SAND2015-6114D

Nonlinear Mechanic and Dynamics Summer Research Institute

STEM Cross-Cultural Engineering Observations

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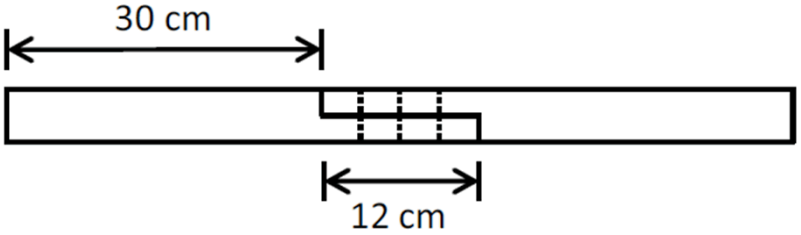
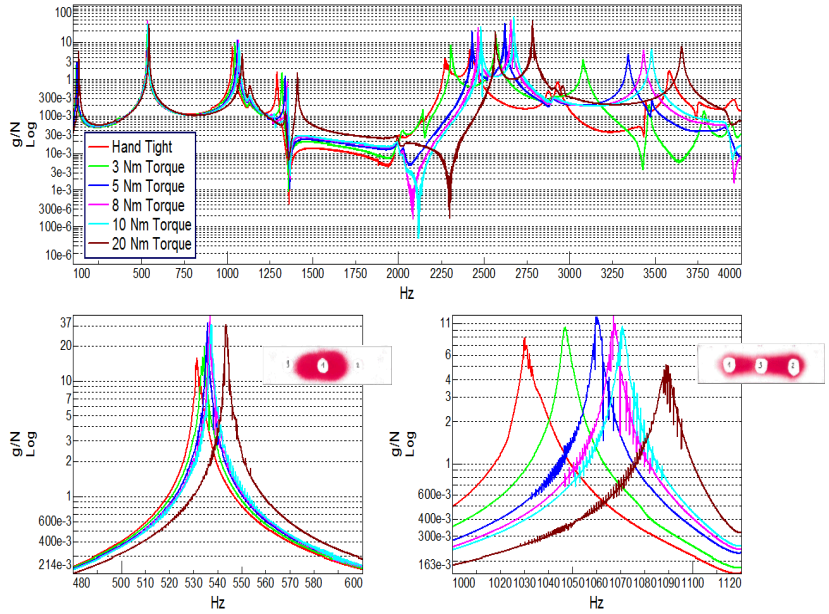
Nonlinear Mechanics and Dynamics Summer Research Institute

A collaborative research institute was organized and held at the University of New Mexico for a period of six weeks. This research institute brought together researchers from around the world to work collaboratively on a set of research projects. In addition to the technical collaborations, the institute also included a series of tours and field trips to local places of scientific and engineering importance.

