

MARY KATHERINE WATSON

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Charleston, SC 29464

EDUCATION

- PhD** **Georgia Institute of Technology,** August 2013
Civil & Environmental Engineering; Atlanta, GA
Dissertation: Assessment and Improvement of Sustainability
Education in Civil and Environmental Engineering
Committee: Michael O. Rodgers (chair), Nelson Baker,
Randall Guensler, Donna Llewellyn, James Mulholland,
Caroline Noyes, Kari Watkins
- MS** **Georgia Institute of Technology,** June 2011
Environmental Engineering; Atlanta, GA
Project: Biotransformation of Alkanoylcholines by a Mixed
Methanogenic Culture
Advisor: Spyros G. Pavlostathis
- MS** **Clemson University, Biosystems Engineering** May 2009
Thesis: Growth and Modeling of Freshwater Algae as a Function
of Media Inorganic Content
Advisor: Caye M. Drapcho
- BS** **Clemson University, Biosystems Engineering** May 2007
Graduated Magna Cum Laude (GPA: 3.88)
Minor in Environmental Engineering

ACADEMIC APPOINTMENTS

The Citadel, The Military College of South Carolina; Charleston, SC (2013 - present)
Assistant Professor, Department of Civil and Environmental Engineering

RESEARCH & PROFESSIONAL PROJECTS

Developing and Assessing Engineering Students' Cognitive Flexibility Related to Sustainable Design (2015-present)

Collaborators: Dr. Elise Barrella, Dr. Robin Anderson, Dr. Olga Pierrakos

- Refining and validating methods for using concept maps to capture students' cognitive development in the areas of sustainability and sustainable design.
- Improving a cross-disciplinary, student-level sustainable design rubric to assess and scaffold learning related to sustainable design.
- Developing curricular materials, based on systematic literature review, for guiding students in learning about and applying sustainable design principles.

Enhancing Undergraduate Civil Engineering Opportunities for Socioeconomically Disadvantaged, Minority and Female Students in South Carolina (2014 – present)

Collaborators: Kevin Bower, William Davis, Jane Warner

- Aiding in management of a scholarship program for disadvantaged, minority, and female students in civil engineering.
- Planning academic and professional development activities for scholarship recipients, including diversity workshops, resume and interviewing seminars, and field trips.
- Organizing service activities for scholarship recipients, including projects with a local elementary school and Water Missions International.
- Participating in qualitative and quantitative assessment of program outcomes.

Sustainability Education in Civil and Environmental Engineering (2011 – present)

Collaborators: Michael Rodgers, Caroline Noyes, Elise Barrella, Joshua Pelkey, Thomas Wall

- Developed a learning-cycle-based module to guide students in learning about and applying sustainability concepts during design.
- Conducted an experiment to compare student learning gains using concept maps in a traditional CEE capstone design course and one modified to incorporate the module.
- Created and applied a sustainable design rubric to quantify application of sustainability principles in student projects.
- Designed, administered, and analyzed a survey to examine student interest in, knowledge of, and previous learning experiences related to sustainability.

Growth and Modeling of Freshwater Algae as a Function of Media Inorganic Carbon Content for Production of Bioproducts (2005 – Present)

Collaborators: Caye Drapcho, Joshua Pelkey

- Investigated the impacts of inorganic carbon concentration on algal growth in open and closed batch reactors.
- Developed a dynamic mathematical model to predict biomass concentrations within batch systems to improve biofuels production and carbon mitigation strategies.
- Completed basic laboratory procedures, including culture cultivation, biomass quantification, and alkalinity determination.
- Using Matlab to model impacts of freshwater algal growth on carbon mitigation.
- Summarizing findings in published manuscripts.

Investigating Environmental Impacts of Using the Wave Dissipation System for Shoreline Erosion Mitigation (May 2016 – Dec 2016)

Collaborator: Dr. Timothy Mays

- Consulted with key stakeholders to obtain data for conducting an energy-based life cycle analysis of the wave dissipation system.
- Compared the energy-associated environmental impacts of the wave dissipation system to traditional use of sandbags. Composed a report submitted to Ocean & Coastal Resource Management (OCRM) and SI Sewall & Fencing Services.

Biotransformation of Alkanoylcholines by a Mixed Methanogenic Culture (2009 – 2013)

Collaborators: Dr. Spyros Pavlostathis, Dr. Ulas Tezel

- Studied fate and effect of monoesterquat surfactants on anaerobic treatment systems.
- Analyzed effect of surfactants on loss of antibiotic susceptibility in biological treatment systems using minimum inhibitory concentration (MIC) assays.
- Used automated laboratory equipment, including gas chromatography-mass spectrometry (GC/MS) and liquid chromatography-mass spectrometry (LC/MS).

TEACHING EXPERIENCE

The Citadel, The Military College of South Carolina; Charleston, SC (2013 - present)

Assistant Professor, Department of Civil and Environmental Engineering

- Courses developed and disseminated: Introduction to Civil Engineering, Fluid Mechanics, Introduction to Environmental Engineering, Water and Wastewater Systems, and Environmental Lab.
- Promoted student learning by incorporating active teaching and learning strategies into all courses, including demonstrations, laboratory exercises, role playing, collaborative learning and/or project-based learning.
- Encouraged student-regulated learning using minute paper exercises and post-exam reflection activities.

The Georgia Institute of Technology; Atlanta, GA (2012)

Graduate Assistant, Center for the Enhancement of Teaching and Learning

- Developed and led professional development workshops for graduate students.
- Prepared and distributed an online newsletter (CETL Education Newsletter) to update graduate students about upcoming professional development workshops, job opportunities, and other campus activities.
- Assisted with other operations of a teaching and learning center, including aiding in preparation of faculty development seminars, organizing materials for campus-wide teaching and learning courses, and conducting graduate student teaching evaluations.

