Innovation Diversity Education Activities (IDEA) Highlights of Accomplishments Y6

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UC DAVIS
UNIVERSITY OF CALIFORNIA

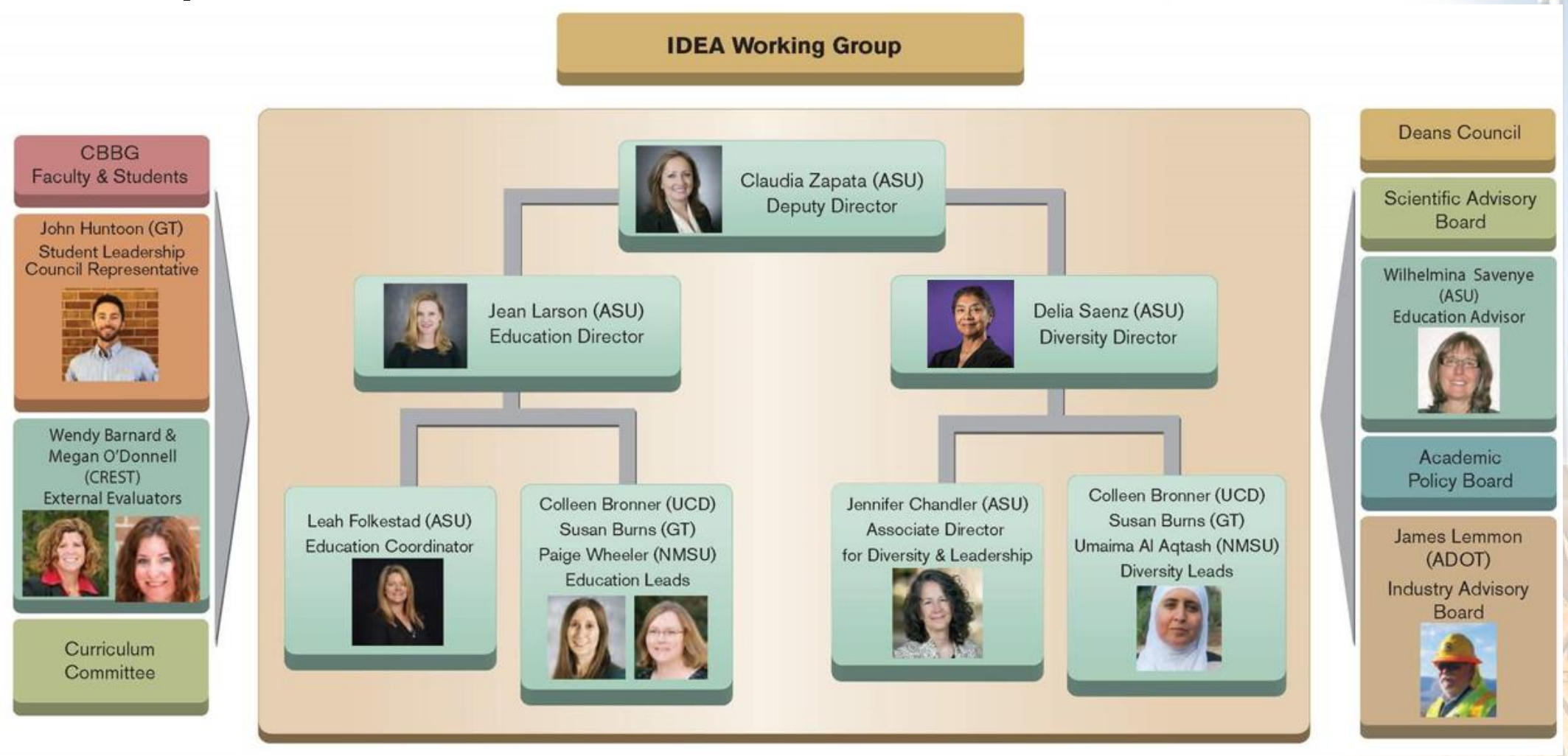
Georgia Institute of Technology

NM STATE

NSF

Center for Bio-mediated & Bio-inspired Geotechnics
CBBG

Innovation, Diversity, & Education Activities (IDEA)



