SECTION 07: EVALUATION OF TEACHING AND SCHOLARSHIP OF TEACHING

EVIDENCE OF THE QUALITY OF TEACHING AND ADVISING:

Teaching Awards:

In 2013, peers from the School of Engineering and Technology voted to award me the Frank E. Burley Distinguished Professor Award, due in large part to my mentoring of so many students. I have advised twenty-two students on their thesis or directed projects, eighteen students on multidisciplinary undergraduate research experiences, two international students on research internships projects, and one undergraduate on a Rhodes Scholar project. Additionally I advised two student clubs, one of which included extensive mentoring on the design of a school/community center in Ecuador.

In 2014, peers from the School of Engineering and Technology continued acknowledging my dedication to student achievement, by selecting me for the 2014 Outstanding Teacher Award. This recognition was due in large part to very positive peer evaluation of my courses, the large number of grants that allowed me to mentor students, and the high (3.27/4) weighted student course evaluation scores the prior year.

Peer Evaluation:

One of the central elements in constructivist theory is a concept called scaffolding. Scaffolding occurs when an individual at one level of cognitive development interacts with an individual at a higher level of cognitive development and negotiates a new understanding in that context (e.g., Dewey, 1938, Piaget, 1951, Vygotsky, 1978, and Kolb, 1984). In this spirit, I have reached out to higher ranked peers to evaluate my teaching and course resources. Four higher ranked peers evaluated my teaching and one peer evaluated the content, structure, and layout of a hybrid online course. In fall 2010, Dr. Barb Christe, Biomedical Engineering Technology, Faculty Colloquium on Excellence in Teaching (FACET) member, evaluated ECET-499 and MET-499 Alternative Energy Systems. She stated, “Overall, Dr. Goodman’s classroom activities and presentation style are quite good. He offers a comfortable learning environment that fosters analytical and critical thinking.” The reviewer encouraged me to explore techniques to design group work activities in order to move towards the upper end of excellence, so as an example, I incorporated a roundtable process where students can review and critique each other’s work on project design, documentation, poster design, etc. in various classes.

In fall 2011, Jennifer Beasley, Center for Teaching and Learning, conducted an online content evaluation of TECH-30300 and states, “In this online course Professor Goodman provided an experience that incorporated good teaching techniques and encouraged student learning” and “Most resources and materials are easily accessible.” Based on her recommendations, I changed the Home page of all my courses to make the course sites more welcoming and give more guidance about contacting me and where to begin in the site and the courses. I added items to the syllabus including details for handling technical problems, and location of assignment details. In the future, I plan to address accessibility for the hearing impaired by creating transcripts of course presentations.

In spring 2012, Professor Brian Kinsey, Construction Engineering Management Technology, evaluated ECET-491 Senior Capstone and stated, “My impressions of his classroom management and presentation skills are most favorable” and “I was very satisfied with David’s teaching strategy and his commitment to the students and his desire to draw the best effort from the students.” Professor Kinsey did not suggest any specific improvements, but verified that my methods were sound which provided confidence to move forward with other changes. I decided to add an online open question forum to a few classes, so that students could ask questions outside of class and I or other students could respond.

Next, in fall 2013, Professor Ken Rennels, Mechanical Engineering Technology, evaluated TECH-581 Energy Assessment and stated, “Delivery of technical content is difficult via online courses. The format and delivery method for this course dealt with these issues very well” and “Instructor’s tone, comments and demeanor demonstrated his interest and knowledge of the subject area. Questions were responded to in a positive, supportive manner.” Professor Rennels also did not suggest specific improvements, but his positive comments on using non-PowerPoint instruction methods led me to incorporate more non-traditional aids in my courses. I have developed videos for how to use lab equipment, included YouTube videos, and uploaded audio files for recorded question and answer sessions.

