NOMINATION FORM

CHE SERVICE LEARNING PROJECT COMPETITION

Institution: Clemson University

Title of Project: Designing and Delivering Manufacturing Equipment to Elementary Schools

Director of Project: Joshua D. Summers

Contact Information of Project Director

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Clemson, SC 29634-0921

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Establishment Date of Project: August 15, 2013

Unit That Administers Project: Department of Mechanical Engineering; CoES

Total Number of Students Involved: ~60 Clemson Students + 120 Midway Fifth Graders

Signature of Institutional President James P. Clements

PLEASE ANSWER THE FOLLOWING QUESTIONS REGARDING THE NOMINATED PROJECT
(Insert your answer after each question.)

1. For purposes of this competition, the Commission on Higher Education defines service learning as college student learning at any level and in any situation that is *linked* in a direct, hands-on fashion to the resolution of a problem or concern in a target community outside the institution *and is related* to a college course with some type of reflection activity. Briefly, how does your project meet the parameters of this definition?
   - All students within the Mechanical Engineering undergraduate program are required to complete a two course capstone design sequence. The last course is essentially an exit exam project where teams of students work on industry sponsored design projects. The first course of the sequence is where students are taught tools and methods with respect to the engineering design process. To support this learning objective, a service learning project is introduced where teams of students are guided through the design process as they develop manufacturing equipment that can be used within classrooms for a local elementary school (Midway Elementary). The student teams are challenged to elicit requirements from the elementary (fifth graders) students and teachers, such as size, usability, interactivity, and curricular integration. The engineering student teams visited the classrooms multiple times, explaining the new manufacturing processes to the teachers and fifth graders. Ultimately, the program culminates in a daylong event hosted at Clemson University where all the fifth graders from Midway Elementary visited the Mechanical Engineering department, where shown the manufacturing equipment, and given tours of the manufacturing labs. All the eight distinct manufacturing systems were delivered to Midway Elementary after the daylong event. This project is being replicated again this semester, but with internal customers being the professors in Mechanical Engineering that were so impressed with the equipment delivered that they wanted to use this in their own classrooms.

2. Specifically, which segments of the college/university community does your project involve?
   - This program is focused on providing real world customers for projects that the senior mechanical engineering students can query for requirements. Moreover, this program uniquely introduces the mechanical engineering students to options in how what they design can have significant impact beyond industry.

3. How many students (specify degree levels to the extent possible) does the project affect?
   - This program, for the 2013-2014 school year will impact approximately 120 first semester senior mechanical engineering students (60 Senior ME students (Fall 2013) + ~60 senior ME students (Spring 2014))

4. Describe the target community or communities your project serves.
   - Our target community that we are reaching into is local elementary schools. This program is a replication of our previous successful program in delivering windtunnels to three local elementary schools in two semesters. We are trying to help stimulate interest in engineering and design within elementary schools, targeting both teachers and student. The windtunnels have been used to support student science fair projects and have been used for the past two years in the classrooms. We are hopeful, that the manufacturing equipment will be similarly used.

5. Describe your project's effectiveness in helping to solve the problems or concerns in the target community.
   - A major national and state level concern is how to positively impact STEM education. Moreover, several state and national level efforts have tried to restimulate the manufacturing industries.

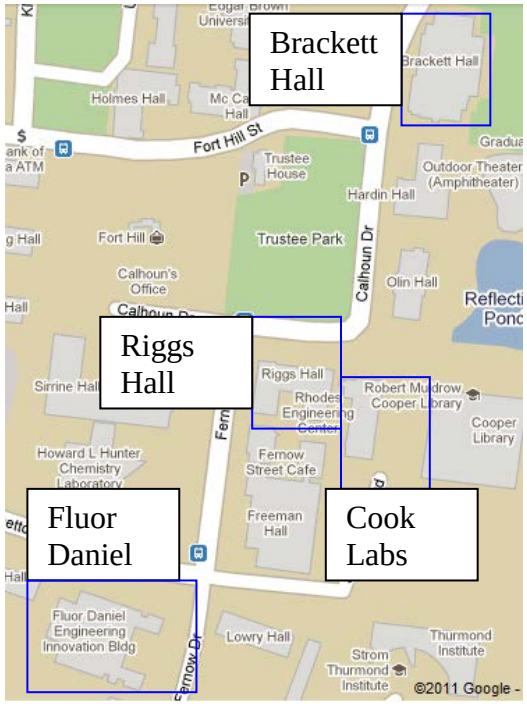
Recognizing that elementary schools should be integrated into these efforts, we believe that this approach of developing demonstrators and experimental platforms for the classroom can address both of these efforts. Moreover, it provides a customer for student design projects in mechanical engineering with customers that are highly sympathetic for the senior mechanical engineering students.