Strategic Plan and Broader Impacts

- Create an inclusive culture to develop a globally competitive workforce prepared to:
  - **Transform fundamental research** on biogeotechnical processes into innovative, sustainable, and cost-effective processes
  - **Respond to increasing social, economic, and political demands** for sustainable development of civil infrastructure systems
- Diversity, inclusion, innovation and industry components
- Workforce development with activities aimed at:
  - Promoting **collaboration/communication** among research groups
  - Increasing awareness of **diversity/inclusion**
  - Highlighting **industry needs**
  - Achieving excellence in **innovation, mentoring and leadership**

Strategic Plan Goals and Benchmarks

Education Program Goal	Benchmarks
Desired Skillsets	**At least 70% of participants** report their skills increased Somewhat, Quite a Bit, or A Great Deal by participation in CBBG
Leadership and Innovation	**At least 70% of participants** report their leadership and innovation skills were impacted by participation in CBBG
Diversity and Inclusion	**At least 90% of participants** report feeling valued and accepted for their contributions in CBBG
Education Partners Engagement	**At least 50% of applications for the summer programs** are from our educational partners Engage with educational partners **through at least 3 major outreach events**
Curriculum Development	**At least 70% of participants** report that their understanding of biogeotechnics was impacted by participation in CBBG

Impact Tracking and Assessment

Revised Strategic Plan

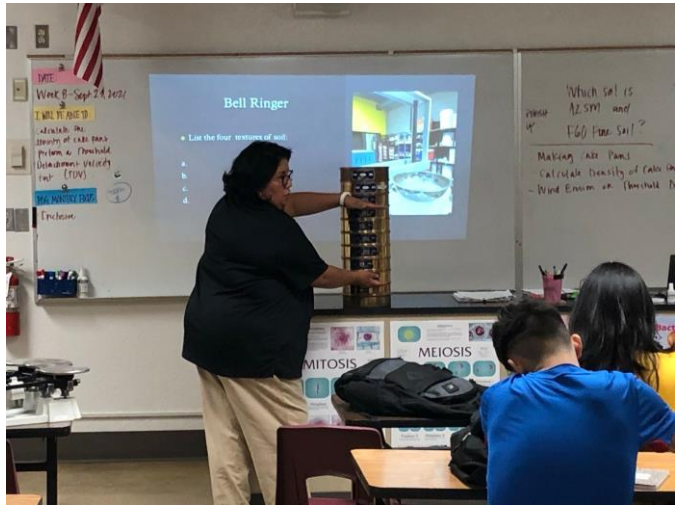
- Updated Logic Model to better **align** activities with **strategic goals and long-term impact goals**
- Included benchmarks
- Helped reduce the WFD and D&I workloads