Project 1: Effects of Experimental Methods

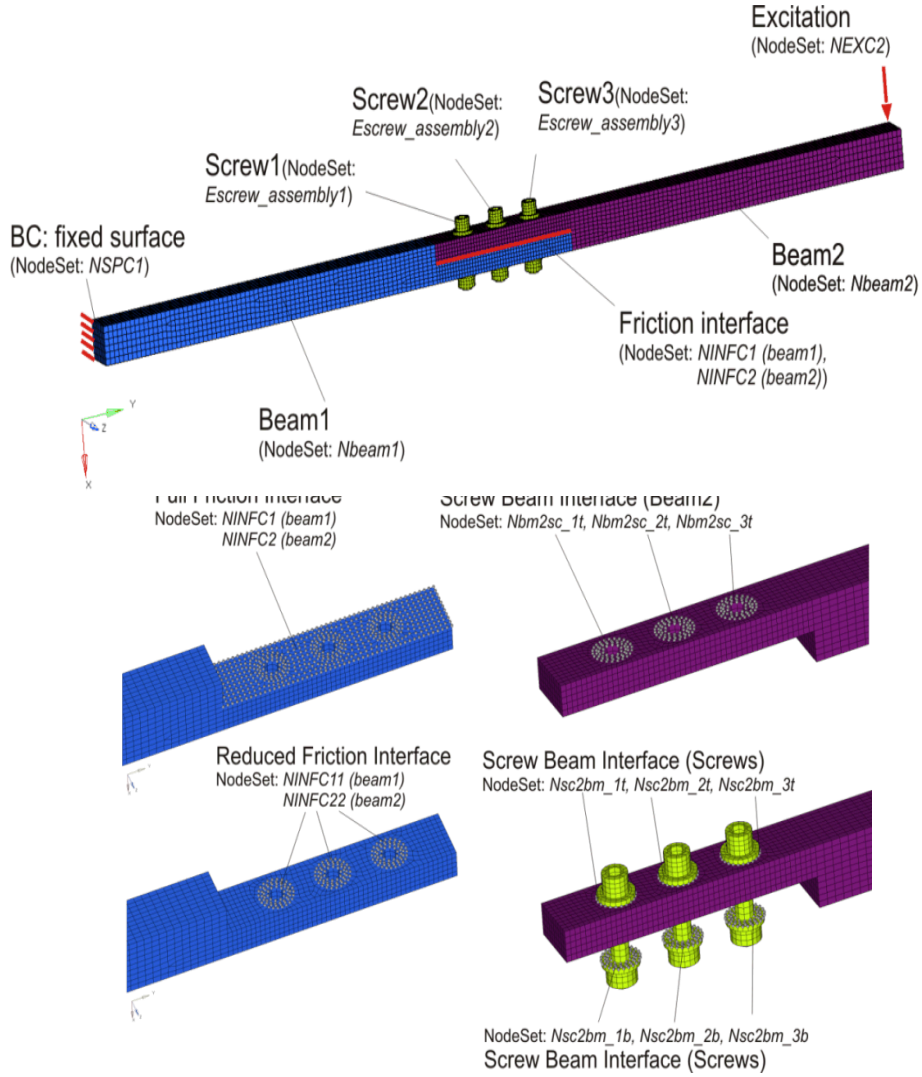
- Developing a set of best practices for measurements of nonlinear systems. Focusing on control algorithms and damping extraction methods
- Team: Simone Catalfamo, Florian Morlock, Scott Smith
- Mentors: Christoph Schwingshackl, Randy Mayes, Pascal Reuß, and Matthew Brake