The Georgia Institute of Technology; Atlanta, GA (2011-2012)

Teaching Assistant, Civil & Environmental Engineering

- Courses assisted with: Civil Engineering Systems and Capstone Design
- Designed and implemented active learning activities with large classes of 60 – 100 students.
- Developed activities to help students learn about and apply sustainability during the design process.
- Evaluated Statement of Qualifications (SOQs) and final design reports submitted by student groups.

Clemson University; Clemson, SC (2007-2009)

Teaching Assistant, Biosystems Engineering

- Courses assisted with: Fundamentals of Biosystems Engineering, Biological Kinetics and Reactor Modeling, and Heat and Mass Transport
- Prepared and facilitated selected laboratory sessions.
- Led selected classroom lectures.
- Graded homework and lab reports.

SERVICE ACTIVITIES

University, College, and Departmental Service

Cadet Life Committee (2016 - present)

The Citadel; Charleston, SC

Served on a committee composed of faculty, staff, and military personnel to devise strategies to improve the cadet experience.

Environmental Studies Minor Committee (2016 - present)

The Citadel; Charleston, SC

Served on a committee to develop a new cross-disciplinary minor in sustainability and environmental studies.

Interdisciplinary STEM Education Master's Degree Committee (2016 - present)

The Citadel; Charleston, SC

Served on a committee composed of faculty from education, engineering, math, and sciences to improve a Master's degree in Interdisciplinary STEM Education.

Faculty Search Committee (2016)

Civil and Environmental Engineering Department, The Citadel; Charleston, SC

Served on a committee to evaluate applications, conduct phone interviews, and participate in on-campus interviews to hire two new civil engineering faculty.

American Society of Civil Engineers Concrete Canoe Team Advisor (2013 – present)

Civil and Environmental Engineering Department, The Citadel; Charleston, SC

Worked with a team of civil engineering students to construct a concrete canoe for the annual Carolinas Conference, as well as develop visual display and oral presentation for competition.

American Society of Civil Engineers Mead Paper Co-Advisor (2014 – present)

Civil and Environmental Engineering Department, The Citadel; Charleston, SC

Guided a senior each year in composing an essay on a relevant ethics topic in civil engineering.

Advancement, Scholarship, and Awards Committee (2013 – present)

The Citadel; Charleston, SC

Aided in selection of scholarship and award recipients among Civil and Environmental Engineering student candidates.

Indefinite Delivery Engineering Contract Committee (2015)

Facilities and Engineering, The Citadel; Charleston, SC

Evaluated statements of qualifications and conducted on-campus interviews for companies applying for a civil, roofing, and structural indefinite delivery contract.

Faculty Search Committee (2015)

Civil and Environmental Engineering Department, The Citadel; Charleston, SC

Served on a committee to evaluate applications, conduct phone interviews, and participate in on-campus interviews to hire a new civil engineering faculty.

Society of Women Engineers Student Chapter Advisor (2013 – 2014)

School of Engineering, The Citadel; Charleston, SC

Aided students in all chapter activities, including regular meetings, travel to national and regional conferences, and community outreach events.

Pre-Knob Recruitment Facilitator (2013 – 2015)

Civil and Environmental Engineering Department, The Citadel; Charleston, SC

Co-hosted tours of the Civil and Environmental Engineering (CEE) department to encourage prospective students to consider a major in engineering.

Safety Director Search Committee (2014)

Facilities and Engineering, The Citadel; Charleston, SC

Evaluated applicant's resumes and conducted virtual interviews.

Graduate Career Symposium Co-Organizer (2013)

Center for the Enhancement of Teaching and Learning Center, The Georgia Institute of Technology; Atlanta, GA

Invited and coordinated academic and industry professionals to deliver talks and workshops to aid graduate students in selecting a career path.

STEM Expo Co-Organizer (2013)

Graduate Student Chapter of the American Society for Engineering Education, The Georgia Institute of Technology; Atlanta, GA

Coordinated a poster expo showcasing engineering education research projects being conducted across different academic departments at Georgia Tech.

Engineering Education Workshop Co-Organizer (2012)

Graduate Student Chapter of the American Society for Engineering Education, The Georgia Institute of Technology; Atlanta, GA

Organized a workshop entitled "Teaching, Scholarship, and Research: Building an Engineering Education Community at Georgia Tech" in Atlanta, GA, which was attended by 75 administrators, faculty, staff, and graduate students.

President's Undergraduate Research Awards Reviewer (2011-2012)

The Georgia Institute of Technology; Atlanta, GA

Reviewed abstracts and letters of recommendations for undergraduate students at Georgia Tech applying for research funding.

Clemson College of Engineering and Science Advisory Board Member (2008)

Clemson University; Clemson, SC

Selected to discuss status and future directions of college with key faculty and administrators from the perspective of a graduate student.

Clemson College of Engineering and Science Ambassador (2004 – 2007)

Clemson University; Clemson SC

Presented the field of biosystems engineering to prospective freshmen.

Professional Service

Associate Editor (2016)

Journal of Professional Issues in Engineering Education and Practice

Solicit reviewers and compile reviews for manuscripts submitted to the journal.

National Science Foundation Panelist (2016 - 2017)

Directorate of Undergraduate Education (DUE), National Science Foundation (NSF)

Reviewed proposals submitted to the NSF for funding from the DUE. To date, commitments on three separate panels have been completed.