Broader Approach

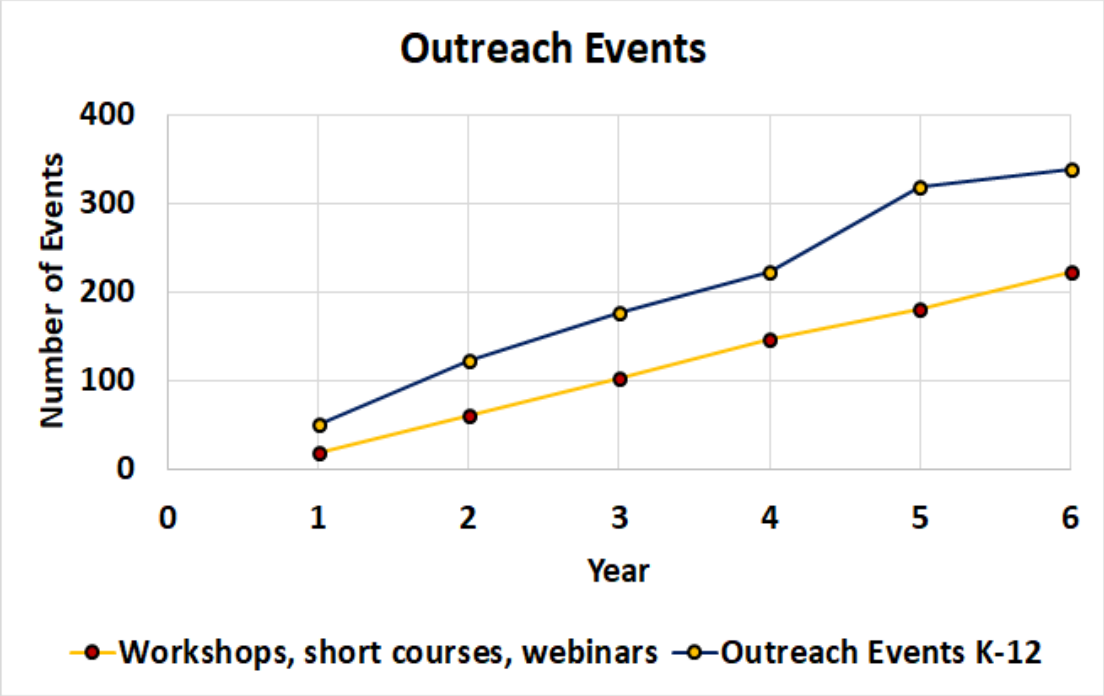
- All CBBG populations
- Partnerships with industry, museums, colleges and school districts