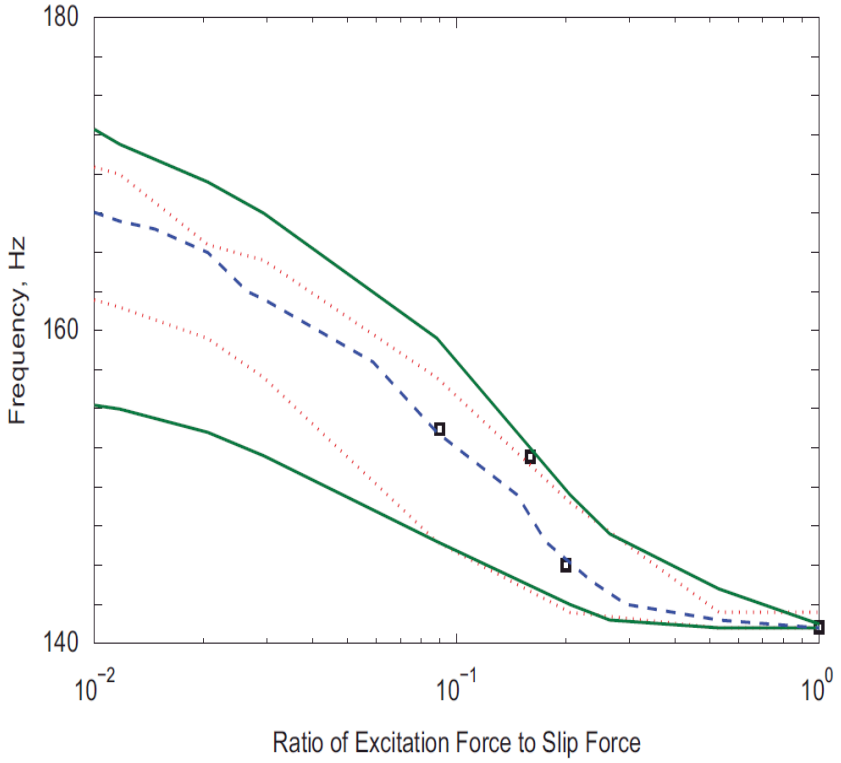
Project 2: Numerical Round Robin

- Performing a numerical round robin to compare predictions by multiple finite element and reduced order modeling codes for joint dynamics.
- Team: Jason Armand, Johann Groß, Bob Lacayo
- Mentors: Christoph Schwingshackl, Pascal Reuß, Tim Truster, Loic Salles, Rob Kuether, and Matthew Brake



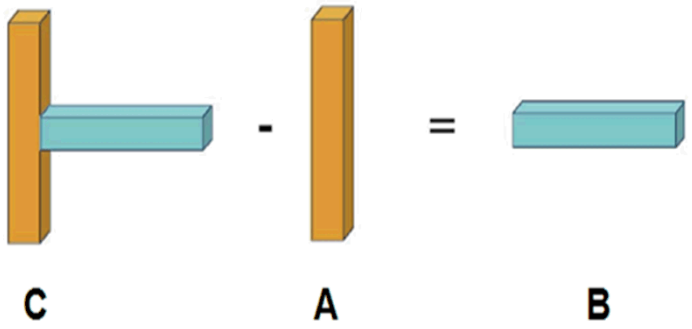
Project 3: Uncertainty Quantification Analysis of Lap Joints

- Developing uncertainty distributions for multiple friction models used to describe the Brake-Reuβ Beam
- Team: Brett Robertson, Matt Bonney, Fabian Schempp
- Mentors: Matthew Brake and Marc Mignolet



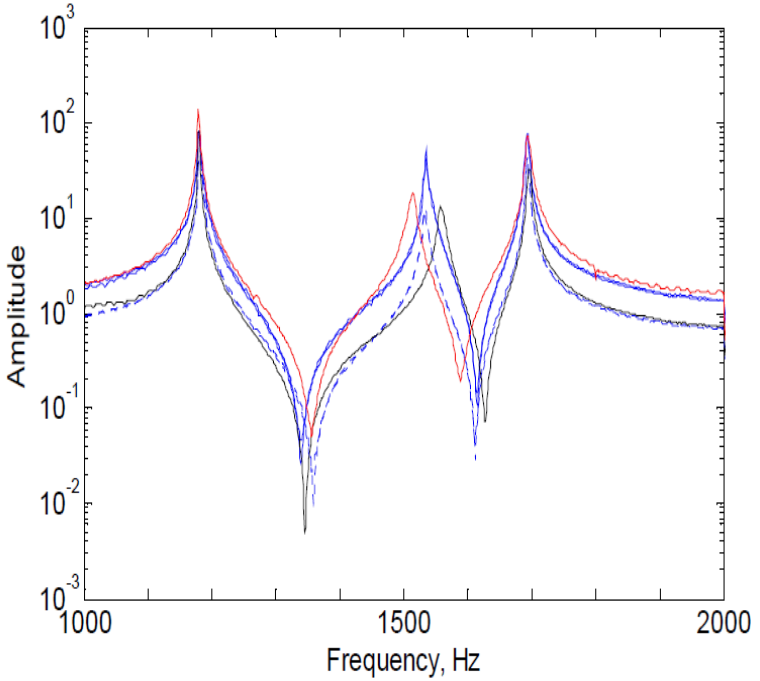
Project 4: Reduced Order Modeling Assessment

- Assessing the effects of “mixing and matching” different types of sub-ROMs
- Team: Seunghun Baek, Tilan Dossogne, Dan Roettgen, Benjamin Seeger, Wei Che Tai
- Mentors: Randy Mayes, Matt Allen, and Rob Kuether