The fifth evaluation, in fall 2013, was performed by Dr. Sohel Anwar, Mechanical Engineering, in ME-50103 Industrial Energy Assessment: Tools and Applications. He stated,”He was very thorough in the coverage of the subject matter that included step by step process and captured the details.” He noted my style of dialog, “Dr. Goodman not only answered their questions, but also provoked more questions that were aimed at better understanding of the subject matter. He shared examples from IAC (Industry Assessment Center) energy audits which connected the classroom activities directly to an industry application,” and how I utilize concrete, authentic examples to explicitly tie theory to practice. Dr. Anwar suggested that, “Utilization of other audio-visual tools such as pen and tablet would further enhance Dr. Goodman’s already superior teaching.” Therefore, I spoke to an assistant in the Center for Teaching and Learning about other technologies and plan to incorporate the pen and tablet in the spring 2015 courses.

EVIDENCE OF EFFECTIVE TEACHING THROUGH SCHOLARLY DISSEMINATION OF KNOWLEDGE ABOUT TEACHING:

I understand the value of dissemination, having received schedules, syllabi, and course material to develop or change the courses I have taught. I have shared lectures, quizzes, syllabi, etc. with various local professors, and colleges in the Midwest Solar Training Network, but the most prized are peer-reviewed publications, which I will list below:

Listed below are peer-reviewed journal publications:

- Goodman, D., Fox, P., Cowan, J., and Tabas, J. (2013). How to Establish Successful International Experiences for Engineering and Technology Students. *Technology Interface International Journal* (TIIJ): Volume 14, Number 1, Fall/Winter 2013, Page 108-113.
    - TIIJ has an impact factor of 1.02, placing it among an elite group of most-cited engineering journals worldwide, and is the #4 visited engineering journal website (according to the National Science Digital Library).
    - I discussed how to more deeply engage students in service and experiential learning and to include international experiences in college life. My primary example described using an international service club, Engineers Without Borders, to achieve the goal.
- Goodman, D., Fox, P., and Cowan, J. (2014). Educating Engineers and Technologists for a Green/Sustainable Future. *Journal of Engineering Technology* (JET). Volume 31, Number 1, Spring 2014, Page 26-36.
    - JET is the flagship journal of the Engineering Technology Division of the American Society for Engineering Education, which is the flagship organization for engineering educators.
    - I described a phased approach to improving student preparation for employment in the high technology workforce of this century and beyond by developing certificate and degree programs that prepare engineers for a greener, more sustainable future. This article was one of the outcomes of the IUPUI Curriculum Enhancement Grant.
- Goodman, D. (2015). Effects of an Informal Energy Exhibit on Knowledge and Attitudes of Fourth Grade Students. Journal of Education and Learning. Vol.9 (2) pp. 145-157.
    - Our library considers all journals listed in the Directory of Open Access Journals respectable, however the 2014 impact factor has not been calculated.
    - In this paper, I developed an educational exhibit and determined educational impact in a museum, community center, and school. The mixed method study revealed that knowledge gain was not significant but that attitude was positively impacted. A follow on study of fifth grade students will be submitted shortly and reveals significant impact on both knowledge and attitude which suggest a developmental level may be present.

Listed below are peer-reviewed conference proceedings:

Since the American Society for Engineering Education is the premier society for engineering educators and has over 12,000 members and 3-4,000 typically attend the annual conference, most of my conference proceedings have been submitted to this organization.

- Goodman, D. and Durkin, R. (2012). AC 2012-4428: Energy Demos: Class Project versus Commercial Equipment. American Society for Engineering Education Conference, Atlanta. This paper illuminated the pros and cons (pedagogical, time, cost, etc.) of having students design/build laboratory demonstration equipment versus commercial equipment.

- Goodman, D. and Cooper, H. L. (2011). AC 2011-1636: Informal Energy Education: Fuel Cell Exhibit Pilot Study. American Society for Engineering Education Conference,

Vancouver. This paper discussed developing museum style exhibits for informal public spaces such as community centers, parks, etc. to educate the public about renewable energy topics. This work continued with a quantitative and qualitative study of the effect on fourth and fifth grade aged students in informal environments and has been submitted (but not yet accepted) to a journal.

