Encouraging Undergraduate Engineering Students to Generate Research and Design Publications

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Abstract – Approximately 60 students in Mercer University's School of Engineering published design and/or research work at the 2010-2012 ASEE-SE Annual Conferences. These publications include twenty posters, one podium presentation, and four proceeding papers with podium presentations. Two female students presented at all three of these conferences. These student publications are primarily associated with undergraduate efforts in the Environmental Engineering Department and Engineering Honors Program. However in 2012, the School of Engineering's Fall 2011/Spring 2012 senior design course sequence generated several posters. In the Environmental Engineering Department, students in the Senior Environmental Engineering Laboratory (Fall semester course) conduct an open-ended experiment on a lab-scale system. One of the final deliverables for this course is a poster with the expectation that an abstract will be submitted to the ASEE-SE Student Poster Competition. Undergraduate environmental engineering students conducting independent research are typically required to develop a poster for the ASEE-SE Student Poster Competition. The Engineering Honors Program is structured around independent research projects with yearly, public presentation requirements. The primary deliverable for Sophomore Engineering Honors II (Spring semester course) is a publication at the ASEE-SE Student Poster Competition. The potential for leveraging the research and design work associated with the capstone senior design sequence into publications at the ASEE-SE Student Poster Competition was explored successfully in the Spring of 2012. This paper will provide extended details on the courses and initiatives generating student publications at the ASEE-SE Conference as well as Mercer University's on campus Engineering Exposition event which is being used to provide opportunities and enthusiasm for students to present their research and design efforts. Logistics, financial commitment, and administrative support requirements will also be discussed.

Keywords: student presentations, honors, environmental lab

INTRODUCTION

Approximately sixty students in Mercer University's School of Engineering (MUSE) published design and/or research work at the 2010 through 2012 ASEE-SE Annual Conferences. These publications include twenty posters, one podium presentation, and four proceeding papers with podium presentations. It is interesting to note that the same wo female students presented at all three of these conferences. The majority of these publications were associated with efforts in the Environmental Engineering Department and Engineering Honors Program. In 2012, the School of Engineering's Fall 2011/Spring 2012 senior design course sequence also generated several posters.

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In the Environmental Engineering Department (EVE), students in the Senior Environmental Engineering Laboratory (EVE 445L, Fall semester course) conduct an open-ended experiment on a lab-scale system. One of the final deliverables for EVE 445L is a poster with the expectation that an abstract will be submitted to the ASEE-SE Student Poster Competition. Undergraduate environmental engineering students conducting independent research are typically required to develop a poster while graduate-level environmental engineering research projects are often required to generate a paper for publication. The ASEE-SE Conference has been the venue of choice for many of these publications.

The Engineering Honors Program at Mercer University is structured around independent research projects with yearly, public presentation requirements. Freshman Honors students present a poster of their work at the on-campus Engineering Expo. Sophomore Honors students deliver a poster a presentation at a regional conference. Junior Honors students present both a podium and poster presentation at the Engineering Expo. Senior Honors students prepare a manuscript for submission to an appropriate regional conference.

The potential for leveraging the research and design work associated with the capstone senior design sequence into publications at the ASEE-SE Student Poster Competition was explored successfully in the Spring of 2012.

This paper provides extended details on the courses and initiatives generating student publications at the ASEE-SE Conference as well as Mercer University's on campus Engineering Exposition event which is being used to highlight and motivate student research and design efforts. Logistics, financial commitment, and administrative support requirements will also be discussed.

EFFORTS OF THE ENVIRONMENTAL ENGINEERING PROGRAM

The initiative generating the largest number of student publications from the Environmental Engineering Program (EVE) is the independent research focus of the Senior Environmental Engineering Laboratory (EVE 445L). In 2008, the majority of the students enrolled in EVE 445L were also enrolled in their first semester of senior design. Their senior design projects were based around gray water treatment for residential re-use and little information was available on design parameters for biological treatment of gray water. The decision was made to conduct research in EVE 445L that would support the decisions they were trying to make in senior design. The students indicated that they greatly enjoyed working on lab projects that they had a personal interest in and related to a real problem. Posters produced from this effort were presented at the Engineering Expo and displayed in the EVE labs. This format was continued in the Fall 2009 offering of EVE 445L and the students were offered the opportunity to publish their work at the 2010 ASEE-SE Student Poster Competition, Virginia Tech, Blacksburg, Va. The entire group of six Seniors with three posters made this trip. The format described has been continued and six EVE Seniors presented two posters at both the 2011 Conference (The Citadel, Charleston, SC) and the 2012 Conference (Mississippi State University, Starkville, Mississippi). In the situations where a student was out of sequence for senior design or did not have a project with lab appropriate content, they were paired with another group or an independent project was developed. The relationship between senior design project topic and EVE 445L research activities is shown in Table 2. Independent research activities include: evaluation of a bench scale gray water treatment system, open channel flow device experiments, and treatment of gray water with a trickling filter. Two Sophomore EVE students also participated in the 2010 trip to the ASEE-SE Conference. They were enrolled in the Introduction to Environmental Engineering Laboratory (EVE 290L), a sophomore level course, and offered the opportunity to research how storage time impacted the measured oxygen uptake rate (OUR) of a sample with the understanding that the work would be presented at the ASEE-SE poster competition. The students accepted the opportunity and every week, lab period started with measuring the OUR of a stored sample. The ASEE-SE student poster presentation titles, authors, and awards received for publications associated with EVE lab courses are provided in Appendix A.