Effective Teaching Standing Committee Chair (2015 - present)

Civil Engineering Division of the American Society for Engineering Education (ASEE)

Work with committee to create program for 2016 ASEE conference.

Campus Representative (2014 – present)

American Society for Engineering Education (ASEE)

Disseminate information about ASEE conferences and events to faculty, as well as compose and submit an annual report.

Engineering Excellence Awards Judge (2013 – present)

American Council of Engineering Companies South Carolina Chapter (ACEC-SC)

Reviewed and scored engineering projects completed by consulting firms in South Carolina and made recommendations for distinguished awards.

President of the Georgia Tech Chapter of the American Society for Engineering Education (GT-ASEE) (2011-2012)

The Georgia Institute of Technology; Atlanta, GA

Co-founded and organized GT-ASEE to guide graduate students in the development of teaching and engineering education research skills.

Women in Engineering (WIE) Ambassador (2011-2012)

The Georgia Institute of Technology; Atlanta, GA

Supported efforts to increase female participation in engineering by introducing different engineering disciplines to middle- and high-school girls.

Women in Engineering (WIE) Graduate Student Panelist (2012)

The Georgia Institute of Technology; Atlanta, GA

Served as an invited panelist to answer undergraduate engineering students' questions on the topic "How to Apply for Graduate School."

Peer-Reviewed Articles for:

- Journal of Cleaner Production
- Journal of Professional Issues in the Engineering Education and Practice
- Canadian Journal of Engineering Education
- Frontiers in Education Conference
- American Society for Engineering Education Southeastern Conference
- American Society for Engineering Education National Conference
- First Year Engineering Education Conference
- Engineering Education for Sustainable Development Conference

Community Service

Co-Organizer of "Introduce a Girl to Engineering Day" (2013-current)

The Citadel; Charleston, SC

Interfaced with student and professional chapters of the Society of Women Engineers (SWE), as well as the Girl Scouts of Eastern South Carolina, to develop interactive projects to excite 100 middle-school-aged girls about engineering.

Organizer for the STEM Festival College of Engineering Booth (2014)

The Citadel; Charleston, SC

Led a group of undergraduate civil engineering students in developing an interactive project using K'NEX to introduce children of all ages to civil engineering.

President of Clemson Engineers without Borders (CU-EWB) (2005-2007)

Clemson University; Clemson, SC

Founded and organized CU-EWB to help students apply their engineering knowledge to improve the quality of life in developing and recovering areas.

Service Trip Coordinator (2006-2007)

Clemson University; Clemson, SC

Organized and led 10-35 undergraduates and graduates on three service trips to New Orleans, LA to aid in Hurricane Katrina relief.

HONORS AND AWARDS

Teaching and Learning Awards

Thomas C. Evans Best Instructional Paper Award (2017)

American Society for Engineering Education, Southeastern Section

Paper entitled "Assessing Conceptual Knowledge using Three Concept Map Scoring Methods" published in the Journal of Engineering Education.

New Faculty Excellence in Teaching Award (2016)

Committee on Faculty Development, American Society of Civil Engineers

Awarded to an untenured faculty on the basis of outstanding teaching record, as well as service to students.

New Faculty Excellence Award (2016)

The Citadel

Awarded to an untenured faculty on the basis of excellence in the classroom, as well as related service and scholarship.

Harry C. Saxe Teaching Award (2014, 2016)

Civil and Environmental Engineering Department, The Citadel

Awarded to the most outstanding instructor, as selected by the civil engineering faculty.

Best Paper Award (2015)

New Engineering Educators Division, The American Society for Engineering Education

Awarded to the best paper in the New Engineering Educators division: What Makes an Undergraduate Course Impactful? An examination of students' perceptions of instructional environments.

Outstanding New Teaching Award (2015)

Southeastern Section, American Society for Engineering Education

Awarded to a full-time faculty with no more than four years of experience, based on participation in development of courses/curricula and development or authorship of instructional materials that enhance student learning.

Certificate of Appreciation (2014, 2015)

Naval ROTC Unit, The Citadel

Selected by senior, contracted Navy students as a faculty who made a lasting impression on their professional growth and development.

Stephen J. Ressler Best Paper Award (2014)

Civil Engineering Division, American Society for Engineering Education

Awarded for the best paper presented in the Civil Engineering Division: Development and Application of a Sustainable Design Rubric to Evaluate Student Abilities to Incorporate Sustainability into Capstone Design Projects.

Mara H. Wasburn Early Engineering Educator Award (2014)

Women in Engineering Division, American Society for Engineering Education

Awarded to females at the entry/launch point of their engineering education career who have the potential to contribute to the engineering education community, specifically in the recruitment and retention of women.

Thank-A-Teacher Award (2012)

Center for the Enhancement of Teaching and Learning, The Georgia Institute of Technology

Anonymously recognized by an undergraduate student for the use of innovative teaching and learning practices in Civil Engineering Systems course.

Patricia K. Cross Future Leaders Award Nominee (2012)

Association of American Colleges and Universities

Nominated for award based on demonstrated commitment to leadership, service, and teaching excellence at Georgia Tech.

Teaching Assistant Fellow (2012)

Center for the Enhancement of Teaching and Learning, The Georgia Institute of Technology

Selected as an experienced teaching assistant to design and implement workshops for campus-wide teaching assistant orientations and graduate student professional development programming at Georgia Tech.

Thomas C. Evans Best Instructional Paper Award (2012)

American Society for Engineering Education, Southeastern Section

Paper detailing the development of a learning-cycle-based sustainability module was recognized as the most outstanding engineering education paper.