6. Describe the degree to which your project enhances student learning while providing specific examples of the service learning activities the students engage in. Also explain how the service learning activities reinforce or apply what the students learn in the classroom.
   - In previous versions of the design methods course, faculty "made up" design projects were used as teaching platforms. This new approach, to use real world customers creates a sense of urgency and relevancy not previously seen in the course. Moreover, a critical aspect of this approach to teaching is that students are introduced to the most challenging aspect of engineering design - the uncertainty and moving targets of the customer.

7. Is there academic credit associated with the project (not necessary for submission)? If so, please explain the particulars.
   - This project is integrated into a core, required course and all students in Mechanical Engineering earn 3 credits in the course (with the project accounting for ~50% of the grade).

8. If funding is required, how is the project funded and what is the approximate annual budget for the project?
   - The project and program were funded by the Clemson Service Faculty Fellows program. Each project team was given a budget of $200 to use in the project. Additional monies were drawn from a private donation from Meritor, a local manufacturing firm of automotive equipment, and from Summers' personal research incentive accounts.

9. Feel free to add any other comments you may have about your project.
   - A media release for the CEDE event was prepared by the College of Engineering and Science: http://newsstand.clemson.edu/college-of-engineering-and-science-seniors-give-manufacturing-equipment-to-elementary-school-students/.
   - One of the senior design teams put together a video for MidWay Elementary that captures their team's project progression throughout the semester. Some of the material is a little out of order to align with the "design" process that the elementary school is teaching through Project Lead the Way. This video can be found at http://youtu.be/q6Jt3ulmwxE.
   - As this project was extended from a previous effort (before I left on sabbatical), additional related materials and videos from the windtunnel project can be found at http://www.clemson.edu/ces/cedar/CEDE_2011_-_Spring
   - A copy of a paper that explores the evolution of requirements on parallel student design teams in the windtunnel project is included to illustrate how design research can be conducted on platforms such as the service learning project component of the design course. This is important as it shows the true synergy between the traditionally competing objectives and missions of faculty (scholarship, teaching, and service). The paper is under review for the ASME International Design Engineering and Technical Conferences and the Computers and Information in Engineering Conference for presentation in August 2014.
   - In February 2014, a webinar interview was conducted as part of the Service Learning Alliance program which can be found at http://www.clemson.edu/public/servicealliance/faculty_fellows_program/webcast_windtunnels_and_manufacturing_2_27_14.html. The presentation is also included in the package.
   - Flyers for the CEDE events are also included.



CONTACT INFORMATION

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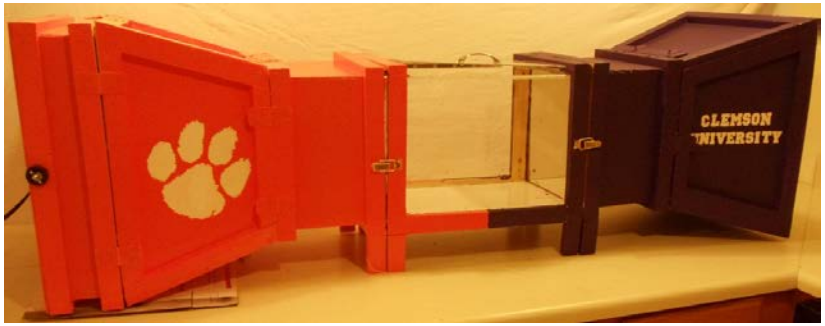
CEDAR
Clemson Engineering Design Applications and Research

Clemson Engineering Design Expo

CEDE – Spring 2011

Mechanical Engineering
Clemson University
ME401 Introduction to Design
Friday, April 29, 2011
9:30 AM- 1:30 PM



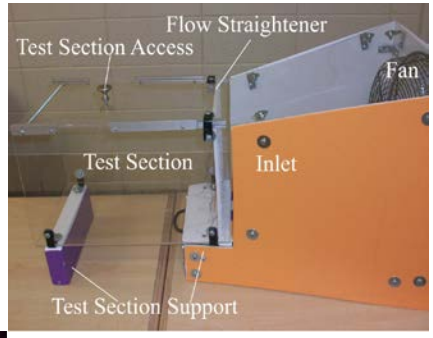
CEDE- Spring 2011 is intended to showcase the work of mechanical engineering students based on their work in introduction to design project course

