literacy and level of engagement of the United States public and create a diverse, highly skilled, and motivated future workforce in climate-related sciences*. The objectives of the GCCE project are to use NASA's unique contributions to climate and Earth system science to:

- Improve the teaching and learning about global climate change and Earth system science in elementary and secondary schools and on college campuses;
- Increase the number of students, particularly high school and undergraduate students, using NASA Earth observation data/NASA Earth system models to investigate and analyze global climate change issues;
- Increase the number of undergraduate students prepared for employment and/or to enter graduate school in technical fields relevant to global climate change; and
- Increase access to high quality global climate change education among students from groups historically underrepresented in science.

The GCCE project selects new participants on an annual basis and awards two or three-year education grants or co-operative agreements to develop new activities that support the goals and objectives of GCCE and NASA Science Mission Directorate Earth system science education. Each proposal funded through a GCCE NASA Research Announcement or Cooperative Agreement Notice is expected to take advantage of NASA's unique contributions in climate science to enhance students' academic experiences and/or to improve educators' abilities to engage and stimulate their students.

The GCCE project also works to bring Principal Investigators (PIs) working on climate change education (CCE) projects together with researchers and subject matter experts to create a CCE community of practice. The purpose of building such a community is to provide opportunities for climate change researchers and educators to share their knowledge, challenges, new ideas, and best practices and work together to improve climate change education. In this endeavor, GCCE works closely with the other two Federal agencies

responsible for leading the Education subcommittee of the U.S. Global Change Research Program (USGCRP), the National Science Foundation (NSF) and the National Oceanic and Atmospheric Administration (NOAA). The Virginia Space Grant Consortium supports GCCE with these integration efforts through a cooperative agreement.

GCCE PERFORMANCE GOALS

The GCCE project directly supports the goals of the NASA Office of Education and Outcomes 1 and 2 of the NASA Education Strategic Portfolio. Significant progress was made in FY2010 for both the 2008 and 2009 solicitation awards with development of new college courses, online curricula for K-12 and professional development activities, research activities, and workshops. GCCE contributes to the accomplishment of the following Office of Education Outcomes and PART measures:

Outcome 1: Contribute to the development of the STEM workforce in disciplines needed to achieve NASA's strategic goals through a portfolio of investments.

- Number of new or revised courses targeted at STEM skills needed by NASA that are developed with NASA support.
- Number of institutions served in designated EPSCoR states
- Percentage of NASA higher education program student participants employed by NASA, aerospace contractors, universities, and other educational institutions.
- Number of underrepresented and underserved students participating in NASA education programs.

Outcome 2: Attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers, and faculty.

- Percentage of elementary and secondary educators who either obtain NASA content-based education resources or participate in short-duration NASA education activities and use NASA resources in their classroom instruction
- Percentage of students expressing interest in science, technology, engineering, and math (STEM) careers following their involvement in NASA elementary and secondary education programs

PROJECT BENEFIT TO OUTCOME (1,2, OR 3)

A summary of the Office of Education performance goals that GCCE benefits and the specific targets established for the GCCE project are highlighted in yellow in the table below. Actual reported numbers for each measure are shown in the FY10 column.

APG	METRIC	Target	ACTUALS			
			FY09	FY10	FY11	FY12
10ED1	# of new/revised courses targeted at STEM skills	5		14		
	# of students reached through course			224		
10ED2	# of institutions in designated EPSCoR states	7		9		
10ED6	Percent of student participants interested in STEM careers	50%		TBD		
10ED7	# of elem and secondary educators receiving NASA resources	200		734		
	# of elem and secondary educators using NASA resources	150		TBD		
10ED8	# of elem and secondary students participating in NASA activities	200		3970		
10ED9	# of elem and secondary educators participating in NASA training	50		169		
	# of elem and secondary educators using NASA resources	40		TBD		

PROJECT ACCOMPLISHMENTS

(CONNECTION BACK TO ANNUAL PERFORMANCE GOALS AND PLANS)

Awards made in response to the FY08 solicitation were made in the third and fourth quarter of FY09, and FY09 awards were made in the beginning of FY10. FY10 was therefore the first year of execution for project grants and cooperative agreements. As a consequence, there is little if any FY10 data available on long term student or K-12 teacher impacts, such as the number of teachers using NASA materials in their classroom.