Graduate Engineering Education Consortium for Students Fellow (2012)

National Science Foundation (NSF)

Selected as an emerging engineering education researcher from a pool of national applicants to attend the NSF Engineering Education Awardees Conference.

Service and Leadership Awards

Young Civil Engineer of the Year (2016)

South Carolina Chapter, The American Society of Civil Engineers

Awarded to a civil engineer in South Carolina under the age of 35 who has demonstrated service and commitment to the profession.

Clark Lindsay McCaslan Award (2007)

Agricultural and Biological Engineering Department, Clemson University

Presented to a senior biosystems engineering student at Clemson University for outstanding scholarship, professional and extracurricular activities, as well as character and leadership.

Blue Key Academic and Leadership Award (2007)

College of Agriculture, Forestry and Life Sciences, Clemson University

Awarded to one student in each of the five colleges at Clemson University who distinguishes himself or herself in terms of academic scholarship and campus leadership.

Fellowships and Scholarships

Graduate Research Fellowship Recipient (2009)

National Science Foundation (NSF)

Supports outstanding graduate students in selected fields who are pursuing research-based master's and doctoral degrees.

President's Fellowship Recipient (2009)

Georgia Institute of Technology

Awarded to students that bring exemplary levels of scholarship and innovation to their academic departments.

Graduate Research Fellowship Honorable Mention (2008)

National Science Foundation (NSF)

Honors outstanding graduate students in selected fields who are pursuing research-based master's and doctoral degrees.

Wade Stackhouse Fellowship Recipient (2007)

Clemson University College of Agriculture, Forestry and Life Sciences

Awarded to select graduate students for academic and research excellence.

Palmetto Fellowship Recipient (2003-2007)

State of South Carolina

Provided to high school students earning at least a 3.5 high school GPA and 1200 SAT score.

Research Awards

Biological Engineering Colloquium Best Graduate Presentation Award (2008)

Agricultural and Biological Engineering Department, Clemson University

Awarded for exemplary presentation of graduate research at a colloquium held to showcase biosystems engineering research.

Natural Resources Symposium Best Undergraduate Presentation Award (2007)

Natural Resources Graduate Student Association, Clemson University

Awarded for exemplary presentation of research at a symposium held to showcase research within the College of Agriculture, Forestry, and Life Sciences.

Biological Engineering Colloquium Best Undergrad Presentation Award (2007)

Agricultural and Biological Engineering Department, Clemson University

Awarded for exemplary presentation of undergraduate research at a colloquium held to showcase biosystems engineering research.

B.C. Inabinet Medallion (2007)

Calhoun Honors College, Clemson University

Given to students at Clemson University in the Calhoun Honors College who complete honors coursework and an undergraduate research project with accompanying thesis.

PUBLICATIONS

Journal Articles

Watson, M.K. & Drapcho, C.M. Kinetics of Inorganic Carbon-Limited Freshwater Algal Growth at High pH. *Transactions of the American Society of Agricultural and Biological Engineers*, in press.

Watson, M.K. & Barrella, E. Using Concept Maps to Explore the Impacts of a Learning-Cycle-Based Sustainability Module Implemented in Two Institutional Contexts. *Journal of Professional Issues in Engineering Education and Practice*. 2016, D4016001.

Watson, M.K., Pelkey, J.G., Noyes, C., & Rodgers, M.O. Assessing Impacts of a Learning-Cycle-Based Module on Students' Conceptual Sustainability Knowledge using Concept Maps and Surveys. *Journal of Cleaner Production*. 2016, 133, 544-556.

Watson, M.K., Pelkey, J.G., Noyes, C., & Rodgers, M.O. Assessing Conceptual Knowledge using Three Concept Map Scoring Methods. *Journal of Engineering Education*. 2016, 105(1), 118-146.

Watson, M.K., Lozano, R.L., Noyes, C., & Rodgers, M.O. Assessing curricula contribution to sustainability more holistically: Experiences from the integration of curricula assessment and students' perceptions at the Georgia Institute of Technology. *Journal of Cleaner Production*. 2013, 61, 106-116.

Watson, M.K., Pelkey, J.G., Noyes, C., & Rodgers, M.O. Student perceptions of sustainability education in civil and environmental engineering at the Georgia Institute of Technology. *Journal of Professional Issues Engineering Education and Practice*. 2013, 139(3), 235-243.

Watson, M.K., & Lozano, R. Sustainability and chemistry education: Assessment of chemistry curricula at Cardiff University using the STAUNCH® System. *Educación Química*. 2013, 24(2), 184-192.

Watson, M.K., Tezel, U., & Pavlostathis, S.G. Biotransformation of alkanoylcholines under methanogenic conditions. *Water Research*. 2012, 46(9), 2947-2956

Book Chapters

Barrella, E. and M.K. Watson, *Comparing the Outcomes of Horizontal and Vertical Integration of Sustainability Content into Engineering Curricula using Concept Maps*, in *New Developments in Engineering Education for Sustainable Development*, W.L. Filho & S. Nesbit, Editors. 2016, Springer: Switzerland. p. 1-14.

Lozano, R.L. and M.K. Watson, *Assessing Sustainability in University Curricula: Case Studies from the University of Leeds and the Georgia Institute of Technology*, in *Sustainability Assessment Tools in Higher Education Institutions*, S. Caeiro, et al., Editors. 2013, Springer: New York NY. p. 359-373.

