

Grand Challenges

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GRAND CHALLENGES EDUCATION COMMITTEE

Agenda, September 26, 2019. STEM Collaborative Center

- Welcome and Introductions and Sign-in Sheet
- Review of notes from the April 3rd meeting
- Update: GC Lecture Series and Faculty Fellows
- Planning: Select and implement education initiatives
- Adjourn

Committee Charge:

- *Leverage UNM Grand Challenges to broaden student and faculty participation in interdisciplinary research and problem-solving (at undergraduate and graduate levels).*
- *Leverage UNM Grand Challenges to strengthen instruction.*
- *Leverage UNM Grand Challenges to enrich student learning through co-curricular programs.*
- *Leverage UNM Grand Challenges to build enrollments and increase retention/graduation rates.*
- *Work closely with GC Research Teams to keep them engaged in GC education efforts.*
- *Report regular progress to the GC Steering Council.*

Participants: Tim Schroeder, Pamela Cheek, Lili Dai, Jan Armstrong, David Torney

Meeting Notes

The committee discussed ideas for improving student turnout for the Spring Lecture Series, including:

- **Align the times/dates of lectures with related classes where instructors may be willing to let students out early to attend, or to receive participation points for attending.**
- **For the Successful Aging lectures, connect with the UNM Retiree Association to help recruit students and community members.**
- **Conduct the Successful Aging lectures on Fridays to allow for easier parking by community members. Purchase free parking passes for community members who wish to attend.**
- **Network with Medieval Studies Institute to explore how they are able to drive up participation at their annual lecture series.**

The committee discussed and updated the GC Education Ideas document (as included below).

- **Discussion comments/questions:**
- **Can we work the Foundation to offer naming rights for specific educational and outreach events in order to increase funding?**

Grand Challenges

Ideas for Leveraging Grand Challenges to Engage Undergraduate and Graduate Students

The following strategies were primarily generated and/or discussed during the April 3rd GC Education Committee meeting, but also include a few additions generated in conversations subsequent to the meeting. The approximate costs, potential outcomes and recommendations have been added by the GC Operations Director in July 2019, and will be revised by the committee in Fall 2019.

RECOMMENDATIONS: The highlighted strategies are those recommended by the GC Operations Director to be the most quickly implemented, can be implemented at varying scales, and/or have the highest returns on investment. The strategies in boxes are those currently under development.

APPROXIMATE COSTS: The approximate costs detailed below for each strategy are highly subjective and variable. Each strategy could be implemented in any number of ways, resulting in vastly different costs. In some cases, costs could be covered by existing resources within individual departments. In many cases, costs would need to be covered through new financial resources. The costs below are based on the implementation models conceptualized by the GC Operations Director, and should be treated as preliminary and adjustable.

POTENTIAL OUTCOMES: Potential outcomes for individual students include those related to AGENCY (research efficacy, academic efficacy, and sense of belonging), BEHAVIOR (GPA, retention, and graduation) and new student RECRUITMENT (application for admission and new student enrollment). Outcome levels include high, moderate, low and none. Strategies that have low or no impact on agency, behavior or recruitment may still meet other important institutional and/or Challenges goals, including public awareness, marketing, and interdisciplinary collaboration. As with approximate costs, estimates for potential objectives are subjective, and vary considerably depending on implementation levels.

NETWORK-BUILDING AND SPONSORSHIP STRATEGIES. The following strategies could be implemented by the GC Operations Director and Education Committee members. At this level of GC engagement, the anticipated impact on individual students would vary greatly, as would the number of students served. For instance, if the networking partners are able to identify new and substantial programming resources (including coordination personnel), then they will be more likely to serve larger populations of students, and with greater individual student impacts.