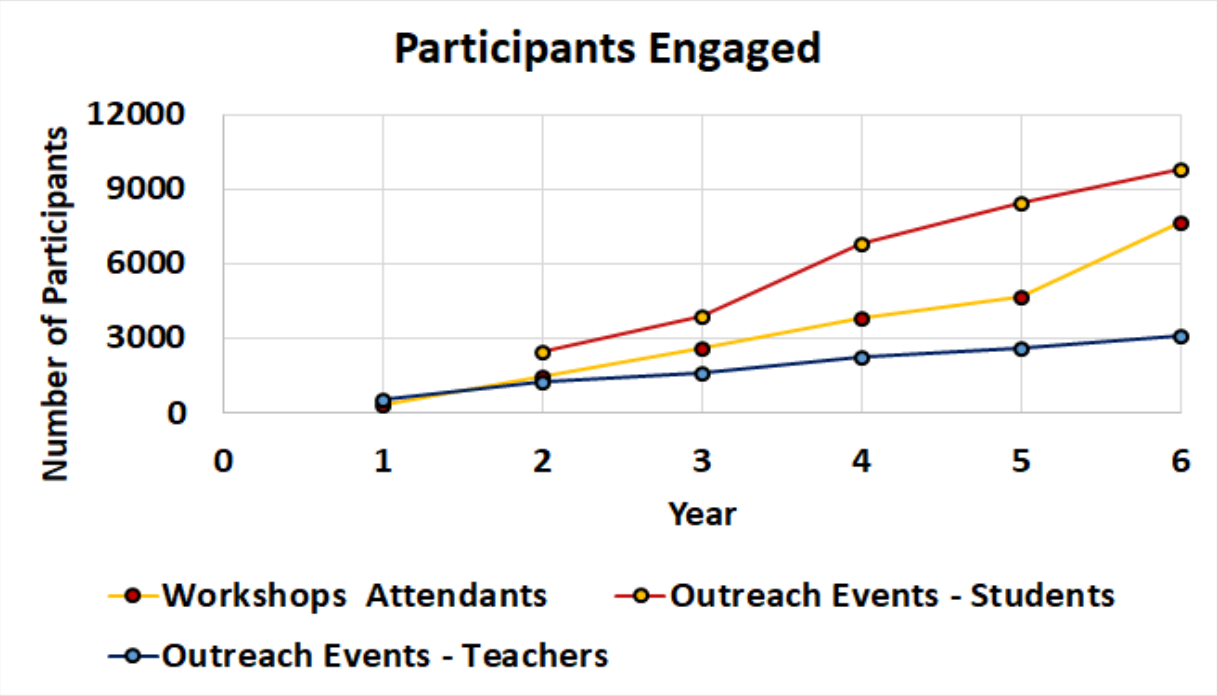
Education Activities – Year 6

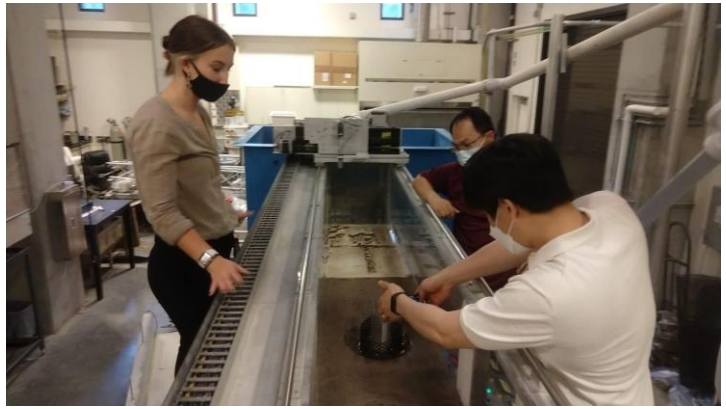
	Course Materials	REU	RET	Young Scholar	Pre-College	Practitioner Education	General Community
ASU	In Place	In Place	In Place	In Place	In Place	In Place	In Place
GT	In Place	In Place	In Place	In Place	In Place	In Place	In Place
NMSU	In Place	In Place	In Place	In Place	In Place	In Place	In Place
UCD	In Place	In Place	In Place	In Place	In Place	In Place	In Place