Conference Proceedings

Watson, M.K., Bower, K.C., & Davis, W.J. (2017) Advancing Diversity Initiatives in the Civil Engineering Profession: Impacts of an NSF S-STEM Grant at a Regional Undergraduate Teaching Institution. American Society for Engineering Education Annual Conference, Columbus, OH (**Draft Accepted**).

Watson, M.K. & Barrella, E. (2017) A Systematic Review of Sustainability Assessments in ASEE Proceedings. American Society for Engineering Education Annual Conference, Columbus, OH (**Draft Accepted**).

Barrella, E., Watson, M.K., & Anderson, R. (2017) Methods and Preliminary Findings for Developing and Assessing Engineering Students' Cognitive Flexibility in the Domain of Sustainable Design. American Society for Engineering Education Annual Conference, Columbus, OH (**Draft Accepted**).

Cowan, M., Barrella, E., & Watson, M.K. (2017) Validating Content of a Sustainable Design Rubric Using Established Frameworks. American Society for Engineering Education Annual Conference, Columbus, OH (**Draft Accepted**).

Barrella, E., Cowan, C., & Watson, M.K. (2017) Expert Evaluation of a Sustainable Design Rubric. American Society for Engineering Education Zone 2 Conference, San Juan, Puerto Rico.

Watson, M.K., Russo, L. & Michalaka, M. (2017) Introduce A Girl To Engineering Day: Assessment and Future Directions. American Society for Engineering Education Zone 2 Conference, San Juan, Puerto Rico.

Watson, M.K. & Barrella, E. Innovative Tools for Assessing Student Sustainability Knowledge. American Society for Engineering Education Zone 2 Conference, San Juan, Puerto Rico.

Barrella, E. & Watson, M.K. (2016) Developing a Cross-Disciplinary Sustainable Design Rubric for Engineering Projects. 8th International Conference on Engineering Education for Sustainable Development, Bruges, Belgium.

Watson, M.K., Barrella, E., & Pelkey, J.G. (2016) Concept Maps as Teaching, Learning, and Research Tools. 8th First Year Engineering Experience Conference, Columbus, OH.

Watson, M.K., Mills, A.R., Bower, K.C., Brannan, K., Woo, M.H., & Welch, R.W. (2015) Refinement of a Concept Inventory to Assess Conceptual Understanding in Civil Engineering Fluid Mechanics. American Society for Engineering Education Annual Conference, Seattle, WA.

Coso, A.E., Watson, M.K., & Llewellyn, D.C. (2015) What Makes an Undergraduate Course Impactful? An Examination of Students' Perceptions of Instructional Environments. American Society for Engineering Education Annual Conference, Seattle, WA.

Watson, M.K., Ghanat, S.T., Michalaka, D., Bower, K., Welch, R.W. (2015) Why Do Students Choose Engineering? Implications for First-Year Engineering Education. 7th First Year Engineering Education Conference, Blacksburg, VA.

Barrella, E. & Watson, M.K. (2015) Comparing the Outcomes of Horizontal and Vertical Integration of Sustainability Content into Engineering Curricula using Concept Maps (2015). 7th International Conference on Engineering Education for Sustainable Development. Vancouver, Canada.

Watson, M.K., Marley, K., Ghanat, S., & Michalaka, D. Using Student Attitudes to Inform the Design of a First-Year Civil Engineering Course (2015). American Society for Engineering Education Southeastern Conference, Gainesville, FL.

Watson, M.K., Pelkey, J.G., Noyes, C., & Rodgers, M.O. (2014). Using the SOLO Taxonomy to Analyze Student Sustainability Knowledge. American Society for Engineering Education Annual Conference, Indianapolis, IN.

Watson, M.K., Pelkey, J.G., Noyes, C., & Rodgers, M.O. (2014). Using Concept Maps to Analyze the Structure and Content of Student Sustainability Knowledge. American Society for Engineering Education Annual Conference, Indianapolis, IN.

Watson, M.K., Barrella, E., Wall, T., Noyes, C., & Rodgers, M.O. (2013). Development of a sustainable design rubric to assess student abilities to apply sustainability principles in engineering design. American Society for Engineering Education Annual Conference, Atlanta, GA.

Watson, M.K., & Coso, A. (2013). Deconstructing graduate students' philosophies of education. American Society for Engineering Education Annual Conference, Atlanta, GA.

Watson, M.K., Noyes, C., & Rodgers, M.O. (2012). Development of a Guided-Inquiry Module for Teaching Sustainability 'Through the Cycle'. Paper presented at the American Society for Engineering Education Southeastern Section Annual Conference, Starkville, MS.

Project and Technical Reports

Watson, M.K. Assessment of Student Knowledge of Sustainable Community Principles using Concept Maps. Submitted to the Center for Serve-Learn-Sustain at The Georgia Institute of Technology (2017).

Watson, M.K. Assessment of Student Knowledge of Sustainable Communities and Systems using Concept Maps. Submitted to the Center for Serve-Learn-Sustain at The Georgia Institute of Technology (2017).

Watson, M.K. & Mays, T. Environmental Impacts of the Wave Dissipation System. Submitted to SI Seawall and Fencing Services, LLC (2016).

PRESENTATIONS

Engineering Education

Watson, M.K., Pelkey, J.G., Noyes, C. & Rodgers, M. (Mar. 2017) Assessing Conceptual Knowledge using Three Concept Map Scoring Methods. Keynote Address at the American Society for Engineering Education Zone 2 Conference. Oral Presentation.

Barrella, E., Cowan, C., & Watson, M.K. (Mar. 2017) Expert Evaluation of a Sustainable Design Rubric. Presented at the American Society for Engineering Education Zone 2 Conference. Oral Presentation.