- Cowan, D. J., Fox, P., Tabas, J., Goodman, D., et. al. (2010). AC 2010-551: The DORMaTECHture Project: A Multi and Interdisciplinary Educational Experience. American Society for Engineering Education Conference, Louisville. This paper discusses the pedagogical impact of a project to convert a shipping container into student housing (and other applications). It brought together students from in and out of the classroom, along with faculty from various disciplines, professionals, and trades people … it educated everyone in how different groups approach an issues and how different stakeholders come together to make progress on a project.

- Chen, R., Goodman, D., Izadian, A., and Cooney, E. (2010). AC 2010-229: Teaching Renewable Energy through Hands-on Project-Based Learning for Engineering Technology Students. American Society for Engineering Education Conference, Louisville. This paper explored the application of hands-on, project-based learning methods for teaching renewable energy courses to engineering technology students. We demonstrated that hands-on teaching methods are effective for introducing various renewable energy concepts and practical skills to engineering technology students across four focus areas within two program disciplines.

- Cowan, D. J., Fox, P., Hundley, S., **Tabas, J., and Goodman, D. (2010). Sustainability and Education: The Need for New Degree Options. American Society of Civil Engineers: Earth Space Conference, Honolulu. Page 3821-3832. This paper looked at integrating sustainability into existing curriculum as well as the possibility and attributes of new degree programs designed to address the new green economy. It also addressed how sustainable knowledge affects a graduate's ability to establish a green career and how the future green global workforce will address stakeholders' needs and expectations.

- Fox, P., Hundley, S., Cowan, D. J., **Tabas, J., and Goodman, D. (2009). Teaching Sustainability: Course, Program and Degree Considerations. Portland International Center for Management of Engineering Technology Conference, Portland. Page 2240-2245. This paper outlined how sustainability can be taught in multiple disciplines within Engineering & Technology, and how sustainability might be integrated into the curriculum from three perspectives: course, program and degree.

Listed below are presentations:
The following presentations are important because they educated the public and manufacturing industries about energy, energy efficiency, and issues related to sustainable energy and how they can be developed for the public good and corporate profitability.

- Goodman, D. Presentation: Role and Impact of the Industrial Assessment Center on Triple Bottom Line of Indiana Manufacturers. Indiana Automotive Council. 2014, Indianapolis.

- Goodman, D. Panel Discussion: Role of Solar in Microgrids. Microgrid Interconnections and Energy Storage Symposium. 2014, Indianapolis.
- Goodman, D., Grocox, A., and Striebeck, C. Panel Discussion: Solar Workforce. WIndiana Conference. 2011, Indianapolis.
- Goodman, D., Hammond, S., and Bowman, L. Panel Discussion: Intercultural Experience Panel. Engineers Without Borders: Great Lakes Regional Conference. 2010, Indianapolis.

I also disseminated lecture, quiz, etc. material to the Midwest Solar Training Network, which provides teaching material (primarily to community colleges in nine Midwest states). My material was accessed 117 times, as shown in Figure 1.