In addition to the efforts associated with the EVE lab courses, poster publications are a common deliverable for undergraduate students conducting independent research or projects in collaboration with an EVE faculty member. The publication of these posters is dependent on the quality of the student's work and timing. Four posters have been published at conferences using this format. Three were presented at ASEE-SE Conferences and one at the University of Chapel Hills Water Health and Policy Conference. Details (titles, authors, and awards received) on these publications are provided in Appendix B.

Table 1. Relationship between senior design project and EVE 445L research activities.

Senior Design Project	EVE 445L Research Activity
Residential Gray Water Irrigation System	Impact of chlorine on plant and grass health
	Pathogen content of soils irrigated with gray water
Microbial Fuel Cell Wastewater Treatment for Developing Nations	Measurement of energy production from and wastewater treatment in a microbial fuel cell.
Alternative On-Site Sewage Management: A Bench Scale System for Evaluating Filter Media	Hydraulic testing of system components
Performance Analysis of Composting Systems for Small Scale Use	Evaluation of compost characteristics
Design and Analysis of Biosand Filtration with Added Copper as a Disinfectant	Identification of where copper should be located in a biosand filter
The Use of Ozonation to Improve the Treatability of Pulp and Paper Mill Effluent	Impact of ozonation rate and time on pulp and paper mill effluent composition

EFFORTS OF THE ENGINEERING HONORS PROGRAM

In the Fall of 2010, the Engineering Honors Program at Mercer University was restructured with a focus on student publication of research and/or design efforts. The Program consists of eight, one-credit, Satisfactory/Unsatisfactory courses (EGR 101, EGR 102, EGR 201, EGR 202, EGR 301, EGR 302, EGR 401, and EGR 402). Publication requirements and typical time commitments are shown in Table 2. The program currently has fifty active students (21 freshman, 15 sophomores, 9 juniors, and 5 seniors). Freshman honors students are required to conduct an independent project that culminates in a poster presentation at the Engineering Expo. Eighteen Freshman Honors posters have been generated by 26 students to date. Sophomore Honors students are required to conduct a more extensive independent semester project that culminates in a poster presentation at a regional conference. Fourteen posters have been presented by 17 Sophomore Honors students at the ASEE-SE student poster competition. Details on these posters (titles, authors, and awards received) are provided in Appendix C. Junior Honors students work on a project for an entire academic year and publish their progress at the Spring Engineering Expo as both a podium and poster presentation. Two podium and five poster presentations were delivered by the five Junior Honors Students at the 2012 Engineering Expo. Senior Honors students prepare a manuscript for submission to a regional conference and provide podium and poster presentations at the Engineering Expo. This is the first year with Senior Honors Students under the new format. It is anticipated that one of the five Senior Honors students will achieve this goal at the 2013 ASEE-SE Annual Conference while the remaining four plan to meet this requirement at the 2014 Conference.

EFFORTS OF THE SENIOR DESIGN COURSE SEQUENCE

All engineering students at Mercer University complete a two-semester senior design sequence. This sequence is coded XXX 487 and XXX 488 where XXX is replaced with the descriptor for the specific student's specialization, biomedical, computer, electrical, environmental, industrial, or mechanical engineering. In the first semester (XXX 487), students develop design options and select an optimal design. These students deliver regular oral project updates to their fellow students and project manager (section instructor), produce a preliminary design review (PDR) document detailing their design selection rationale, and present their design to a panel consisting of their project manager, client, and technical advisors. In the second semester (XXX 488) of this sequence, the design is built and tested to ensure that it meets design goals and specifications. Students again deliver oral progress reports. The course culminates in a critical design review (CDR) manuscript and presentation that document the construction process, design modifications, and testing results. This design, build, test format naturally produces content appropriate for publication at least as a poster and often as a conference paper. Drs. Hodge Jenkins (Associate Professor, Mechanical Engineering Program) and Michael Leonard (Professor, Senior Associate Dean of Engineering) were the instructors for the Fall 2011/Spring 2013 offering of the senior design sequence and recognized the opportunity for presentation of senior design work. A bonus of 5% was offered to students who presented their senior design work at a conference. Eight of the sixteen senior design teams took advantage of this

opportunity and delivered presentations at conferences as follows: three posters at the 2012 ASEE-SE Annual Conference, one poster at the MESCON 2012 Conference, one presentation at the 2012 KEEN Regional Meeting at Mercer University, and two podium presentations at the 2012 Engineering Expo. The presentation titles, authors, and awards received for publications associated with this effort are provided in Appendix D.

Table 2. Engineering Honors Program course sequence, research commitments, and publication requirements.