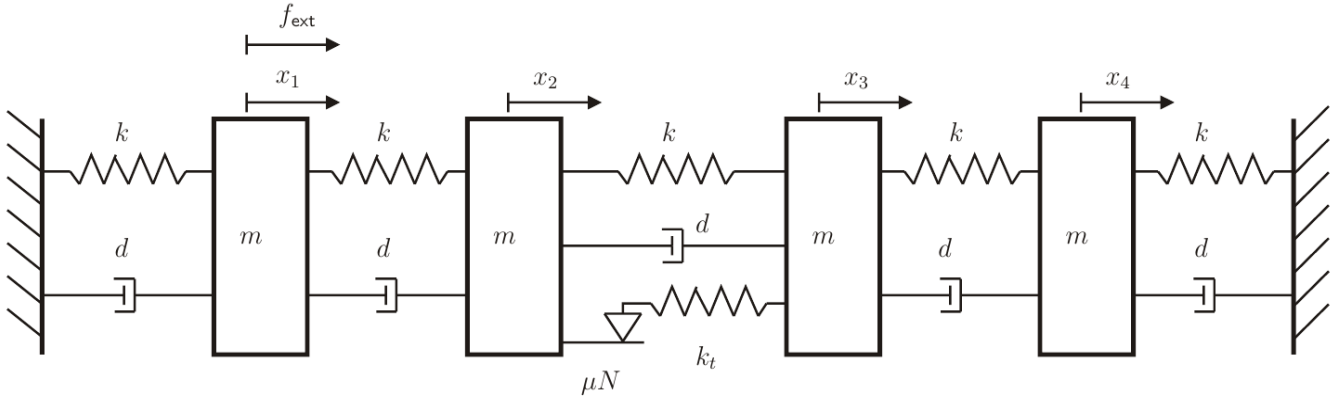
Project 5: Stress Wave Propagation Through Joints

- Developing an understanding of why different types of stress waves interact with a joint in dramatically different manners.
- Team: Rob Flicek, Keegan Moore
- Mentors: Tim Truster, Chris Hammetter, Gustavo Castelluccio, and Matthew Brake



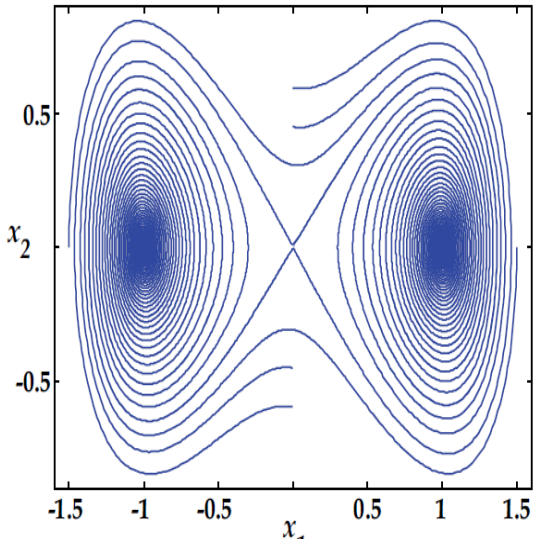
Project 6: Structural Design Optimization with Joints

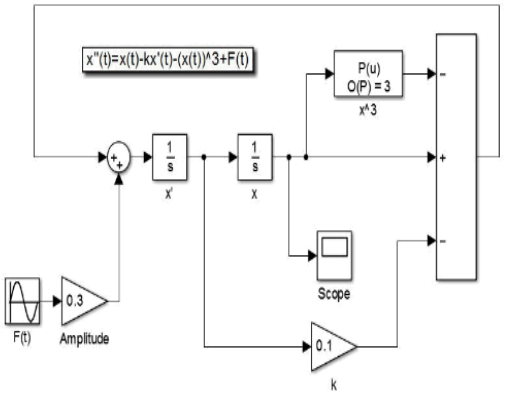
- Optimization over joint location, type, surface finish, etc. in order to use the joint as a design tool.
- Team: Merten Stender, Antonio Papangelo
- Mentors: Matt Allen, Christoph Schwingshackl, Merten Tiedemann, and Matthew Brake