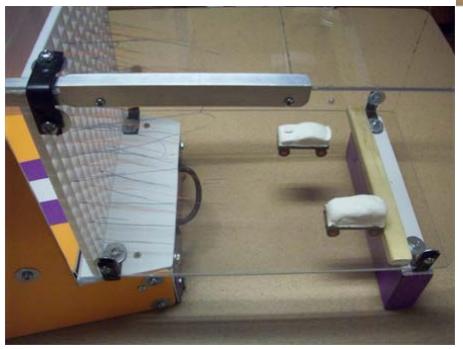
CEDAR
Clemson Engineering Design Applications and Research

PROJECT DESCRIPTION

Wind Tunnel Construction

The design challenge for ME 401 senior design class was to construct a wind tunnel for using in the fourth grade class rooms at Midway Elementary.





The wind tunnels were built by the ME-401 students at Clemson University to show the concepts of lift, drag, and power generation through wind energy.

On Friday, April 29, the design teams will undergo tough scrutiny of their client – students from Midway Elementary, as they present their final designs to future engineers and scientists.

SCHEDULE AND LOCATIONS

9:15- 9:30 AM	Welcome and Briefing	Atrium Flour Daniel
9:30- 10:15 AM	ME401 Teams presentation	Classrooms in Riggs Hall
10:30-11:00 AM	Dr James Leylek's Presentation	Brackett Hall
11:15AM- 12:00 PM	Lunch	Fluor Daniel
12:00-1:30 PM	Lab Tours and Demonstrations	Fluor Daniel, Cook Labs

ACKNOWLEDGEMENTS

Dr James Leylek, Mechanical Engineering

Dr Todd Schweisinger, Cook Undergraduate Labs

Dr Gregory Mocko, Mechanical Engineering

CEDAR Lab Students

Mechanical Engineering Staff

CEDAR
Clemson Engineering Design Applications and Research

Clemson Engineering Design Expo (CEDE 2013)
Manufacturing System Handoff to Midway Elementary

December 6, 2013
Sponsored by:
Clemson University, Mechanical Engineering
CEDAR
http://www.clemson.edu/ces/cedar

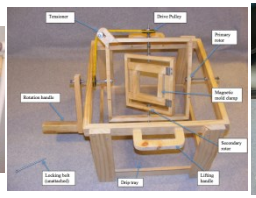
CLEMSON
College of ENGINEERING AND SCIENCE

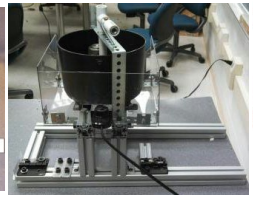
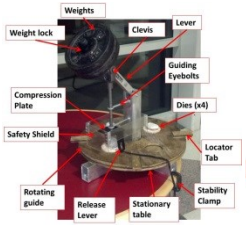
Teacher	Volunteer	9:20-9:40	9:40-10:00	10:00-10:20	10:20-10:40	10:40-11:00	11:00-11:20	11:20-11:40	11:40-12:10	12:10-1:00
Addison	M. Jaradat G. Doepker	FD-1	D	G	B	C-Sh	C	F	Lunch	Dillard
Brunetti	M. Fazelpour A. Hynes	FD-2	E	H	C-Sh	G	B	A		
Buckner	J. Paulino	C-Sh	F	FD-2	C	H	E	D		
Clardy	R. Banes	A	FD-1	C-Sh	D	E	G	B		
Echols	D. Scharf	B	FD-2	A	E	C	C-Sh	H		
Holzshu	C. Wilson M. Cote	C	C-Sh	FD-1	F	A	D	G		

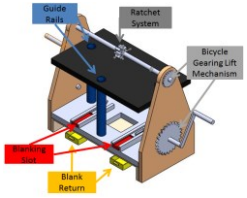
Legend

Tour	Shop	Location	Team	Process	Location	Team	Process	Location
FD-1	Fluor Daniel Machine Shop	G09	A	Vacuum Forming	108	E	Spin Casting	Atrium
FD-2	Fluor Daniel Water Jet	GXX	B	Injection Molding	132	F	Stamping	217
C-Sh	Cook Shop	Cook Building	C	Rotational Molding	Atrium	G	Spin Welding	Atrium
			D	Wax Molding	Atrium	H	Compression Molding	132





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