Academic year	Course	Research time commitment	Activites and deliverables
Freshman	EGR 101	n/a	Experiential learning exercises, identify a project and team for EGR 102
	EGR 102	15+ hours	1 semester, ~20 hours Poster at Mercer Engineering Expo
Sophomore	EGR 201	n/a	Technical training seminars and workshops, identify a project and team for EGR 202
	EGR 202	1 semester, ~30 hours	Poster at a regional conference, identify a project and team for EGR 301/302
Junior	EGR 301	2 semester, ~60 hours	Podium and poster at Mercer Engineering Expo
	EGR 302		
Senior	EGR 401	As required to complete project	Complete manuscript on EGR 301/302 project
	EGR 402		Deliver paper and podium at a regional conference

ON CAMPUS PUBLICATION OPPORTUNITIES

In 2002, the School of Engineering developed a Spring Engineering Expo that revolved around the Freshman Engineering Design Course and associated competition. This competition was originally held in and around the engineering building. As attendance by parents and students (both upper-level engineering and non-engineering) grew, more space was required and the event was moved to the practice basketball court. Attendance continued to grow and in 2008, the competition was moved to the main basketball court. A few student groups and senior design teams had presentations on the upper concourse of the Arena. The participation of student organizations, senior design teams, and student researchers continued to grow on a mostly informal basis. In 2011, Dr. Sinjae Hyun (Associate Professor, Biomedical Engineering Program and Director of Engineering Research Program) formalized and highlighted the student posters presented at the Expo. In 2012, the Expo was held in conjunction with a new University initiative called Breakthroughs in Engagement, Arts, and Research Day (BEAR Day). Undergraduate classes were cancelled on BEAR Day to allow students to deliver and attend presentations. Dr. Hyun took advantage of this collaboration to formalize participation in and expand the number and variety of presentations at the Engineering Expo. A morning session (9:30-11:30 AM) consisting of eighteen student and faculty podium presentations was initiated. This session was followed by a lunch social (11:30 AM – 1 PM) held in the Latorre Family Plaza adjacent to the School of Engineering. The lunch (hot dogs, hamburgers, chips, and soda) was coordinated by the Tau Beta Pi and Institute of Industrial Engineers student organizations. The Freshman Design Competition was held from 1 – 3 PM on the main basketball arena with a concurrent poster session (1 – 4:30 PM) on the upper concourse of the Arena. The poster session included seventeen from senior design, six from student research projects, and 24 from the Engineering Honors Program. The Society of Women Engineers student

organization coordinated preparation of the competition kits for the course, setup of the competition venues, and poster easels. An awards ceremony recognizing the winning freshman design teams and outstanding student podium and poster presentations was held from 4:30 to 5 PM. The program from this event has been included in Appendix E.

LOGISTICS AND ADMINISTRATIVE SUPPORT

The achievements described above are subject to several logistic constraints and support from administrative entities. The key logistic constraints are timing, cost, and travel arrangements. Students and universities typically operate on a semester scheduling format with Fall courses ending in early December and Spring courses ending in early May. Students need a sufficient period of time to complete research activities, analyze results, and develop their presentation. When linking student publications to course activities, Fall courses should consider either late November or Spring conferences while Spring courses should consider late April conferences. If publications are to be generated in the same semester as the course, every effort should be made to aggressively pursue research activities at the beginning of the semester leaving the last part of the semester for detailed data analysis and presentation development. Cost and travel arrangements are related items. The approximate total cost for Mercer students to attend the ASEE-SE Poster Competition has been $350, this total includes registration, lodging, meals, and transportation. The key to keeping travel costs manageable has been transporting students as a group in a bus with luggage storage. In 2010 and 2011, a 15-passenger mini-bus with luggage storage was used. These vehicles can be easily rented and driven with a regular driver's license (Class C). In 2012, twenty-three Mercer Engineering students attended the poster competition. To make this trip cost effective, a larger bus was needed. Carrying more than 15 occupants requires a Class C licenses with passenger endorsement. This is a commercial driver's license and requires passing basic commercial vehicle knowledge, vehicle inspection, road, and physical health examinations. Dr. McCreanor completed these requirements and a twenty-five passenger bus was used for the 2012 trip. The other aspect of keeping costs down is room arrangements. The School of Engineering expects an average of three students of the same gender per room. The total expenditure for student attendance at the ASEE-SE 2012 was $6421 or $279.17/student. These expenditures are itemized in Table 3.

Table 3. Costs for student travel to 2012 ASEE-SE Student Poster Competition.

Item	Cost ($)
Transportation – bus rental*	1,345
Transportation – fuel costs*	400
Lodging	2,376
Registration	2,300
Total:	6,421

*Two faculty traveled in the bus with the students which reduced faculty travel costs.

While every effort is made to keep the per student cost down, the trip is still a significant financial commitment. The School of Engineering at Mercer University is fortunate to have a Dean, Dr. Wade Shaw, who sees the value in encouraging students to present at conferences. These conferences are an opportunity for students to highlight their achievements, hone their presentation skills, and showcase the School of Engineering. These trips would not be possible without his support. The Provost's Office has a program with financial assistance for undergraduate students attending conferences. This program has supported the ASEE-SE trip every year by covering 50% of the travel costs. In addition to support for the ASEE-SE trip, the Dean's and Provost's Office support a number of other individual or small group student conference attendances. Lastly, the Dean's Office supports the Engineering Expo with not only the direct financial commitment associated with the materials required for the Freshman Design Competition and Expo but also by compensating the student organizations that support the event. This level of administrative support is critical to developing and maintaining an environment that encourages undergraduate students to present their research and design work.

RECOMMENDATIONS

Engineering programs looking to increase undergraduate publications and presentations should focus on the following actions.