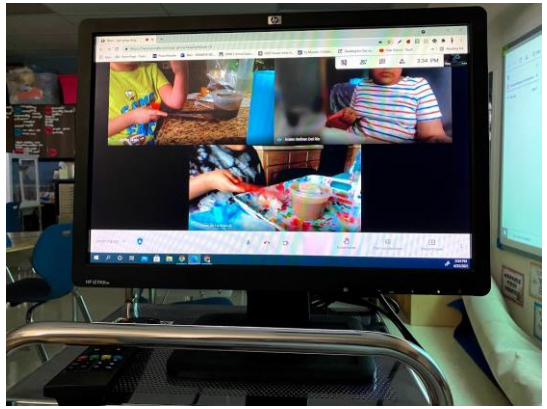


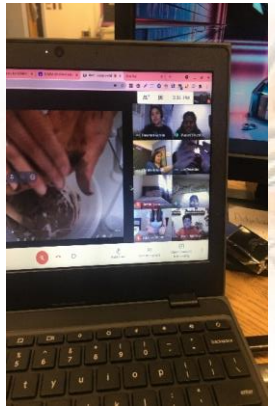
Outreach Activities Cumulative Summary





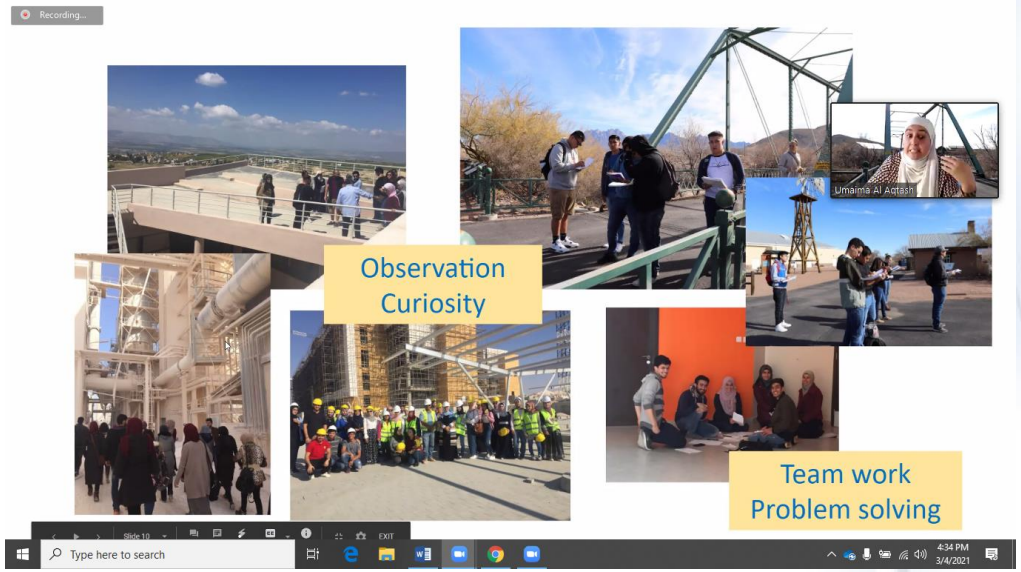






University Education - IDEA Impact

- Increased **student-industry interaction**
  - Co-authoring of journal articles
  - Submitting a provisional patent
  - Adding CBBG industry members to Ph.D. dissertation committees
- Supported faculty and students engaged in **mentoring activities**
  - Additional mentor training and workshops
  - Shared best practices
  - Increased mentor resources

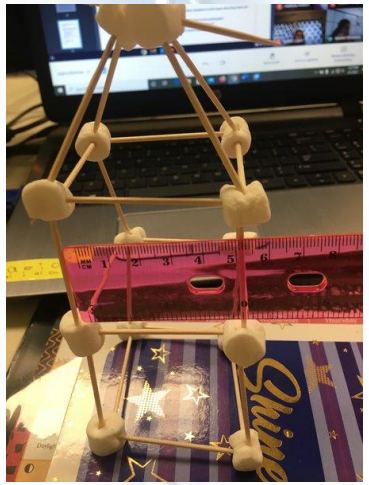


New and Ongoing Curriculum Y6

- **New Courses – UG Level (Dr. Colleen Bronner – UC Davis)**
  - Global Learning: Diversity, Equity, Inclusion and Justice in Engineering
  - UN Sustainable Development Goals: How Can Engineers Affect Social Justice?
  - Strategies for Success in Online Learning
- **Ongoing Courses, Training Videos, Webinar Series**

Ongoing Course Name	Level	Course Developer/ Instructor
Fundamentals of Geoenvironmental Engineering	UG	Kirk Craig, Geosyntec
Environmental Engineering Fundamentals: Biological Processes	UG	Dr. Anca Delgado, ASU
Bio-inspired Design	UG//Grad	Dr. Julian Tao, ASU
Connecting Research to the Broader Community	Senior/Grad	Dr. Claudia Zapata, ASU
Contaminant Fate and Transport	Grad	Dr. Treavor Boyer, ASU
Engineering Education I	Grad	Dr. Colleen Bronner, UCD
Engineering Education II	Grad	Dr. Colleen Bronner, UCD

Pre-College Education - IDEA Impact



- Developed and disseminated **virtual STEM curricula**
  - Support and engage parents, teachers, and students
  - Accessible education materials during the COVID-19 pandemic
  - Some material translate to Spanish
- Summer **Hybrid RET Program**
  - **Twelve** K-12 teachers
  - All partner universities hosted RETs
  - Expanded engagement nationwide
- **Expanded** science center and museum partnerships
  - Former RETs presented lessons **to more than 20 Title I k-12 educators**
  - NMSU followed ASU model with Museum of Nature & Science in Las Cruces, NM