Watson, M.K., Russo, L. & Michalaka, M. (Mar. 2017) Introduce A Girl To Engineering Day: Assessment and Future Directions. Presented at the American Society for Engineering Education Zone 2 Conference. Oral Presentation.

Barrella, E. & Watson, M.K. (Sept. 2016) Developing a Cross-Disciplinary Sustainable Design Rubric for Engineering Projects. Presented at the 8th International Conference on Engineering Education for Sustainable Development.

Watson, M.K., Ghanat, S.T., Michalaka, D., Bower, K., & Welch, R.W. (Aug. 2015) Why Do Students Choose Engineering? Implications for First-Year Engineering Education. Presented at the 7th First Year Engineering Education Conference. Oral Presentation.

Barrella, E. & Watson, M.K. (Jun. 2015) Comparing the Outcomes of Horizontal and Vertical Integration of Sustainability Content into Engineering Curricula using Concept Maps. Presented at the 7th International Conference on Engineering Education for Sustainable Development. Oral Presentation.

Watson, M.K., Marley, K., Ghanat, S., & Michalaka, D. (Apr. 2015) *Using Student Attitudes to Inform the Design of a First-Year Civil Engineering Course*. Presented at the American Society for Engineering Education Southeastern Conference. Oral Presentation.

Watson, M.K., Pelkey, J., Rodgers, M.O., & Noyes, C.R. (Jun. 2014) *Exploring Student Sustainability Knowledge using the Structure of Observed Learning Outcomes (SOLO) Taxonomy*. Presented at the American Society for Engineering Education Annual Conference. Oral Presentation.

Watson, M.K., Pelkey, J., Noyes, C.R., and Rodgers, M.O. (Jun 2014) *Use of Concept Maps to Assess Student Sustainability Knowledge*. Presented at the American Society for Engineering Education Annual Conference. Oral Presentation.

Watson, M.K. & Strong, A.C. (Jun. 2013). *Examining Graduate Students' Philosophies of Education: An Exploratory Study*. Presented at the American Society for Engineering Education Annual Conference. Oral Presentation.

Watson, M.K., Barrella, E.M., Wall, T.A., Noyes, C.R., & Rodgers, M.O. (Jun. 2013) *Development and Application of a Sustainable Design Rubric to Evaluate Student Abilities to Incorporate Sustainability into Capstone Design Projects*. Presented at the American Society for Engineering Education Annual Conference. Oral Presentation.

Watson, M.K., Noyes, C., & Rodgers, M.O. (Oct. 2013). *Use of Concept Maps to Assess Student Learning*. Presented to the Citadel Academy for the Scholarship of Teaching, Learning, and Evaluation. Oral Presentation.

Watson, M.K., Noyes, C., & Rodgers, M.O. (2012). Development of a Guided-Inquiry Module for Teaching Sustainability 'Through the Cycle'. Keynote Address at the American Society for Engineering Education Southeastern Section Annual Conference, Starkville, MS.

Watson, M.K., Noyes, C., & Rodgers, M.O. (Mar. 2012). *Analyzing the Structure of Student Sustainability Knowledge Using Traditional and Holistic Concept Map Scoring Methods*. Presented at the Georgia Scholarship of STEM Teaching and Learning Conference, Statesboro, GA. Oral Presentation.

Watson, M.K., Noyes, C., & Rodgers, M.O. (Feb. 2012). *Analyzing Student Sustainability Knowledge Using Concept Maps*. Presented at the Georgia Tech Research and Innovation Conference, Atlanta, GA. Poster Presentation.

Biological and Environmental Engineering

Watson, M.K., Tezel, U., & Pavlostathis, S.G. (Apr. 2010). *Fate and Effect of Acetylcholine in Biological Treatment Systems*. Presented at the Association of Environmental Engineers and Scientists Symposium, Atlanta, GA. Poster Presentation.

Watson, M.K., & Drapcho, C.M. (Apr. 2008). *Growth and Modeling of Freshwater Algae as a Function of Media Inorganic Carbon Content*. Presented at the Institute for Biological Engineering National Meeting, Chapel Hill, NC. Poster Presentation.

Watson, M.K., & Drapcho, C.M. (Apr. 2008). *Growth and Modeling of Freshwater Algae as a Function of Media Inorganic Carbon Content*. Presented at the Natural Resources Symposium, Clemson, SC. Poster Presentation.

Watson, M.K., & Drapcho, C.M. (Apr. 2008). *Growth and Modeling of Freshwater Algae as a Function of Media Inorganic Carbon Content*. Presented at the Biological Engineering Colloquium, Clemson, SC. Oral and Poster Presentations; Received Best Graduate Presentation Award.

Watson, M.K., & Drapcho, C.M. (Apr. 2007). *Growth of Freshwater Algae as a Function of Media Inorganic Carbon Content*. Presented at the Institute for Biological Engineering National Meeting, St. Louis, MO. Oral Presentation.

Watson, M.K., & Drapcho, C.M. (Apr. 2007). *Growth of Freshwater Algae as a Function of Media Inorganic Carbon Content*. Presented at the Natural Resources Symposium, Clemson, SC. Oral Presentation; Received Best Undergraduate Presentation Award.

Watson, M.K., & Drapcho, C.M. (Apr. 2007). *Growth of Freshwater Algae as a Function of Media Inorganic Carbon Content*. Presented at the Biological Engineering Colloquium, Clemson, SC. Oral Presentation; Received Best Undergraduate Presentation Award.