1. Re-consider structure and deliverables in upper-level laboratory courses. Could students learn the required material by working on a semester long research project? If so, this is an easy way to get students involved in research. One of the final deliverables for the course should be electronic submission of a poster. The best posters could then be printed and displayed in the lab.
2. Initiate an in-house undergraduate poster symposium. This is a low effort way to showcase student work and foster student interest in working on research projects. After the symposium, the posters can be placed in the lab generating them or on display in public areas of the School. MUSE has dedicated two hallways to the display of student posters. This display will be updated with new posters yearly.
3. Identify and target a regional student poster symposium for a group trip. While the ASEE-SE Conference is an ideal venue, there are other student research conferences that may work better for some institutions. The group trip makes the event very cost effective and provides students with a bonding opportunity.

Finally, there are a growing number of Internet based student research conferences. In these conferences, the presentation materials are loaded to a web-site where they can be viewed by conference attendees. An exciting aspect of these digital conferences is that submissions are often not limited to a slide show or static poster but can include videos and objects a viewer can interact with such as rotatable 3D images. The cost of presenting at these conferences will be significantly less than a traditional brick and mortar conference as there will not be any travel or lodging expenses. The lack of physical travel also simplifies logistics a great deal. The down-side is that students are unlikely to develop the same presentation skills and make the same kind of interpersonal connections they would when operating in a face to face environment.

APPENDIX A – ASEE-SE STUDENT POSTER PRESENTATIONS FROM EVE LAB COURSES.

- Harris, Mark, Perry, Alex, and Swinford, Andrew, "Bench Scale Gray Water Treatment System", ASEE SE Section Annual Conference, Student Poster Competition, Mississippi State University, Starkville, MS, April 1-3, 2012.
- Goodman, Jennifer, Simms, Andrew, and Wyckoff, Kristen, " The Use of Ozonation to Improve the Treatability of Pulp and Paper Mill Effluent", ASEE SE Section Annual Conference, Student Poster Competition, Mississippi State University, Starkville, MS, April 1-3, 2012.
- Fair, Arneshia, Poole, Timothy, and Smith, Cassie, "Design and Analysis of Biosand Filtration with Added Copper as a Disinfectant, 1st Place - Junior/Senior Engineering, ASEE SE Section Annual Conference, Student Poster Competition, The Citadel, Charleston, SC, April 10-12, 2011.
- Lee, Elizabeth, Waldron, James, and Wozny, Jared, "Performance Analysis of Composting Systems for Small Scale Use", ASEE SE Section Annual Conference, Student Poster Competition, The Citadel, Charleston, SC, April 10-12, 2011.
- Dinkins, T.C. and Hammett, Drew, "Open Channel Flow Apparatus", ASEE SE Section Annual Conference, Student Poster Competition, Virginia Polytechnic Institute and State University, Blacksburg, Virginia, April 18-20, 2010.
- Dorminy, Sarah, Lagratta, Jacqueline, and Peters, Ryan, "Alternative On-Site Sewage Management: A Bench Scale System for Evaluating Filter Media", ASEE SE Section Annual Conference, Student Poster Competition, Virginia Polytechnic Institute and State University, Blacksburg, Virginia, April 18-20, 2010.
- Joyner, Jamie and Moore, Leah, "Microbial Fuel Cell Wastewater Treatment for Developing Nations", 3rd Place - Junior/Senior Engineering, ASEE SE Section Annual Conference, Student Poster Competition, Virginia Polytechnic Institute and State University, Blacksburg, Virginia, April 18-20, 2010.
- Simms, Andrew and Wyckoff, Kristen, "The Effect of Sample Storage Time and Temperature on Oxygen Uptake Rate Measurement", 1st Place - First and Second Year Engineering, ASEE SE Section Annual Conference, Student Poster Competition, Virginia Polytechnic Institute and State University, Blacksburg, Virginia, April 18-20, 2010.

APPENDIX B – PUBLICATIONS FROM INDEPENDENT STUDENT RESEARCH PROJECTS.

- Pritchard, Justin, "The Calibration of Images for Coliform Counting", 2012 Water and Health Conference: Science, Policy, and Innovation, University of North Carolina - Chapel Hill, October 29 – November 2, 2012.

- Pippard, Jessica,"Effect of Liquid Conductivity on Time Domain Reflectometry Based Water Level Measurement in Porous Media", Honorable Mention - Undergraduate Research Individual, ASEE SE Section Annual Conference, Student Poster Competition, The Citadel, Charleston, SC, April 10-12, 2011.
- Wyckoff, Kristen, The Impact of Metallic Biocide and User Compliance on the Effectiveness of Biological Sand Filtration," 3rd place - Individual Research, ASEE SE Section Annual Conference, Student Poster Competition, The Citadel, Charleston, SC, April 10-12, 2011.

- Pippard, Jessica L., "Time Domain Reflectometry and Water Level Measurement in Porous Media", 1st Place - Undergraduate Research Individual, ASEE SE Section Annual Conference, Student Poster Competition, Virginia Polytechnic Institute and State University, Blacksburg, Virginia, April 18-20, 2010.

- Berry, Kevin, "Mercer University School of Engineering Paper Recycling Program", 3rd Place - Junior/Senior Engineering, ASEE SE Section Annual Conference, Student Poster Competition, The University of Alabama, Tuscaloosa, Alabama, April 2-4, 2006.

APPENDIX C – ASEE-SE STUDENT POSTER PRESENTATIONS ASSOCIATED WITH SOPHOMORE ENGINEERING HONORS.