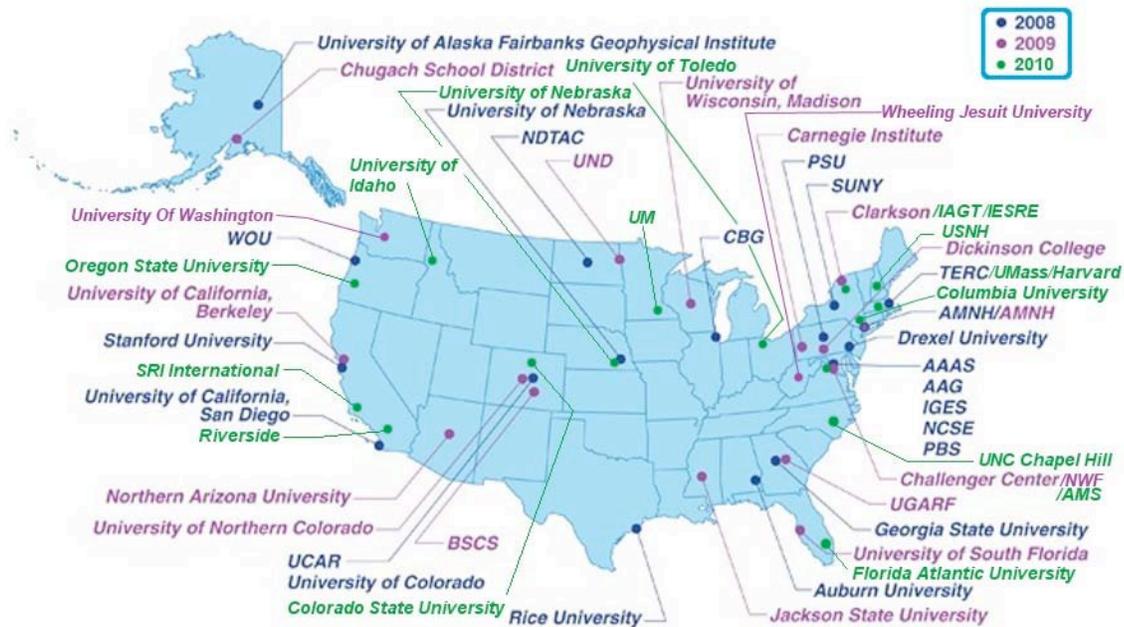
Outcome 1: Contribute to the development of the STEM workforce in disciplines needed to achieve NASA's strategic goals through a portfolio of investments.

1. The GCCE project had as an FY10 target goal to develop 5 new or revised undergraduate level courses on climate change and Earth system science.

In FY10, fourteen new or significantly modified university courses were developed with GCCE funds. Data received from PIs indicate that 224 students were enrolled in these new courses in FY10. Student enrollment numbers may be low as several of these courses were in beta-test during FY2010.

2. A goal for GCCE is to award as much of the available funding as possible through competitive solicitations and increase the number of institutions participating in global climate change education. It is also a goal of the GCCE project to increase the diversity of institutions and activities awarded, the number of states participating, and the number of awards made to Minority Serving Institutions (MSIs).

Below is a map showing the FY08 awards (shown in blue), the FY09 awards (shown in pink), and FY10 awards (shown in green). Institutions in 23 states have been awarded grants and/or cooperative agreements since the start of the project. Nine awards have been made to institutions in EPSCoR states.



Approximately fifty percent of the awards made in response to the FY08 solicitation are focused on teacher professional development and the other fifty percent are focused on activities that enhance teaching and learning in K-12 and Higher Education. In an attempt to increase the diversity of activities within the total portfolio of awarded projects, the GCCE FY09 and FY10 solicitations requested proposals focused on research and teaching and learning using NASA data and did not include teacher professional development as a primary focus.

A total of 57 awards have been made to date. The table below shows the total number of awards made in each fiscal year solicitation cycle and the total funding awarded each year through these competitive opportunities. The table also shows the number awarded to Minority Institutions (MI-Led), institutions with High Hispanic Enrollment (HHE-Led), and community colleges.

Award Teams	FY2008	FY2009	FY2010
Minority Lead	1	1	1
Minority Partner	0	2	3
Community College	0	1	1
Total	1	4	5
Total Proposals	22	18	17
Funds Awarded	\$6.4M	\$7.4 M	\$9.3 M

Outcome 2: Attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers, and faculty.

1. The GCCE project had a target goal of 200 teachers to receive short duration educator professional development. The actual number of K-12 educators attending GCCE workshops and receiving short duration educator professional development exceeded this target by more than a factor of 3.

Educator Professional Development – Short Duration (Engage)

Provide short duration professional development and training opportunities to educators, equipping them with the skills and knowledge to attract and retain students in STEM disciplines.