Watson, M.K., & Drapcho, C.M. (Apr. 2007). *Growth of Freshwater Algae as a Function of Media Inorganic Carbon Content*. Presented at the Focus on Creative Inquiry Symposium, Clemson, SC. Poster Presentation.

Watson, M.K., & Drapcho, C.M. (Apr. 2006). *Growth of Freshwater Algae as a Function of Media Inorganic Carbon Content*. Presented at the Focus on Creative Inquiry Symposium, Clemson, SC. Poster Presentation.

Grant Proposals

Sustainable Design Framework for Developing and Assessing Engineering Students' Cognitive Flexibility (\$292,317)

National Science Foundation, Research in Engineering Education (Awarded Aug. 2015)
Co-Principle Investigators: Dr. Elise Barrella (lead), Dr. Jacquelyn K Nagel, Dr. Olga Pierrakos, Dr. Heather L Watson, Dr. Mary K. Watson

The primary goals of the project are to distill common principles/core competencies that can be used as a framework for teaching and evaluating sustainable engineering design in undergraduate college curricula and to assess the outcomes of applying this learning framework on students' development of cognitive flexibility.

Investigation of a Wave Dissipation System as a Soft Technology Option for Shoreline Erosion Mitigation at Kennedy Space Center (KSC) (\$24, 896)

National Aeronautics and Space Administration, Experimental Program to Stimulate Competitive Research (EPSCoR) (Submitted Aug. 2015)

Co-Principle Investigators: Dr. Timothy Mays (lead) and Dr. Mary Katherine Watson

The primary goal of this project was to evaluate the feasibility of implementing a wave dissipation system for mitigating erosion along the shoreline at KSC. Technical emphasis was on determining the extent to which the wave dissipation system could reduce sand loss at KSC. Additional objectives were to determine economic and environmental impacts of the wave dissipation system.

Aerobic Biodegradation of Quaternary Ammonium Compounds and Homologous Esterquats (\$3000)

The Citadel Foundation, New Faculty Research Grant (Funded Jan 2014)

Principle Investigator: Dr. Mary K. Watson

The goal of this project is to compare and model the effects of various surfactants on an aerobic culture derived from an activated sludge unit. Specifically, a traditional quaternary ammonium compound (dodecyl trimethyl ammonium) and its homologous esterquat (lauroylcholine) will be studied.

Analyzing Sustainability Knowledge using Surveys and Concept Maps (\$3000)

The Citadel Foundation, Faculty Research Grant (Submitted Jan 2014)

Principle Investigator: Dr. Mary K. Watson

The goal of this project is to examine the use of student surveys and concept maps for assessing sustainability knowledge across the novice-expert spectrum. Specifically, the sustainability knowledge of engineering students and professors at two institutions that have incorporated sustainability to different degrees within their curricula will be investigated.

PROFESSIONAL CERTIFICATIONS AND DEVELOPMENT

Professional Certificates

Envision™ Sustainability Professional (August 2014)

Institute for Sustainable Infrastructure; Washington, DC

Trained to use the Envision® sustainable infrastructure rating system as a guide to address triple bottom line sustainability dimensions in the design, construction, and operation of an infrastructure project.

Engineer in Training (April 2008)

National Council of Examiners for Engineering and Surveying; Seneca, SC

Passed the Fundamentals of Engineering Exam administered in South Carolina, including the environmental afternoon session.

Public Policy Certificate (May 2011)

Georgia Institute of Technology; Atlanta, GA

Completed 12 graduate credit hours in Public Policy. Courses completed: Fundamentals of Policy Processes; Energy Technology and Policy; Earth Systems; Public Policy and Finance

Seminars and Other Long-Term Training

Scholarship of Teaching and Learning Journal Club (Aug. 2011 – May. 2013)

Georgia Institute of Technology; Atlanta, GA

Faculty and graduate students gather to discuss and critique current research publications pertaining to teaching and learning in higher education.

Glimpses of Educational Innovation (Jan. 2012 – May 2012)

Georgia Institute of Technology; Atlanta, GA

Seminar where students observe different pedagogical practices being applied across campus and then discuss related learning theories

Workshops Attended

How Do I Know if My Students Can Handle Wicked Problems? (Sept. 2016)

8th Annual Engineering Education for Sustainable Development Conference

Strategies for guiding students in addressing ill-structured, wicked, real-world problems that are characterized by a high degree of complexity and open-endedness.

I'm an Academic Adviser – Now What? (Aug. 2016)

8th Annual First Year Engineering Experience Conference

Presentation of four key aspects of advising, including degree requirements, academic policies and procedures, the students themselves, and documentation.

Resources and Strategies for Addressing ASCE'S New ABET Criterion on Sustainability (Jun. 2016)

2016 American Society for Engineering Education Annual Conference and Exposition

Discussion of numerous resources for integrating sustainability into civil engineering curricula through modular, full-course, and other approaches.

Fundamentals of Qualitative Research (Jul. 2015)

Research Talk, Inc. and The Odom Institute at The University of North Carolina

Intensive two-day introductory overview of basic approaches to and methods for qualitative inquiry. Topics include: styles of qualitative research, data collection methods, research design, and data analytic methods.

8 Criteria for Creating Quality in Qualitative Research (Jul. 2015)

Research Talk, Inc. and The Odom Institute at The University of North Carolina

One-day workshop that presents a parsimonious “big tent” model of eight key markers of quality in qualitative research: worth topic, rich rigor, sincerity, credibility, resonance, significant contribution, ethics, and meaningful coherence.

Coding and Analyzing Qualitative Data (Jul. 2015)

Research Talk, Inc. and The Odom Institute at The University of North Carolina

Two-day workshop that focuses on a range of selected methods of coding qualitative data for analytic outcomes that includes patterns, categories, themes, processes, and causation.