- **Emeritus Engagement: Meet with groups of retired professionals to gauge their interest in engaging in and/or sponsoring various student programming elements (i.e., mentoring, scholarships, projects, proposal reviews). Meet with the UNM Retiree Association, and seek out similar groups at Sandia, LANL and Air Force Research Labs.** APPROXIMATE COSTS: No additional costs.
- **Staff Council: Meet with leaders from Staff Council to develop strategies for Staff to engage in GC student programming.** APPROXIMATE COSTS: No additional costs.
- **Honors and University Colleges: Meet with deans and faculty to develop strategies for incorporating GC research, practice and/or policy into Honors and UC courses (especially learning communities).** APPROXIMATE COSTS: No additional costs for meeting, but costs for subsequent programming would vary depending on the strategies implemented.
- **Undergraduate Research Programs: Meet with existing undergraduate research programs (i.e., McNair, FYRE, MARC) to connect student participants to GC researchers.** APPROXIMATE COSTS: No additional costs.
- **UNM Alumni Association: Meet with Alumni staff and leaders to develop strategies for engaging alumni in Grand Challenges research, education and community outreach.** APPROXIMATE COSTS: No additional costs.
- **UROC (Undergraduate Research Opportunity Conference: Work with UROC Committee to identify which student presentations and posters are connected to the Grand Challenges, and then develop methods for showcasing and connecting those (possibly including a GC UROC Award for Best Poster).** APPROXIMATE COSTS: No additional costs.
- **Build partnerships with New Mexico museums and parks, focusing educational/outreach programming around the three challenges.** Museums could include: Explora, Rio Grande Nature Center, Museum of Natural History, etc. APPROXIMATE COSTS: Unkown. ANTICIPATED OUTCOMES: If UNM students participate in programming, this strategy could have high impacts on agency, and moderate impacts on behavior and recruitment.
- **Build stronger connections to UNM Water Resource Management Program (master's degree).** For instance, create a GC student advisory board from this and other related degree programs, provide GC Water researcher connections to graduate students who are looking for thesis projects, provide mentoring to graduate students, expand graduate students professional networks. APPROXIMATE COSTS: No additional costs, however significant time and effort from GC Water team members. ANTICIPATED OUTCOMES: For graduate students, high impact on agency, moderate impact on behavior, and no impact on recruitment.

- **“Water Game” undergraduate fellows program, co-sponsored (\$5K) by the Sustainable Water Resources team. Engages undergraduate students in building an online water simulation to help the public better understand the decisions that go into water resource management.** COST: \$5,000. ANTICIPATED OUTCOMES: Could engage 5-10 students in direct educational programming, and could engage hundreds of community members online. This would likely have a high impact on agency and behavior, and a moderate impact on recruitment. This project would also produce high returns for community engagement and educational outreach.
- **S-CAP Tracking and Promotion: Work with Career Services to identify Challenge-related student research and conference travel supported by the UNM Student Conference Award Program. Promote Challenge-related conference applications among undergraduate and graduate levels.** APPROXIMATE COSTS: No additional costs. ANTICIPATED OUTCOMES: No impact on outcomes, but could provide an avenue to connecting with individual students beyond the S-CAP program.
- **2020 Science & Engineering Research Challenge, sponsored (\$500) by GC operations budget. Provides research experience competition for 4th through 12th graders. Directed by HSC Office of Diversity, STEM-H Center.** COST: \$500. ANTICIPATED OUTCOMES: Low impact on enrollment, but also provides high visibility of GC to community members.
- **Partner with Wild Friends, providing Water Resources faculty expertise to K-12 students (4th through 12th grades) who are working to propose and lobby for wildlife legislation at the state and regional levels.** Directed by the Wild Friends program at the UNM School of Law Institute of Public Law. ANTICIPATED COSTS: None. ANTICIPATED OUTCOMES: Low impact on enrollment, but also provides high visibility of GC to community members.
- **Partner with University College to recruit faculty instructors to offer BIG QUESTION courses focused on one of the three challenges.** ANTICIPATED COSTS: No additional costs at this time. ANTICIPATED OUTCOMES: Moderate impact on agency, behavior and recruitment.
- **Datasets: Work with GC teams and UNM libraries to make GC research datasets available to UNM instructors for use in their classes (for instance, in statistics classes) and to make these data sets available to the public through a citizen science framework.** APPROXIMATE COSTS: These datasets could be collected through the effort of existing staff. It’s possible they could be archived and distributed from UNM libraries. Building a citizen science framework around the data would be more expensive, possibly including one 0.5 FTE graduate assistant per year (\$20,000 total). ANTICIPATED OUTCOMES: Could engage more than 100 students per year. Outcomes with this strategy are specialized. This would be a useful curricular tool for some subjects (especially statistics), but would not likely have measureable impact across the institution in relation to agency, behavior or recruitment. However, community and student outcomes of a full citizen science project would be significant in all three categories.