Project 7: Nonlinear Dynamics and Controls of Micro- and Nano- Systems

- Nonlinear system identification, characterization, and controls of a MEMs Duffing oscillator
- Team: Maren Scheel, Simon Peter, Albert Ybarra, Bekir Bediz, Gary Macias, Adnan Raza
- Mentors: Zayd Leseman, Matthew Brake, and Steve Shaw





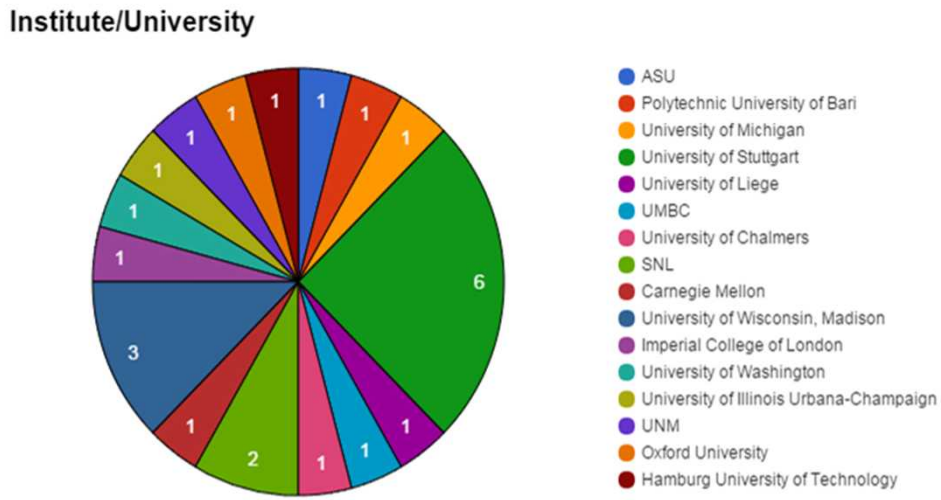
Project Goals

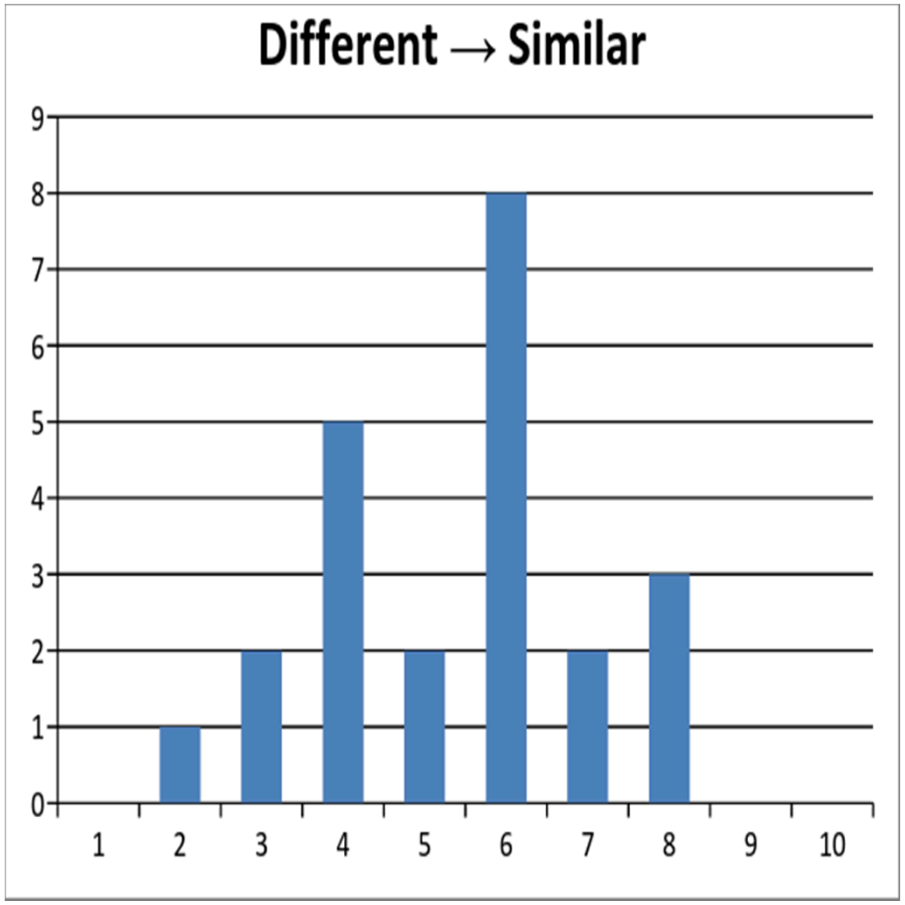
- Obtain an understanding of multi-cultural engineering differences
- How to improve the institute
- Cultural Norms
  - Differences and similarities