Curriculum Development

- **Pre-College Level**
  - K-14 curricula created by RET Summer Program participants
  - Material aids in implementation lessons for K-12 classrooms, out-of-school and general public activities
  - Teacher professional development
    - Training material for STEM teachers
- **Outreach portfolio**
  - Activities objectives, background, materials list, procedures and questions
  - Support graduate students and teachers when delivering lessons and demos

Industry Interaction

- Facilitate **student interaction and engagement** with industry
  - Participation in innovation and entrepreneurship **training and knowledge exchange**
  - **Feedback to students** from CBBG industry partners
- Support student **transition into the workforce**
  - Co-hosting presentations with industry, seminars and webinars
  - Industry networking events
  - Guest lectures with industry partners
  - Outreach
  - Career opportunities weekly posting
- Industrial Practices
  - Co-authoring journal articles with industry partners
  - Incorporating industry partners in the student's dissertation committees and internships
- Provide **opportunities** to students to hear from experts
  - **Career talks** with industry partners and academia
- Mentoring students
  - Obtaining internships and employment

New Education Partnerships/Collaborations

- Fresno City College
  - Developed research experience on **training Community College undergraduate** students on culturally responsive **mentoring**
- Museum of Nature & Science in Las Cruces, New Mexico
  - Community events
- Maricopa Institute of Technology
  - **Feedback to high school students** on Science and Engineering Fair topics
- Gadsden Independent School District in New Mexico
  - **96% Hispanic students**
  - **100% low-income**
- Desert Trail Elementary and Desert View Elementary Schools in New Mexico
  - **After-school programs**

Diversity and Inclusion Highlights

- **Two new Center-wide diversity and inclusion courses** developed and delivered
  - Understanding and Addressing Underrepresentation in STEM
  - Building an Inclusive Environment

- **Training on anti-racism practice in engineering** separately for students and faculty/staff)
  - Awareness
  - Understanding
  - Self- and unit-reflection
  - Action steps in advancing equity and inclusion

Diversity and Inclusion Highlights

- CBBG rates of **participation by women and Hispanics in all major categories** exceeded both National Engineering Averages and All ERC's Averages

- Rates of participation by both **persons with disabilities and underrepresented minorities** exceeded All ERC's Averages in 3 of the 4 categories

- Getting noticed in the **Hispanic community**
  - DD Claudia Zapata received the Professor William Yslas Velez Outstanding STEM Award for promoting and champion the recruitment and graduation of students completing undergraduate and graduate degrees in the STEM fields

Diversity and Inclusion Highlights

- **Strategic recruitment** of diverse population
  - New partnerships to secure inclusion
    - ASRC Industrial agreed to **sponsor high school students** from the Inupiat community of Alaska to participate in the CBBG Young Scholars Program
  - RET Program and YS Program
    - **Four** participants identified as Black
    - **Seven** participants identified as Hispanic
    - **Two** participants identified as American Indian

Evaluation & Assessment Objectives for Y6

Assessment Logic Model updated in Y6 to include **long-term goals**

1. Participants **gain knowledge and skills**
2. Leadership and Center participants create a **diverse and inclusive culture** within the center
3. Participants demonstrate an **interest in STEM** regarding their future education and/or career paths
4. Participants are satisfied with their **mentoring experiences**
5. CBBG participants demonstrate **overall satisfaction** with the CBBG program
6. CBBG program demonstrates **long-term impact in their former students' education and/or career trajectories**

CBBG Impact: Knowledge and Skill Development Pre-College and University Programs

- **Self-reported survey data** confirmed all benchmarks associated with the desired skillsets, leadership & innovation, and curriculum developed education goals **were met**