- Grand Challenges Academic Learning Communities: Encourage faculty to teach courses via interdisciplinary student learning communities that address one or more challenge. These courses could be offered as Freshman Learning Communities, or as stand-alone projects.**
 APPROXIMATE COSTS: Costs for this strategy would be similar to those for the the Freshman Learning Communities program. For that program, all instructors receive \$1,000 for course development (Regular Faculty, PTIs, TAs). Regular faculty teaching ON-LOAD compensation is \$1,500 in addition to regular course pay from home department. Regular faculty teaching OVER-LOAD compensation is \$4,500. PTI teaching compensation is \$4,500. TA teaching compensation is \$1,500 in addition to regular course pay from home department. Depending on what combination of instructors are teaching an FLC, cost per FLC (traditional model: 2 linked courses) can range from \$5,000-\$11,000. ANTICIPATED OUTCOMES: Could engage 50-250 students per year. Learning Communities are backed by considerable research/literature. Could have high impact on agency, and moderate impact of behavior and recruitment.

STRATEGIES AT NO ADDITIONAL COST. The following strategies could be implemented by the GC Operations Director and/or Education Committee members. Some of these would also require a commitment of time and expertise from the three challenge teams.

- Student Organization GC Committee: Create a committee of representatives from UNM students organizations interested in furthering the aims of the GC research projects.**
 APPROXIMATE COSTS: No additional costs. ANTICIPATED OUTCOMES: Could *directly* engage 15-20 student leaders, with moderate impact on agency, and minimal impact on behavior and recruitment (as these students are already actively engaged in co-curricular programming at UNM). Depending on new programming developed, this strategy could *indirectly* reach more than 200 students. Most of these student engagements would be introductory, with moderate impact on agency, and low impact on behavior. Depending on how student organizations engage with prospective students, impact on recruitment could be moderate to high.
- Student and Community Dialogues: Host drop-in dialogue sessions (including online) where GC researchers can meet with interested students and other stakeholders to discuss their research.** APPROXIMATE COSTS: No additional costs. ANTICIPATED OUTCOMES: Could engage 15-30 participants (including 10-25 students) per session. Depending on the effectiveness of the dialogue, could have moderate impact on agency and recruitment, and low impact on behavior. Current GC researcher bandwidth may allow for a total of 12 sessions per year (for all three challenges combined).
- GC Researcher Shadowing: Create shadowing opportunities where undergraduate students could spend a day with Grand Challenges researchers and/or graduate assistants.**
 APPROXIMATE COSTS: No additional costs. ANTICIPATED OUTCOMES: Could engage 15 students per semester. Could have high impact on agency, moderate impact on behavior, and low or no impact on recruitment.
- Grand Challenges Exhibits: Partner with UCAM and OVPR to create an exhibit for each Challenge in a UNM public location (i.e., library, SUB, Domenici). Exhibit could include posters focusing on articulating the challenge, describing the research, illustrating the technology, and introducing the research teams.** APPROXIMATE COSTS: No additional costs. ANTICIPATED

OUTCOMES: Could introduce GC concepts to more than 500 students and community members in 2019-20 academic year. Could have a low impact on agency and recruitment, with no impact on behavior. Note, this strategy would also meet other GC goals, such as keeping the challenges central to campus conversations.

- **Journal Club: Convene regular meetings where undergraduate and graduate students could read and discuss journal articles related to the Challenges, focusing on articles written by UNM researchers where possible.** APPROXIMATE COSTS: No additional costs. ANTICIPATED OUTCOMES: Could engage 10-20 students per semester. Could have a high impact on agency, a moderate impact on behavior, and no impact on recruitment.

- **Grand Challenges Spring Lecture Series.** Provide researcher lectures to students and the community focused around the three challenges. APPROXIMATE COSTS: No additional costs. ANTICIPATED OUTCOMES: Low impact on agency, no impact on behavior or recruitment. However, does provide benefits to community and campus awareness of GC.

STRATEGIES AT LOW ADDITIONAL COST. The following strategies would require additional resources (in some cases including coordination personnel). Some of these costs could be offset by existing curricular and co-curricular resources, but most would require new appropriations.