Survey

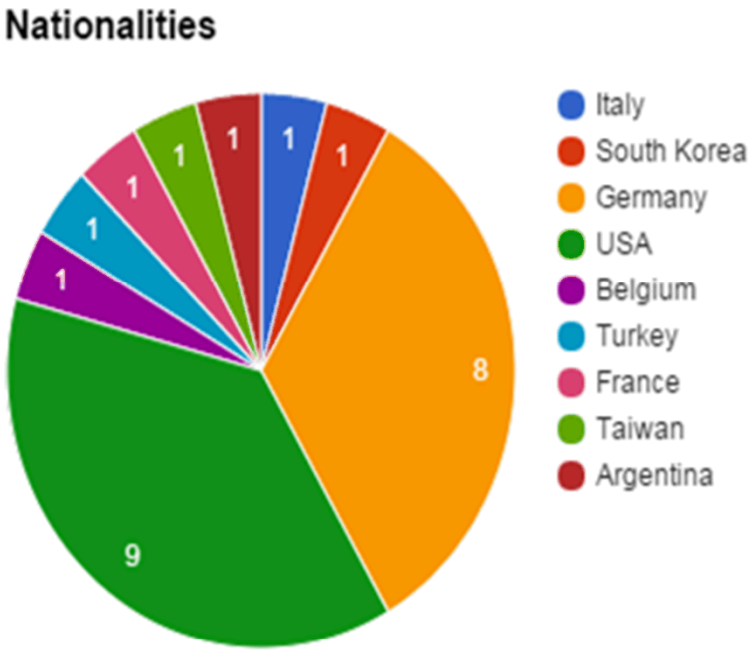
1. Name
2. Gender
3. What is your project? Have you worked on it before?
4. Home country and Institution
5. Current Position, and year in that position
6. Why did you become an engineer?
7. What do you consider your academic specialization to be?
8. What do your consider the academic specialization of your teammates to be?
9. On a scale of 1 to 10, how similar do you consider your skill set to be to the rest of your team?
10. How does your group divide tasks?
11. How does your group make decisions?
12. How does your group assign roles?
13. What are the challenges, if any, of working with someone from a different cultural background?
14. Do you ever have disagreements? If so, how do you resolve them?
15. What are the strengths and weaknesses of your team? How could the weaknesses be improved?
16. Is this your first time in the US?
17. What is the most different thing about working here? And the most unexpected? Is there anything that would make the transition easier?
18. What is the most different thing about living here? And the most unexpected? Is there anything that would make the transition easier?
19. What are differences and similarities to you approach to engineering problems at your home institution versus this institute?
20. What cultural differences in interactions have you noticed between the US and your home?
21. Besides the unexpected items you gave us earlier about life and work, in general would you say the US has lived up or down to all of your expectations of cultural norms?
22. Typically, in your country, what happens during free time outside of work? Do you work or relax for more productive work later? What about breaks at work?