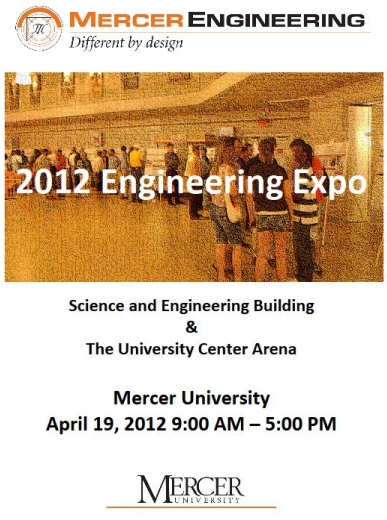
- Deremer, Joshua and Aquino, Carl, "A-maze-ing Robot", 3rd Place - First and Second Year Engineering, ASEE SE Section Annual Conference, Student Poster Competition, Mississippi State University, Starkville, MS, April 1-3, 2012.
- Brett, Emily, "Biomechanics of Isotonic Exercises", 3rd Place - Undergraduate Research Individual, ASEE SE Section Annual Conference, Student Poster Competition, Mississippi State University, Starkville, MS, April 1-3, 2012.
- Brett, Erin "The Anti-microbial Affects of Several Forms of Copper", 3rd Place - Undergraduate Research Individual, ASEE SE Section Annual Conference, Student Poster Competition, Mississippi State University, Starkville, MS, April 1-3, 2012.
- Danley, Bryan, "Determining Accuracy of ModelSmart v1.72 Bridge Modeling Software", 1st Place - First and Second Year Engineering, ASEE SE Section Annual Conference, Student Poster Competition, Mississippi State University, Starkville, MS, April 1-3, 2012.
- Lacey, Edward Davis IV, "Comparative Modeling of Full-Scale and Small-Scale Biosand Filtration Systems", ASEE SE Section Annual Conference, Student Poster Competition, Mississippi State University, Starkville, MS, April 1-3, 2012.
- Minch, Emily and Newell, Grey, "Programming a Particulate Filtration System into Second Life®", ASEE SE Section Annual Conference, Student Poster Competition, Mississippi State University, Starkville, MS, April 1-3, 2012.
- Wright, Kyle, "Second Life® Activated Sludge Aeration Basin", ASEE SE Section Annual Conference, Student Poster Competition, Mississippi State University, Starkville, MS, April 1-3, 2012.
- Yin, Matthew, "Drag Force Analysis of Tractor-Trailer Aerodynamics", 2nd Place - First and Second Year Engineering, ASEE SE Section Annual Conference, Student Poster Competition, Mississippi State University, Starkville, MS, April 1-3, 2012.
- Yoon, DoHyun Daniel and Fratino, Anthony, 2nd Place – Junior/Senior Engineering Design Team, "Aerosol Deposition Study of Subject-specific Upper Respiratory Model", ASEE SE Section Annual Conference, Student Poster Competition, Mississippi State University, Starkville, MS, April 1-3, 2012.
- Mason, Katie, "Testing of K'Nex Motors used in a Freshman Engineering Design Competition", 2nd Place - First and Second Year Engineering, ASEE SE Section Annual Conference, Student Poster Competition, The Citadel, Charleston, SC, April 10-12, 2011.

- Kamczyc, Alfred Jason and Lune, Patrick Vande, "Biochemical Properties of Laundry Detergent", 3rd Place - First and Second Year Engineering, ASEE SE Section Annual Conference, Student Poster Competition, The Citadel, Charleston, SC, April 10-12, 2011.
- Eck, Kevin, "Novel Drive System for Spherical Robots", 1st Place - Undergraduate Research Individual, ASEE SE Section Annual Conference, Student Poster Competition, The Citadel, Charleston, SC, April 10-12, 2011.
- Weems, Andrew, "Device and Process to Aid in the Interpretation of Force Plate Data", ASEE SE Section Annual Conference, Student Poster Competition, The Citadel, Charleston, SC, April 10-12, 2011.
- Westbay, Alan, "Bench-scale Demonstration of Flywheel Energy Storage and Release via a Continuously Variable Transmission", Honorable Mention - Undergraduate Research Individual, ASEE SE Section Annual Conference, Student Poster Competition, The Citadel, Charleston, SC, April 10-12, 2011.

APPENDIX D. STUDENT PRESENTATIONS ASSOCIATED WITH SENIOR DESIGN.