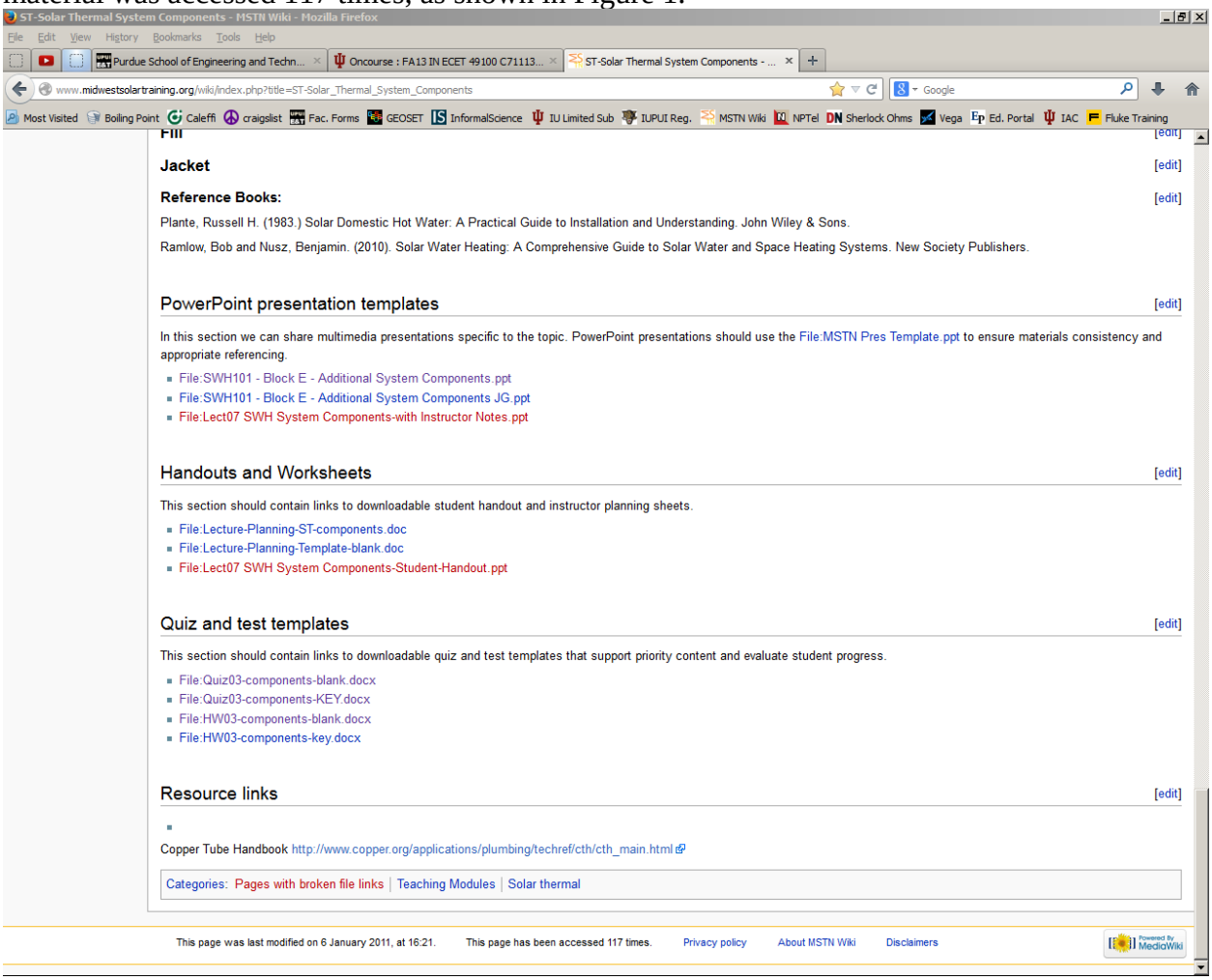

Figure 1: MSTN Dissemination Image

EVIDENCE THAT COURSES TAUGHT CONTRIBUTE TO THE OVERALL STUDENT LEARNING OUTCOMES:

The capstone project for ECET majors is a perfect occasion for students to showcase the information they have amassed during their college career and apply it all to a real world discipline-specific situation, which is also why it is the most assessed course in our program. I will use data from the 2013 accreditation visit, by our accrediting board ABET-ETAC, to show student learning outcomes and how the changes I made in the course improved perceived rigor and quality of the graduating students. In the ABET outcome file, the department chair stated "In 2011 many projects were iPhone apps, some faculty saw this as less rigorous than traditional projects …" So in the fall of 2011, I took over the capstone course and modified the deliverables and individually met with each student. In 2014, the department chair polled faculty and the Industrial Advisor Board and stated "The perceived quality and rigor improved based on faculty and industrial board feedback at the end of semester presentations."