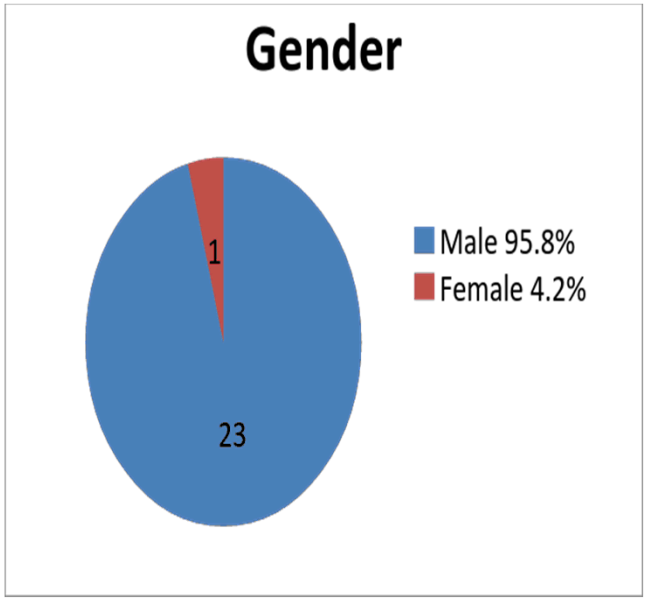
Summary of Responses



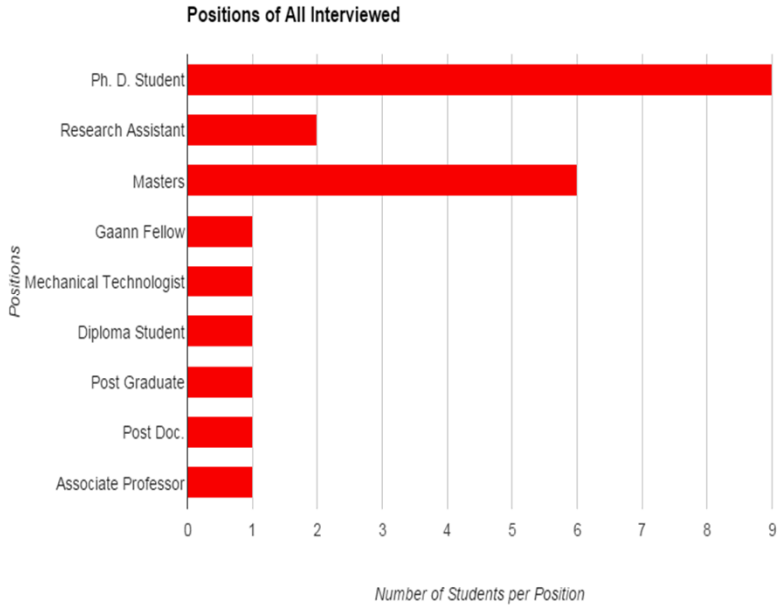


Ranking from 1 to 10 by participants, based on similarity of skill sets





Gender of institute participants



Interesting Responses

Why did you become and engineer? “Actually, I promised myself in the 10th grade I would never become an engineer. In the end I guess I was just good in math at school, and physics was too theoretical for me. Basically to be an engineer is to have every field open. Like even with an engineering degree you can go into economics if you like or do management or whatsoever. So I guess engineering has access to the widest range of professions open.”

What are the challenges, if any, of working with someone from a different cultural background?: “Have not found any challenge. It is just an opportunity, not a challenge. I find it a good way to approach other people and to find out what they think about or to find different approaches, it's quite interesting to see what they think about the same project.”

Besides the unexpected items you gave us earlier about life and work, in general would you say the US (or NM) has lived up or down to all of your expectations of cultural norms? “A little bit different, When I heard I got an internship in New Mexico, I thought it was Mexico. I tried to search Sandia National Laboratories, Google just showed me a building in the middle of a desert, but when I came here it's not like what I imagined.”

Major Themes

- Engineering can bridge cultural differences
- Language was an issue
  - Engineering language could fix this
- Participants love math and science
- Professional environment

Summary/Conclusion

- We now have a more solid understanding of engineering research
- We learned that writing a report is tough work because a lot is expected for it
- Asking the proper question can provide easy data analysis

Suggested Poster Layout