- Adams, Paul, Alston, Kristen, and Crook, Christpher, 'Device to measure Solar /Wind Energy Potential', 2012 KEEN Regional Meeting, Mercer University, Macon, GA, March 15 to 17, 2012.
- Bennett, Robert, Pippard, Jessica, and Samson, Tim, 'Arterial Pulse Velocity Instrument', ASEE SE Section Annual Conference, Student Poster Competition, Mississippi State University, Starkville, MS, April 1-3, 2012.
- Esmond, Micah, Hopkins, Jacob, Richards II, Barrington, 'Wind Turbine Generator and Instrumentation', Mercer Engineering Expo, Macon, GA, April 19, 2012.
- Harding, Mike, Crow, Jeffrey, and Colaprete, Zach, 'To Design, Test, and Build a Breathing Machine Apparatus for use in the MUSE Particle Delivery Laboratory', Mercer Engineering Expo, Macon, GA, April 19, 2012.
- Marko, Kristin, Nascimento, Mario do, and Oakley, Jamie, 'Design and Creation of a Temperature and Moisture Controlled Three-Dimensional Tracheobronchial Lung-Airway', ASEE SE Section Annual Conference, Student Poster Competition, Mississippi State University, Starkville, MS, April 1-3, 2012.
- Quigley, T., 'Research In Autonomous UAV Flight', Math, Engineering, and Science Undergraduate Research Conference, University of Evansville, Evansville Indiana, March 24, 2012
- Weems, Andrew and Adebayo, Adetokundo, 'Measurement of Migratory Forces Acting on Abdominal Aortic Endovascular Stent Grafts', ASEE SE Section Annual Conference, Student Poster Competition, Mississippi State University, Starkville, MS, April 1-3, 2012.

APPENDIX E. PROGRAM FOR THE 2012 MERCER ENGINEERING EXPO, MACON, GA.



Welcome — SEB 104 — 9:20 AM – 9:25 AM

Dr. Wade H. Shaw, P.E.
Dean of School of Engineering

Podium Presentation I — 09:30 AM – 11:30 AM

Session A	SEB 104	Moderator: Dr. Wade Shaw
09:30 AM – 09:55 AM	Dr. Wade H. Shaw, P.E.	Meta-Modeling for Design Synthesis: Application to the Supplemental Instruction Program for Engineering Students
10:00 AM – 10:25 AM	J. Andrew Jones, Dr. Laura Lackey	Equilibrium and Kinetic Analysis of Fluoride Adsorption on Bone Charcoal
10:30 AM – 10:55 AM	Jason Ryans, Dr. Sinjae Hyun	Computational Investigation of Particle Deposition in a Realistic Human Lung Airway Model
11:00 AM – 11:30 AM	Chris Menard, Dr. Joe Sam Robinson, Dr. M. Sami Walid, Dr. Sinjae Hyun, Robert O'Connell, Brandi Bohleber	Computational Modeling of HHH Therapy and Impact of Blood Pressure and Hematocrit

Session B	SEB 143	Moderator: Dr. Paul MacNeil
09:30 AM – 09:55 AM	Dr. Scott Schultz, Dr. Paul MacNeil	Scheduling Radar Warning Receivers (RWRs)
10:00 AM – 10:25 AM	Dr. Paul E. MacNeil	Computing, Equations, and Molecular Structure
10:30 AM – 10:55 AM	Jamie Oakley, Kristin Marko, Mario do Nascimento, Dr. Sinjae Hyun	Temperature and Moisture Controlled Three-Dimensional Tracheobronchial Lung-Airway

Session C	SEB 144	Moderator: Dr. McCreanor
09:30 AM – 09:55 AM	Dr. Philip T. McCreanor, Kevin Berry	Financial Comparison of Dry Tomb and Bioreactor Landfills
10:00 AM – 10:25 AM	Alfred Jason Kamczyc, Derek Munday, Dr. Philip McCreanor	Wireless Attention Acquiring Device (Wireless AAD)
10:30 AM – 10:55 AM	Dr. Philip T. McCreanor, Douglas Doud, Nand Patel and Justin Pritchard	Landscape irrigation with gray water
11:00 AM – 11:25 AM	Mike Harding, Jeffrey Crow, Zach Colaprete, Dr. Sinjae Hyun	To Design, Test, and Build a Breathing Machine Apparatus for use in the MUSE Particle Delivery Laboratory

Session D	SEB 201	Moderator: Dr. Anthony Choi
09:30 AM – 09:55 AM	Andrew Weems, Dr. Ha Van Vo, Dr. Phillip McCreanor	Novel Design for Total Finger/Toe Joint Replacement
10:00 AM – 10:25 AM	Kevin Eck, Dr. Philip McCreanor	Novel Spherical Robot Design
10:30 AM – 10:55 AM	Thomas Quigley, Jana Blust, Thomas Evans, Dr. Anthony Choi	The International Aerial Robotics Competition

Session E	SEB 202	Moderator: Dr. Behnam Kamali
09:30 AM – 09:55 AM	Jared Wozny, Dr. Laura Lackey	Mathematical Modeling of Intermittent Flow Biological Sand Filters
10:00 AM – 10:25 AM	Dr. Behnam Kamali	The Development of Aeronautical Mobile Airport Communications Systems; AeroMACS
10:30 AM – 10:55 AM	Micah Esmond, Jacob Hopkins, Barrington Richards II, Dr. Loren Sumner, Dr. Kevin Barnett	Wind Turbine Generator and Instrumentation

Lunch — 11:00 AM – 1:00 PM

Lunch @ the Plaza Served by Tau Beta Pi and IIE
Lunch at the Quad served by the Fresh Food

Freshmen Design Competition — 1:00 PM – 3:00 PM

The University Center Arena
1:00 PM – 3:00 PM
Dr. Michael Leonard
Senior Associate Dean, School of Engineering