In collaboration with department faculty I developed a plan to collect student outcome data, shown in Table 1. To implement the plan I developed three new rubrics and three assignments to provide data. Going forward the rubrics and results will be presented annually to the department.

Table 1: ECET-49100 Senior Capstone Phase 2 Performance Metrics Plan

ABET Student Outcome	Performance Indicators	Method(s) of Assessment	Where data are collected
4. Apply and design components, circuits, systems and software programs in their specialty area as demonstrated in a senior project.	Students will complete a project that specifically integrates circuits and components into a new system.	The design rubric will be filled out by the faculty member assessing the senior design project.	Design Rubric applied to Final Report
5. Conduct, analyze and interpret experiments, and assess experimental results to improve processes.	Students will debug hardware systems.	EET senior project students will demonstrate working hardware.	Project Demonstration Day Signoff*
7. Write technical reports; present data and results coherently in oral and graphic formats.	Oral reports communicate concepts effectively and demonstrate appropriate oral presentation skills.	Oral reports will be evaluated using departmental oral report rubric.	Oral & Poster Presentation Rubrics
8. Demonstrate skills for life-long learning by locating, evaluating, and applying relevant information using external resources such as the internet, data books, trade publications, and library resources.	Students will acknowledge the need for continuous self-improvement throughout an engineering career.	Survey students	Lifelong Learning Survey
11. Demonstrate a commitment to quality, timeliness and continuous improvement by exhibiting the ability to complete increasingly complex homework and projects throughout the degree experience.	Students will demonstrate project management skills. Students will complete their senior projects on time.	Assess milestone / Gantt charts for each student project.	Weekly progress reports. Gantt chart in Final Report.
	Students will complete a senior project of good quality and complexity.	Assess quality of construction/ software of senior design projects.	Project Rubric applied to Final Report

Partial lists of the results are shown in Table 2. Quantitative data for the course, before I became coordinator, is not available. However, data for the past year is shown in Table 2. The data shows that my ECET-491 students have well exceeded the target metrics of 70%.

Table 2: ECET-49100 Senior Capstone Phase 2 Performance Metrics Results (Source: ABET EET Accreditation Report)

ABET Student Outcome	2013 Fall Performance	2014 Spring Performance
4. Apply and design components, circuits, systems and software programs in their specialty area as demonstrated in a senior project.	8 of 10 students (80%) successfully demonstrated a functional project that met quality guidelines (3 or higher on all rubric items).	16 of 17 students (94%) successfully demonstrated a functional project that met quality guidelines (3 or higher on all rubric items).
11. Demonstrate a commitment to quality, timeliness and continuous improvement by exhibiting the ability to complete increasingly complex homework and projects throughout the degree experience.	10 students completed a Gantt chart of their capstone project and 70% were no more than one milestone behind schedule. 90% completed the capstone project on time and demonstrated good project management skills.	17 students completed a Gantt chart of their capstone project and 82% were no more than one milestone behind schedule. 82% completed the capstone project on time and demonstrated good project management skills. 17% needed an extension, but 100% completed the capstone project.
	10 students completed a capstone project and 80% had a quality/complexity score above 4 on the rubric.	17 students completed a capstone project and 100% had a quality/complexity score above 4 on the rubric.

The assessment data obtained indicates students are being well prepared throughout their college career to attain the student outcomes, though there is room for improvement. Reflecting on the outcomes has shown that a small portion of students fall behind schedule by at least one milestone, in the coming semester I plan to assess the strength of the project from phase 1 during the first week and identify which students are more likely to fall behind. Then I will setup extra personal meetings with those students to mentor them and keep them on track.