Social Life Cycle Assessment (Aug. 2015)

7th Conference on Engineering Education for Sustainable Development; Vancouver, BC

Workshop including discussion of social life cycle assessment in the context of broader life cycle sustainability assessment.

Envisioning the First-Year Engineering Body of Knowledge (Aug. 2015)

7th Annual First Year Engineering Education Conference; Blacksburg, VA

Workshop designed to discuss, apply, and critique a taxonomy of first-year engineering course content and types of courses.

Classroom Assessment Practices (Aug. 2015)

7th Annual First Year Engineering Education Conference; Blacksburg, VA

Workshop including discussion of quantitative and qualitative assessment tools, techniques, practices, and resources.

Engineering Positive Space: Promoting Inclusivity (Jun. 2014)

American Society for Engineering Education Annual Conference; Indianapolis, IN

Workshop including discussion and planning of initiatives to promote inclusivity of all students on campus.

Excellence in Civil Engineering Education (ExCEED) Mini-Workshop (Jan. 2014)

The Citadel; Charleston, SC

Two-day workshop to discuss strategies for effective instruction, including consideration of diverse learning styles, use of board notes, and outline of learning objectives.

Treating Students Equally in Class While Also Honoring Diversity (Sept. 2012)

Georgia Institute of Technology; Atlanta, GA

Workshop disseminated to discuss research-based strategies for promoting equity and diversity in large classes.

Using Minute Papers to Stimulate Self-Directed Learning (Feb. 2012)

Georgia Institute of Technology; Atlanta, GA

Workshop designed to introduce educators to the use of minute papers as a formative assessment technique.

Engaging Millennial Learners (Jan. 2012)

Georgia Institute of Technology; Atlanta, GA

Workshop focused on increasing student engagement by creating learning environments that are linked to current student culture.

Applying Insights from Learning Theory to Classroom Challenges (Nov. 2011)

Georgia Institute of Technology; Atlanta, GA

Workshop aimed to encourage participants to consider educational research in development and evaluation of teaching and learning activities.

Implementing Process Oriented Guided Inquiry Learning (Oct. 2011)

Georgia Institute of Technology; Atlanta, GA

Workshop that allows faculty to discuss difficulties encountered when instituting innovative pedagogical practices.

Failure to Plan is a Plan to Fail: Lesson Planning for Success (Sept. 2011)

Georgia Institute of Technology; Atlanta, GA

Workshop designed to introduce teaching assistants to integrated lesson planning to improve current and future teaching practices.

Workshops Facilitated

Innovative Tools for Assessing Student Sustainability Knowledge (Mar. 2017)

American Society for Engineering Education Zone 2 Conference

Workshop compiled and disseminated based on a systematic review of assessment tools for capturing student knowledge of sustainability and sustainable design.

Concept Maps for Assessment of Serve-Learn-Sustain (Jan. 2017)

Georgia Institute of Technology Center for Serve-Learn-Sustain

Specialized workshop for using concept maps to assess student conceptual development as it relates to sustainable communities.

Concept Maps as Teaching, Learning, and Research Tools (Aug. 2016)

8th First Year Engineering Experience Conference

Workshop designed to guide participants in developing and scoring concept-map-based assessment strategies for assessing conceptual understanding in engineering education.

Building Consensus on an Cross-Disciplinary Sustainable Design Rubric (Jun. 2016)

NSF-Sponsored Research in Engineering Education Grant

Interactive workshop designed to gather participants' perspectives on critical and cross-disciplinary aspects of sustainable design.

Using Active Learning in the Classroom (Feb. 2013)

Georgia Institute of Technology; Atlanta, GA

Workshop presented to graduate teaching assistants to aid them in selecting and applying active teaching and learning techniques in undergraduate psychology classes.

Dealing with Difficult Students (Oct. 2012)

Georgia Institute of Technology; Atlanta, GA

Workshop delivered to graduate teaching assistants to identify strategies for handling defiant, disruptive, and disengaged students.

Crafting Clear Explanations (Oct. 2012)

Georgia Institute of Technology; Atlanta, GA

Workshop disseminated to graduate teaching assistants to discuss strategies for overcoming the expert-novice dilemma.

Answering Student Questions (Sept. 2012)

Georgia Institute of Technology; Atlanta, GA

Workshop designed for graduate teaching assistants to identify barriers to and strategies for effectively answering student questions.

Overtaching: Illusions of Rigor (Aug. 2012)

Georgia Institute of Technology; Atlanta, GA

Workshop developed for graduate teaching assistants to debunk the misconception that poor student performance is an indicator of a difficult or “rigorous” course.

PROFESSIONAL AFFILIATIONS

American Society for Engineering Education, 2011-Present

American Society of Civil Engineers, 2012-Present

Society of Women Engineers, 2013-2014

Institute for Biological Engineering, 2006-2009

REFERENCES

Dr. Kevin C. Bower

Institution: The Citadel; Charleston, SC

Relationship: Department Head

Title: Professor and Chair, Civil and Environmental Engineering

Email: kevin.bower@citadel.edu

Phone: 843-225-3294

Dr. Michael O. Rodgers

Institution: Georgia Institute of Technology; Atlanta, GA

Relationship: Dissertation Committee Chair

Title: Principal Research Scientist in Civil and Environmental Engineering

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Phone: 404-385-0569

Dr. Donna Llewellyn

Institution: Boise State University

Relationship: Dissertation Committee Member

Title: Executive Director of the Institute for STEM and Diversity Initiatives

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