Poster Presentation — 3:00 PM – 4:30 PM

The University Center Arena

Senior Design Track

1	Mike Harding, Jeffrey Crow, Zach Colaprete, Dr. Sinjae Hyun	To Design, Test, and Build a Breathing Machine Apparatus for use in the MUSE Particle Delivery Laboratory
2	Ethan Garrett, Ben Haygood, Kyle Sutton, Bobby Washington, Dr. Jack Mahaney, Dr. Kevin Barnett, Dr. T. Anthony Choi	Low Cost Remotely Operated Mine Detector
3	Micah Esmond, Jacob Hopkins, Barrington Richards II, Dr. Loren Sumner, Dr. Kevin Barnett	Wind Turbine Generator and Instrumentation
4	Brannen Chapman, Rashele Moore, Alex Perry, Dr. Ha Van Vo	Human Powered Water Pumping System
5	Kimberly Camerino, Louis Sansone, Andrew Hyatt, Dr. Kevin Barnett	Large Capacity Accurate Personal Coffee Roaster
6	KaLia Burnette, Kenny Tang, Griffin Pafford, Dr. Ha Van Vo, Dr. Richard Kunz	Improved Universal Trans-Femoral Prosthetic for Above-Knee Amputees
7	Nick Booker, Martin Joubert, Kevin Roberts, Dr. Loren Sumner	Gas Turbine Electric Power Module
8	Toks Adebayo, Andrew Weems, Dr. Sinjae Hyun	Measurement of Abdominal Aortic Aneurysm Migratory Forces
9	Thomas Quigley, Jana Blust, Thomas	The International Aerial Robotics Competition

	Evans, Dr. Anthony Choi	
10	Paul Adams, Kristen Alston, Christopher Crook, Dr. Joan M. Bartner, Dr. Anthony Choi, Dr. Loren Sumner	Solar and Wind Potentiometer
11	Jennifer Goodman, Andrew Simms, Kristen Wyckoff, Dr. Laura Lackey	The Use of Ozonation to Improve the Treatability of Pulp and Paper Mill Effluent
Student Research Track		
12	Nathan Burnham, Elias Hall, James Herring, Dr. T. Anthony Choi	Embedded Robotics Platform
13	Robert Bennett, Jessica Pippard, Tim Samson, Dr. Ed O'Brien	Arterial Pulse Velocity Instrument
14	Matt Baker, Eric Reid, Cory McDuffie, Dr. Loren Sumner	Hydrogen Fuel Cell Laboratory
15	Jamie Oakley, Kristin Marko, Mario do Nascimento, Dr. Sinjae Hyun	Design and Creation of a Temperature and Moisture Controlled Three-Dimensional Tracheobronchial Lung-Airway – Part I.
16	Jamie Oakley, Kristin Marko, Mario do Nascimento, Dr. Sinjae Hyun	Design and Creation of a Temperature and Moisture Controlled Three-Dimensional Tracheobronchial Lung-Airway – Part II.
17	Rob Machen, Joshua Abarra, Dr. Hodge Jenkins, Dr. Jack Mahaney	MUSE Soapbox Car
Student Research Track		
18	Brad Stout, Awab Khan, Vinh Nguyen, Dr. Sinjae Hyun	Modeling Ideal Temperature of Diminutive Laser Pulse to Treat Breast Cancer Utilizing Gold Nanoparticles
19	Kalia Burnette, Caitlyn Ryan, Dr. Ha Van Vo & Dr. Laura Lackey	A Comparative Analysis of Coconut Based filter VS a basic sand filter
20	Laura López Sosa, Katie Safford, Paige Storzo, Dr. Philip McCreanor	Lab Scale Evaluation of Sand Filters for On-site Sewage Management in Georgia
21	Anthony Fratino, Bich Nguyen, Tapas Mitra, Dr. Sinjae Hyun	Heat Transfer of Bone Cemented Femur Anthroplasty
22	Alfonso Sciacchitano, DoHyun Yoon, Michael An, Naend Patel, Dr. Sinjae Hyun	Thermal Effects of Hydrotherapy for Swelling Reduction on Lower Extremities
23	Jason Ryans, Dr. Sinjae Hyun	Experimental Investigation of Particle Deposition in a Realistic Human Lung Airway Model
Honors Program Track	**Freshman Honors**	
24	Ethan Arrendale, Dr. Philip McCreanor	Video Analysis of Linear Martial Arts Techniques Using LoggerPro 3.8.3
25	Jonathan Atzmon, Dr. Philip McCreanor	Remote Monitored and Controlled Horse Watering System
26	Hunter Hickman, Lalla Wise, Dr. Philip McCreanor	Encoding of Electronic Messages using the Enigma Technique
27	Brett Eckles, Bradley Young, Dr. Philip McCreanor	Determination of the Force Required to Break Boards
28	Joel (JT) James, Dr. Philip McCreanor	3D Image Processing
29	Kevin Tapoe, Dr. Philip McCreanor	Alternative Power Turbine Design
30	Patrick Morris, Dr. Philip McCreanor	Impact of a Car's Rear Spoiler on Lift and Drag Forces
31	James Wischmeyer, Dr. Philip McCreanor	Evaluation of Trebuchet Dynamics
Honors Program Track	**Sophomore Honors**	
32	Molly Saffgan, Dr. Susan Codone	What is Technical Communication
33	Erin (Mitzi) Brett, Dr. Laura Lackey	The Anti-microbial Affects of Several Forms of Copper
34	Emily Brett, Dr. Philip McCreanor	Biomechanics of Isotonic Exercises
35	Bryan Danley, Dr. Philip McCreanor	Determining Accuracy of ModelSmart v1.72 Bridge Modeling Software
36	Edward Lacey, Dr. Laura Lackey	Comparative Modeling of Full-Scale and Small-Scale Biosand Filtration Systems
37	Carl Aquino, Joshua Deremer, Dr. Philip McCreanor	A-maze-ing Robot
38	Emily Minch, Alexander Newell, Dr. Philip McCreanor	Programming a Particulate Filtration System into Second Life
39	Daniel Yoon, Anthony Fratino, Dr. Sinjae Hyun	Aerosol Deposition Study of Subject-specific Upper Respiratory Model
40	Kyle Wright, Dr. Philip McCreanor	Activated Sludge Aeration Basin in Second Life
41	Matthew Yin, Dr. Philip McCreanor	Drag Force Analysis of Tractor-Trailer Aerodynamics
Honors Program Track	**Junior Honors**	
42	Kevin Eck, Dr. Hodge Jenkins	A Novel Drive System for a Spherical Robot
43	Alan Westbay, Dr. Philip McCreanor	Bench-scale Demonstration of Flywheel Energy Storage
44	Alfred Kamczyc, Dr. Philip McCreanor	Wireless Attention Acquiring Device
45	Kathryn Mason, Dr. Philip McCreanor	Construction and Testing of a Model Steam Engine
46	Andrew Wreems, Dr. Ha Van Vo	Alternative Design for a Replacement Finger Joint
Honors Program Track	**Senior Honors**	
47	Jones Andrew, Dr. Laura Lackey	Effects of Wind and Effective Emissivity of the Cover on a Passive Solar Still: A Theoretical and Experimental Study