EVIDENCE OF UNDERGRADUATE OR GRADUATE RESEARCH AND EFFECTIVE MENTOR RELATIONSHIPS WITH STUDENTS:

Listed below are student posters:

These were not peer-reviewed, but they are important because they provide students with an entry point into scholarly publication and presentation. Anecdotal evidence for this importance is that at least two of the students listed below have applied for master's degree programs.

- **Nguyen, T., **Moghaddam, D., **Hamid, R., and Mentors: Goodman, D., Mikesky, A., and Tabas, J. VIRO: The Future of Online Learning Interfaces. CRL – Research Day Poster Symposium, April 2013.
- **Nguyen, T., Goodman, D. and Petrache, H. "Hydrogen Generation from Water Disassociation Using Small Currents and Harmonics," IUPUI Research Day, April, 2013.
- **Alshehri, S., Izadian, A., and Goodman, D. "A New Inverter Design and Parameter Sizing Procedure," MURI Poster Presentation, IUPUI, Summer 2012.
- **DiGregory, C., Izadian, A., and Goodman, D. "Combined Adaptive Controller for A Buck Boost Circuit," MURI Poster Presentation, IUPUI, Summer 2012.
- **Jones, G., Izadian, A., and Goodman, D. "A New Power Inverter Circuit Analysis, Modeling, and Operation," MURI Poster Presentation, IUPUI, Summer 2012.

EVIDENCE OF THE NATURE AND QUALITY OF COURSE AND CURRICULUM DEVELOPMENT AND IMPLEMENTATION:

I have implemented changes to each course I have taught at IUPUI to better align with my beliefs about constructivist learning, things such as forum discussions, online student centered question and answer aids, group projects, real world service projects, etc. but I'll focus this section on new course development and new certificate development. All but one of the following courses is offered on an annual rotation.

MET 38800 – Thermodynamics and Heat Power

This is a Mechanical Engineering Technology course covering the topic of thermodynamics and how it can apply to heat and power. In this course, students learn about the refrigeration and steam cycles and the 1st and 2nd laws of thermodynamics. They see how these principles are applied in a virtual tour of a power plant, as well as an actual tour of an ice company.

The course description is as follows:

MET 38800 – Thermodynamics and Heat Power Credit (4): Class (3) Lab (1)

Course provides the engineering technology student with an introduction to the principles of thermodynamics and heat transfer. Basic thermodynamic processes are used to evaluate the performance of energy-based systems such as internal combustion engines, power plants, and refrigeration equipment.

MET/ECET 49900 – Alternative Energy Systems

This was a cross listed Mechanical Engineering Technology and Electrical and Computer Engineering Technology course on Alternative Energy Systems. I taught about several different energy sources that are alternative to conventional fossil fuels, such as photovoltaics, wind energy, geothermal, battery and fuel cell technology, and hydroelectric. I work with the students to design a residential solar thermal and electrical system and allow them to work hands-on with this technology and build a working demo as the class project. It was a great course that meet the

department goal of providing hands-on construction and project management skills, but went away to make room for an online version for the Sustainable Technologies Certificate.

The course description is as follows:
MET/ECET 49900 – Alternative Energy Systems (4 credits) Class 3, Lab 2.
Course provides the engineering technology student with an introduction to renewable energy. Topics include photovoltaics', solar thermal systems, fuel-cells, hydrogen, wind power, waste heat, biofuels, wave/tidal power, geothermal power and hydroelectric. Discussions of economic, environment, politics and social policy are integral components of the course. Additionally, residential/commercial scale PV and ST systems will be designed and constructed in the lab section.

Sustainability Technologies Certificate: managed by the Engineering Technology Department in collaboration with four programs within the school and in partnership with the School of Public and Environmental Affairs:

Since starting at IUPUI in 2009, I have worked with a multidisciplinary group to develop a new Sustainable Technology Certificate (it was approved in 2012) and I have collaborated on developing seven new course offerings, six of which are required for the certificate and two of which I teach annually.