Education Program Goals	Evaluation Outcomes: Knowl. & Skills	Evaluation Benchmarks	Benchmark Met?	Pre-College & University Participant-reported findings
Desired Skillsets	Communication Skills	**At least 70% of participants** report their communication skills were impacted by CBBG "somewhat," "quite a bit" or a great deal"	✓	100% of YSs 71% of RETs 90% of REUs 93% of year-round students
Desired Skillsets	Research Skills	**At least 70% of participants** report their research skills were impacted by CBBG "somewhat," "quite a bit" or a great deal"	✓	83% of YSs 91% of RETs 99% of the REUs 96% of year-round students

CBBG Impact: Knowledge and Skill Development Pre-College and University programs

Education Program Goals	Evaluation Outcomes: Knowledge & Skills	Evaluation Benchmarks	Benchmark Met?	Report Findings
Desired Skillsets Leadership & Innovation	Leadership and Innovation Skills	**At least 70% of participants** report their leadership and innovation skills were impacted by participation in CBBG	✓	100% of YSs 70% of RETs 90% of REUs 86% of year-round students
Curriculum Development	Understanding of CBBG	**At least 70% of participants** reported they understood what the CBBG is "somewhat," "quite a bit" or a great deal."	✓	• 100% of YSs and REUs • 88% of RETs • 100% of RETs reported **being prepared to develop and implement their lessons** as well as expose their students to CBBG-related content

Mentor-reported Impact: Knowledge and Skill Development of Summer Program Participants

Intermediate or Advanced Skill Levels	YS	RET	REU
Creating a poster	64% (N=7)	89% (N=9)	66% (N=8)
Presenting the research	55% (N=5)	70% (N=10)	67% (N=8)
Answering questions about the research	60% (N=6)	72% (N=11)	72% (N=8)
Overall ability to succeed in their mentor's lab	73% (N=8)	100% (N=11)	100% (N=8)

Impact on Former Students' Education and/or Career Trajectories

- **96% of former students** reported CBBG was beneficial to their academic and/or career paths

How did CBBG help fuel your path?

"CBBG was fundamental in propelling me into a successful career as a consultant in environmental engineering. The r**esearch, programs, workshops, and mentorships** were amazing and so helpful in developing skills that I would use in my career."

"The one-year experience at CBBG helped fuel my academic path by the following aspects: 1. **The research work** I conducted at CBBG made great contributions to my doctoral thesis; 2. The activities such as **meetings, webinars, lectures** held by CBBG improved my communication skills and my fluency in English; 3. The experience at CBBG, especially under the great guidance of Prof. Edward Kavazanjian, made me pursue my future and career in academics."