Award Announcement — **4:30 PM – 4:50 PM**

Best Presentation Award
Best Podium Presentation Award
Best Senior Design Poster Presentation Award
Best Student Research Poster Presentation Award
Best Honors Program Poster Presentation Award

Closing Commencement — **4:50 PM – 5:00 PM**

Dr. Wade Shaw
Dean, School of Engineering

Philip T. McCreanor

Dr. McCreanor holds a B.S. in Mechanical Engineering M.S. in Environmental Science, and a Ph.D. in Environmental Engineering. He currently holds the rank of Associate Professor in the Environmental Engineering Department and is Director of the Engineering Honors Program at Mercer University. He has been inducted into the Phi Kappa Phi, Sigma Xi, and Tau Beta Pi honor societies. His professional awards include Frontiers in Education New Faculty Fellow; Outstanding Referee by the Waste Management: Journal of Integrated Waste Management, Science, and Technology; the Mercer University / Vulcan Materials Company Innovations in Teaching Award; Georgia Governor's Teaching Fellow; and the ASEE-SE's 2012 Outstanding Mid-Career Teacher. His research interests include flow and transport in variably saturated media, bioreactor landfills, and gray water reuse.

Laura Lackey

Dr. Laura W. Lackey is the Chair of the Department of Environmental Engineering and a Professor at the Mercer University School of Engineering. She earned B.S., M.S., and Ph.D. degrees in Chemical Engineering from the University of Tennessee. The terminal degree was awarded in 1992. She has six years of industrial experience at the Tennessee Valley Authority as an Environmental/Chemical Engineer where she conducted both basic and applied research with emphasis on the mitigation of organic wastes through bioremediation. In the 15 years since Dr. Lackey began her career at Mercer, she has taught 16 different courses, ranging from a freshman-level Introduction to Problem Solving course to a senior-level Process Chemistry course, which she developed. She is a registered professional engineer.

Hodge Jenkins

Dr. Hodge Jenkins is an Associate Professor of Mechanical Engineering in the Department of Mechanical Engineering at Mercer University in Macon, Georgia. Prior to coming to Mercer in 2002, Dr. Jenkins was engaged in optical fiber product development with Bell Laboratories of Lucent Technologies. He is a registered professional engineer, with over 20 years of design and development experience in high-precision design, dynamic structural analysis, process automation, control, and robotics. Dr. Jenkins holds a Ph.D. in Mechanical Engineering from Georgia Institute of Technology in (1996), as well as BSME (1981) and MSME (1985) degrees from the University of Pittsburgh. He is a member of the ASEE.

Michael Leonard

Michael S. Leonard currently serves as Senior Associate Dean of the Mercer University School of Engineering. He previously held positions on the faculties of the Department of Industrial Engineering at Clemson University, the Department of Industrial Engineering at the University of Missouri-Columbia, and the Health Systems Research Center at Georgia Institute of Technology. Dr. Leonard's research interests focus on production and service delivery systems, and engineering accreditation. He is a registered professional engineer in the states of Missouri and South Carolina. Dr. Leonard is a Fellow of the Institute of Industrial Engineers. He holds bachelors, masters, and doctoral degrees from the University of Florida.

Sinjae Hyun

Sinjae Hyun is an Associate Professor of Biomedical Engineering Department and a Director of Engineering Research Program at Mercer University. He received his Ph.D. degree in Mechanical Engineering from North Carolina State University in 1998. Throughout his career, he has used advanced computational modeling and simulation to study transport phenomena in biological systems including cardiovascular as well as respiratory systems. Most recently, in addition to continuing computational modeling and simulation research, he has began to apply experimental approach to measure transport and deposition characteristics of inhaled aerosols in the image-based 3D printed respiratory models.