- **GC Classroom-Based Activities, Supplies and Materials: Encourage instructors to incorporate small/low-cost activities in current courses by providing supplies and materials costs.** APPROXIMATE COSTS: Recommend \$500 Supplies/Materials grants per instructor/course combination. Anticipate 10 applications/awards in 2019-20 academic year, for a total of \$5,000. ANTICIPATED OUTCOMES: Depending on course enrollments, could engage at least 500 students per year. Could have a high impact on agency, moderate impact on behavior and low or no impact on recruitment.
- **Grand Challenges Course Infusion Mini-Grants: Individual faculty members infuse substantial GC engagement into existing courses, especially at the lower division level.** APPROXIMATE COSTS: Recommend \$1,000 stipend per instructor/course combination. Anticipate six applications/awards in 2019-20 academic year, for a total of \$6,000. ANTICIPATED OUTCOMES: Depending on course enrollments, could engage at least 300 students per year. Could have a high impact on agency, and a moderate impact on behavior and recruitment.
- **Co-Curricular Infusion: Infuse GC research or exploration into existing student support programming (including research and community outreach).** APPROXIMATE COSTS: Recommend mini-grants to departments of \$10,000 each. Anticipate four applications/awards in 2019-20 academic year, for a total of \$40,000. ANTICIPATED OUTCOMES: Could engage 100 students per year. Since these engagements often involve more intensive connections to faculty and staff, impact may be higher per student than in the classroom. However, these programs are likely to engage fewer students. Could have a high impact on agency and behavior, and a moderate impact on recruitment.
- **New Student Orientation: Introduce students to the value of the GC projects, and provide pathways for interested new students to become more involved in research, outreach or education.** APPROXIMATE COSTS: For NSO, it is important to select a charismatic and well-informed person to engage with the new students. NSOs are also time intensive during the

summer when most faculty members are off-contract. Recommend a carefully-selected Summer Graduate Assistantship to attend all NSO sessions and engage students in GC concepts. 0.5 FTE RA, including tuition and benefits, \$8,000. ANTICIPATED OUTCOMES: Will introduce every incoming new student to GC, but at a very minimal level. Will have low impact on agency and behavior, and moderate impact on recruitment.

- **Other Existing Events: Engage students in discussing/exploring the three grand challenges at existing student events.** ANTICIPATED COSTS AND OUTCOMES: Will vary significantly depending on the type of student event.
- **Grand Challenges Researcher Mentor Program: Pair interested undergraduate and graduate students with members of GC research teams to provide full-semester informal engagement with a challenge.** ANTICIPATED COSTS: Highly variable, depending on circumstances. Some financial compensation for GC researchers may be required. If this program is designed to serve low-income students, financial compensation for students would be required. ANTICIPATED OUTCOMES: GC research teams likely have bandwidth to engage only 2-3 students per year. Could have high impacts on agency and behavior, and low impact on recruitment.
- **GC Undergraduate/Graduate Workshops: Leverage Grand Challenges to teach students essential research skills, possibly including “How to Present Your Research to the Public” and “How to Capitalize on Big Data.” Partner with organizations or departments who already provide similar services.** APPROXIMATE COSTS: Costs will vary significantly on the number and types of workshops. GC teams may have capacity to offer a total of six workshops per year (2 per challenge team) without additional resources. However, offering a large slate of workshops (in and out of the classroom) could likely require at least one 0.5 FTE graduate assistant per challenge, at a cost of \$20,000 each per year (\$60,000 total). ANTICIPATED OUTCOMES: This type of programming has potential to reach large number of students, possibly more than 2,000 per year depending on how it is implemented (curricular or co-curricular). Could have a moderate to high impact on agency, but likely will have a low impact on behavior, and no impact on recruitment.

STRATEGIES AS MODERATE ADDITIONAL COST. The following strategies would require additional resources (in most cases including coordination personnel). Few of these costs could be offset by existing curricular and co-curricular resources, and nearly all would require new appropriations.