The following institutions reported short duration educator professional development activities in FY10:

<i>Institution</i>	<i>Number of K-12 Teachers Receiving NASA GCCE Materials</i>	<i>Other Related</i>
<i>Auburn University</i>	<i>52</i>	<i>3 News Stories</i>
<i>Association of American Geographers</i>	<i>24</i>	<i>1 new product</i>
<i>Chicago Botanic Gardens</i>	<i>65</i>	<i>12 new products</i>
		<i>12 family members participated</i>
<i>North Dakota Assoc. of Tribal Colleges</i>	<i>12</i>	
<i>Rice University</i>	<i>72</i>	
<i>TERC</i>	<i>5</i>	
<i>UCAR</i>	<i>387</i>	
<i>University of Alaska Fairbanks</i>	<i>64</i>	
<i>University of CA Berkeley</i>	<i>20</i>	
<i>University of Wisconsin</i>	<i>21</i>	
<i>Western Oregon Univ.</i>	<i>10</i>	
<i>Wheeling Jesuit Univ.</i>	<i>2</i>	<i>1 new product,</i>
		<i>1 news story</i>
<i>TOTAL</i>	<i>734</i>	

2. The GCCE project had a target goal of 50 educators to receive long duration training in CCE. Here again, the actual number of K-12 educators who received long duration training in Earth system science and CCE exceeded this target goal.

Educator Professional Development – Long Duration (Educate)

Provide long-duration and/or sustained professional development training opportunities to educators that result in deeper content understanding and/or competence and confidence in teaching STEM disciplines.

The following institutions reported long duration educator professional development activities in FY10:

<i>Institution</i>	<i>Number of K-12 Teachers Receiving Long Duration CCE Professional Dev.</i>
<i>Auburn University</i>	<i>9</i>
<i>Chicago Botanic Gardens</i>	<i>8</i>
<i>Chugach School District</i>	<i>24</i>
<i>Clarkson University</i>	<i>10</i>
<i>Jackson State University</i>	<i>12</i>
<i>Rice University</i>	<i>20</i>
<i>Stanford University</i>	<i>18</i>
<i>University of CA Berkeley</i>	<i>20</i>
<i>University of Nebraska At Lincoln</i>	<i>25</i>
<i>University of Wisconsin</i>	<i>10</i>
<i>Western Oregon University</i>	<i>13</i>
<i>TOTAL</i>	<i>169</i>

3. A target goal of 200 elementary and secondary students set for the GCCE project was also exceeded. Below are the number of elementary and secondary student participants in NASA instructional and enrichment activities reported by the institutions with GCCE grants and cooperative agreements.

The following institutions reported K-12 student participants in activities

<i>Institution</i>	<i>Number of K-12 Students Engaged</i>
<i>Auburn University</i>	<i>1980</i>
<i>Chicago Botanic Gardens</i>	<i>240</i>
<i>Drexel University</i>	<i>9</i>
<i>Jackson State University</i>	<i>3</i>
<i>Rice University</i>	<i>1449</i>
<i>Stanford University</i>	<i>120</i>
<i>University of Alaska Fairbanks</i>	<i>119</i>
<i>University of Nebraska At Lincoln</i>	<i>50</i>
<i>TOTAL</i>	<i>3970</i>

Office of Education Outcomes 1 and 2

1. Enhance communication efforts using web-based approaches. Increase integration of GCCE funded activities, both across the project and within the larger community of climate change education and research practitioners. Broadly disseminate information about GCCE activities and the opportunities that they and related CCE programs provide.

In FY10, the GCCE website became fully operational. The website is connected to the NASA portal and includes pages describing each of the awarded projects, Principal Investigators, and funded institutions within the GCCE portfolio. There are also pages identifying links to resources for educators, researchers, and potential proposers, including K-12 classroom lesson materials that are searchable by grade level, climate literacy principle, and National Science Education standards, sources of NASA data, and grant writing resources.

The GCCE project began holding monthly PI webinars in FY10. During these webinars, project PIs share upcoming events and news, and a few PIs provide more detailed briefings of their projects. Guest speakers are also invited on occasion to discuss related activities within NASA that may be of interest to the PIs. Schedules of talks are developed 3-4 months in advance and sent to PIs and other interested parties, including NASA Office of Education and SMD education leads, and project managers. In addition, two special webinars were convened in FY10 to enable evaluators working with GCCE grant and cooperative agreement teams to discuss and share their approaches and best practices.

An annual GCCE PI meeting was held at the Langley Research Center in April 2010 to foster communication and knowledge sharing among the PIs, and personnel working climate change education within NASA, NSF, and NOAA. As part of this meeting, the NOAA representative provided a briefing and interacted with meeting participants via webex, and the NASA Digital Learning Network was used to allow PIs to hear and interact with a special guest speaker from the Goddard Space Flight Center.