Impact on Former Students' Education and/or Career Trajectories

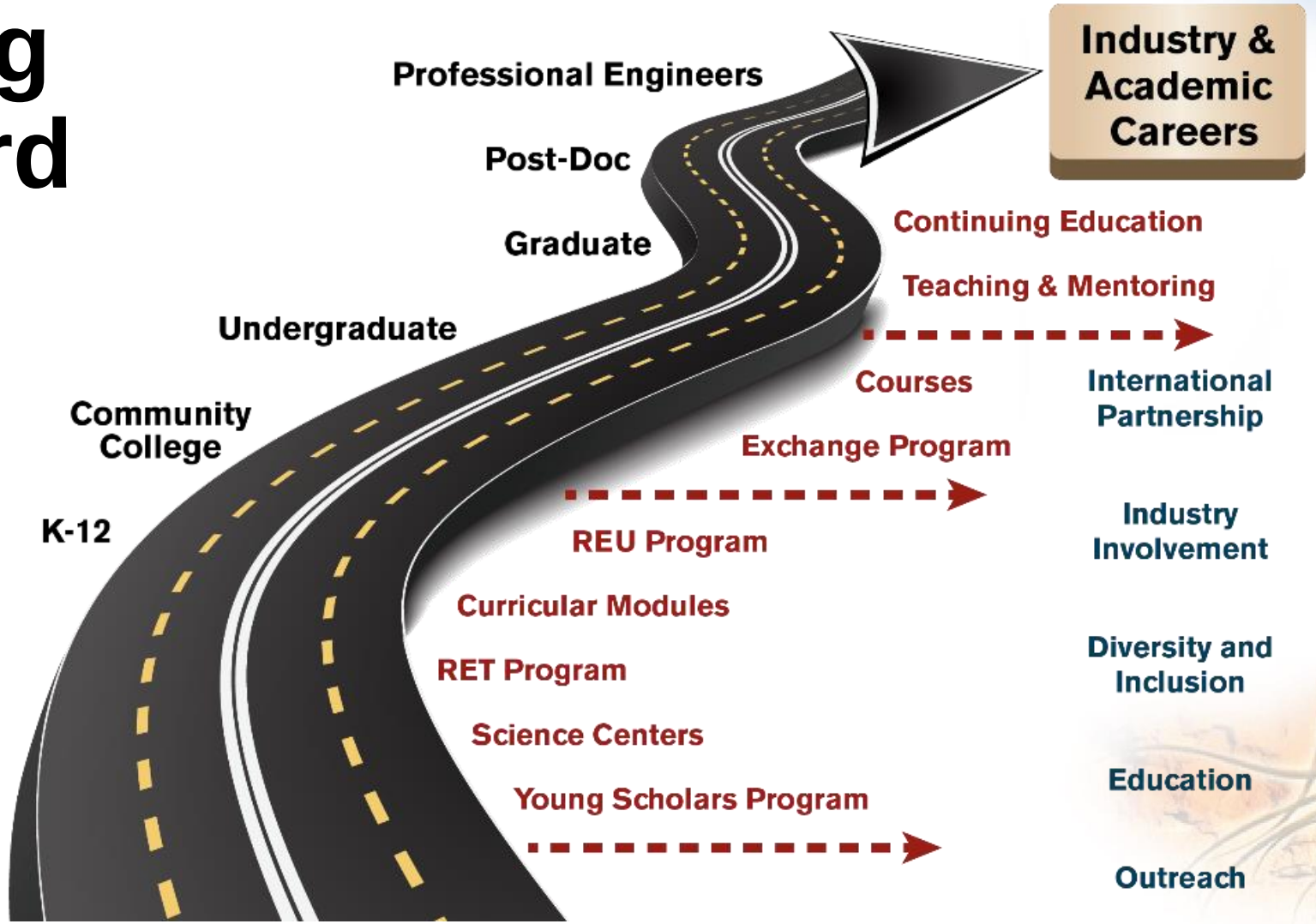
Most Important Skills learned through CBBG currently used in former students' academics or profession

"**Communication skills, technical writing and reporting** are all skills that I've continued to improve within a project team and have been able to *apply in the industry*."

"Learning to **communicate more efficiently**, always trying to **think outside the box**, and having the mindset to improve whatever task, procedure I do at work are skills I improved through CBBG."

"How to **work independently and with a team**, **communication skills, technical writing and presentation skills, and problem-solving**."

Activities Moving Forward



Years 7 – 10 Strategic Plan Activities

- **Pilot-test a Sustainability Plan** put together by the education team
  - CBBG industry partner consulting firms
  - Assess financial viability of credential programs
- Development of Professional Development curriculum to support **fee-based continuing education programs**
- **Facilitate training** in diversity and inclusion, mentorship, entrepreneurship, sustainability, innovation, and intellectual property
- **Design summer REU, RET, and Young Scholar programs**
  - Adapt for hybrid delivery and incorporate lessons learned as needed
- **Develop and disseminate new curriculum in Biogeotechnics**
  - Training videos in biogeotechnical methods produced by SLC
  - Pre-college and community outreach, undergrad and graduate curriculum
- **Seek additional funding** to support IDEA group activities

Thank You!

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