- **Grand Challenges Undergraduate Fellows: Engage students with one or more GC in ways connected to specific academic disciplines (for instance, C&J students could communicate research practices and findings via social media; Fine Arts students could create mechanisms to engage the public in a GC; Political Science students could create opportunities for peers to explore policy implications of a GC).** APPROXIMATE COSTS: In order to attract traditionally underrepresented and low-income students into these fellowships, we would need to provide enough compensation to offset lost earnings in part-time jobs. Recommend fellowships of \$1,000 per student per semester. Each group of 20 fellowships would also require a 0.5 FTE graduate assistant (\$20,000 per year) to develop curriculum and provide instruction/mentoring. Supplies and materials costs (\$5,000 per year) would also be required to promote undergraduate research engagement. Total cost per 40 fellowships (20 per semester), including GA and supplies/materials would be \$65,000. ANTICIPATED OUTCOMES: Could engage up to 100 students per year. These types of extensive engagements generally have high returns on investment. Could have high impact on agency and behavior, and moderate impact on recruitment.
- **Grand Challenges Faculty Fellows: Cohort of faculty members learning about and incorporating GCs into the curriculum and instruction of existing courses, and/or creating special topics GC courses (possibly including add-on 1-credit courses to provide additional research engagements).** APPROXIMATE COSTS: This program will be based on the current model of the Academic Affairs General Education Faculty Fellows. GC Faculty Fellows will receive \$3,000 each to work together on incorporating GC into their courses. Five such faculty fellows will cost \$15,000 for the academic year. ANTICIPATED OUTCOMES: Faculty fellows program could potentially engage more than 300 students per year, and could produce high impacts on agency, moderate impacts on behavior, and low impacts on recruitment. These impacts vary significantly depending on the level to which individual faculty members enhance or improve their instruction.
- **Field Research Site Visits: Using the STEM University model, introduce students to elements of GC research, and take them to visit research sites. These site visits could be connected to classes or made available as co-curricular engagements.** APPROXIMATE COSTS: Costs vary considerably depending on number of students served, and length of the visit. Most day-trip site visits cost approximately \$200-500 per visit (including transportation, trip insurance, meals and supplies), serving 15-25 students per visit. Multi-day visits, or visits serving larger populations, cost considerably more. ANTICIPATED OUTCOMES: Could engage 100-150 students per year. Multi-day visits often produce stronger outcomes, but at higher costs. Daytrips could have high impact on agency, low to moderate impact on behavior, and low impact on recruitment.
- **Grand Challenges 10 Minute Lectures on YouTube.** Work with UCAM, NMEL, PBS and/or other partners to develop, produce and post short public-interest lectures related to the need for each of the challenges, and the research that is helping us address them. These lectures

could also be utilized as supplemental classroom resources for in-person, hybrid and online courses at UNM. APPROXIMATE COSTS: Unknown. ANTICIPATED OUTCOMES: If students are engaged in the process, then high impact on agency and behavior and moderate impact on recruitment. Would also have a high value in communicating GC throughout the state.

STRATEGIES AT HIGH ADDITIONAL COST. The following strategies would require substantial additional resources (in most cases including coordination personnel). Few (or none) of these costs could be offset by existing curricular and co-curricular resources, and all would require new appropriations.

- **GC Transfer or New Student Summer Bridge: Develop summer research experiences that introduces transfer and/or new Freshmen to one or more challenges.** APPROXIMATE COSTS: Summer bridge programs come in to two types: residential and non-residential. Residential bridge programs include overnight housing (facilities and staffing) and three meals per day. Non-residential bridges do not include housing, and generally only include one meal per day. Both formats require extensive staffing and recruitment costs, transportation costs, and supplies/materials. Based on an RPSP proposal from Honors for a similar residential bridge program, serving 100 students (spread across four two-week summer sessions) would cost approximately \$150,000. Costs for a single residential two-week session would likely run 35% of this cost. Non-residential bridge programs cost approximately 50% as much as residential programs. ANTICIPATED OUTCOMES: Could serve 20-100 potential/incoming students per year. Could have a high impact on agency, behavior and recruitment.
- **GC Summer Research Academies: Develop summer research experiences that engage students (undergraduate and graduate) in research projects that connect to or support one or more challenges.** Approximate costs and anticipated outcomes would be similar to GC Transfer Summer Bridge (see above).
- **Thesis/Dissertation Fellowships: Provide scholarships to students who are working on theses or dissertations that connect directly to the Challenges.** APPROXIMATE COSTS: Fellowships and scholarships vary considerably, but preliminary recommendations are for \$2000 per year for master's level research, and \$4000 per year for doctoral level research. ANTICIPATED OUTCOMES: Could engage 10-20 students per year. Though this strategy serves a small population, the impact on research and engagement could be substantial. Could have a high impact on agency, behavior and recruitment.