PROJECT CONTRIBUTIONS TO PAR MEASURES (INCLUDE DATA PLUS EXPLANATION)

NASA Higher Education Outcome 1.3 Student Involvement, Higher Education (Educate)

Number of underrepresented and underserved students participating in NASA education programs.

Fifteen underrepresented and underserved students were reported under PART to have received non-significant engagement in GCCE education, where non-significant is defined as costing less than \$5K per student or involving fewer than 160 hours. One student was reported as receiving significant engagement.

The institutions reporting summer and extracurricular research experiences for minority students were Drexel University, Jackson State University, University of North Dakota, and Georgia State University.

NASA Higher Education Outcome 1.4 Course Development (Educate)

Number of new or revised courses targeted at the STEM skills needed by NASA that are developed with NASA support.

Thirteen new or revised courses with 78 students were reported as part of the PART data collection for FY10. One institution did not report in time to be counted with the PART and

several of the institutions reporting new courses did not report student enrollment in time to be counted with the PART.

The following institutions reported developing new classroom and online courses in FY10 focused on climate change and Earth system science education at the undergraduate level:

<i>Institution</i>	<i>Number of Courses</i>	<i>Number of Students Enrolled</i>
<i>Clarkson University</i>	1	8
<i>Jackson State University</i>	2	36
<i>National Council for Science And the Environment</i>	4	63
<i>State University of New York</i>	2	14
<i>University of Georgia</i>	1	38
<i>University of North Dakota</i>	1	17
<i>Western Oregon University</i>	2	43
<i>Wheeling Jesuit University</i>	1	10
TOTAL	14	224

IMPROVEMENTS (e.g., project management, efficiencies, etc.) MADE IN THE PAST YEAR

1. The GCCE project has worked hard to raise awareness of GCCE funding opportunities and encourage participation, especially among Minority Serving Institutions. Below is a table showing the total number of proposals received each year and how many were led by a Minority Institution (MI-LED) and how many were led by an institution with High Hispanic Enrollment (HHE-Led). The total number of proposals received in 2009 and 2010 were greater than in 2008 and though the number of proposals received in 2010 was less than 2009, the number of proposals received by MI-Led and HHE-Led institutions increased.

Solicitation Yr	# of Proposals	# of MI-Led*	# of Non-MI HHE-Led**
2008	123	8	4
2009***	161	13	2
2010	130	18	3

*Number led by minority institutions of higher education where minority student enrollment > 50%

** Number led by institutions of higher education having Hispanic student enrollment > 25%, but less than 50%.

*** First year that public schools were allowed to apply

2. Continued improvements and efficiencies in selection, offers, and acceptance processes led to a reduction in the length of time required to make awards. The FY08 solicitation cycle took ten months from the time the announcement was released until the first grants were awarded. The solicitation cycle time for FY09 and FY10 was 5 months and 7 months, respectively. The increase in cycle time in FY10 compared to FY09 was intentional to allow proposers more time to develop their proposals and reviewers more time to review them.

PROJECT PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION *(THIS IS WHERE FURTHER FOLLOW-UP TO OCCUR FOR COLLECTING 2010 GRANTEE PERFORMANCE SUMMARIES FOR PUBLISHING TO OUR EDUCATION HOME PAGE)*

The GCCE awardees are partners in the project, and under their grants and cooperative agreements they create new courses, provide teacher professional development workshops and research internships, create new curricula and online courses for undergraduates and K-12, and provide research experiences for K-12 and undergraduate students. The FY2010 awards were made at the end of the 2010 fiscal year and these activities did not get underway until FY2011. About 40 of the Principal Investigators were executing their grants or cooperative agreements during FY2010.

In addition to working with the GCCE awardees, the GCCE project has built a strong partnership with the National Science Foundation Climate Change Education Program and the National Oceanic and Atmospheric Administration climate change education programs and education managers within the Department of Energy working on related education efforts related. A planning workshop was held January 19, 2010 at NASA Headquarters with representatives from these federal agencies to try to align activities and extend the reach and benefit of the government investments in CCE. Education project managers from NASA, the National Science Foundation, and the National Oceanic and Atmospheric Administration Workshop took steps in FY2010 to increase coordination of planned FY2010 solicitations in order to reach a broader audience and increase the diversity of participants across all federal programs. The agencies also supported joint Principal Investigator workshops to increase integration and share best practices. The agencies agreed to work together in the future to establish a common evaluation framework for Federal CCE programs.