- TECH-20100 Introduction to Sustainable Principles and Practices
- TECH-30100 Renewable Energy Systems
- TECH-30200 Introduction to Green Building Technologies
- TECH-30300 Energy Efficiency and Auditing
- TECH-30400 Green Building Information Modeling
- TECH-40100 Leadership and Economic Aspects of Sustainable Technologies
- TECH-40200 Emerging Green Technologies

TECH 30100 – Renewable Energy Systems
This course also provides more of an overview of the topics covered in-depth in the higher level course. I have had so much success in this course that SPEA at IUPUI is now making this course required for their students starting in the fall of 2012.

The course description is as follows:
TECH 30100 – Renewable Energy Systems Credit (3): Class (3) Online.
Course provides the student with an introduction to renewable energy. Topics include photovoltaics', solar thermal systems, fuel-cells, hydrogen, wind power, waste heat, biofuels, wave/tidal power, geothermal power and hydroelectric. Discussions of economic, environment, politics and social policy are integral components of the course. Additionally residential/commercial scale systems will be designed: this year's project will be for a school in Haiti.

TECH 30300 – Energy Efficiency and Auditing
This is an introductory level course that focuses on familiarizing students with basic processes, such as thermodynamics and electricity, and how these basic processes apply on a residential scale, such as with lighting and heating/cooling.

The course description is as follows:
TECH 30300 – Energy Efficiency and Auditing Credit (3): Class (3) Online.
Course provides an introduction to energy efficiency and energy auditing. Students will analyze audit data, research energy improvement measures, and prepare recommendations. Topics include energy audit process, energy audit reports, energy bill analysis, economic analysis, audit instrumentation, and will include a subset of the following: building envelope, electrical system, HVAC system, waste heat recovery, lighting, and other prevalent commercial/industrial systems.

TECH 58100 –Energy Assessment
This is an industrial energy auditing course which extends the knowledge in TECH 30300 to a graduate level and changes the focus to industrial scale facilities and/or high rise buildings. In this course, students look at various power and heat production technologies on the industrial scale, including steam, boilers, and chillers. The course is completely online and focuses on understanding energy usage, hand calculations, and economic justification.

The course description is as follows:
TECH 58100 –Energy Assessment Credit (3): Class (3) Online.
Course synthesizes advanced energy efficiency, energy auditing, and energy management methods and practices. The fundamentals of several types of industrial energy audits will be analyzed with respect to the methods, hand calculations, data measurement techniques, and reporting in industrial applications. Topics include energy audit process, energy bill analysis, economic analysis, measurement instrumentation, building envelop, electrical system, HVAC system, waste heat recovery, lighting, cogeneration, and other prevalent industrial systems. Evaluation of economic, environment, politics and social policy are integral components of the course.

TECH 58100 –Renewable Energy Technologies
This course was co-developed and is co-taught with Dr. Rongrong Chen in Mechanical Engineering Technology. She developed the portions related to fuel cells and batteries and I developed portions related to wind and solar energy.

The course description is as follows:
TECH 58100 – Renewable Energy Technologies Credit (3): Class (3) Online.
This course intends to provide engineers and students with a comprehensive yet practical guide to the characteristics and principles of operation of the most dominant renewable energy systems, including solar energy, wind turbines, battery and fuel cells, biomass, and geothermal energy. The course focuses on the design, manufacturing and application of renewable energy storage devices, with special emphasis on batteries and fuel cells, through project assignments.

Certificate of Energy Management and Assessment: managed by the Department of Mechanical Engineering.

This certificate concept was part of the US Department of Energy (DOE) grant proposal that Dr. Jie Chen and I developed. Once it was awarded, Dr. Razban and I collaborated on the course development. I teach the ME 50103 annually.

- ME50101 Energy Assessment of Industrial Processes
- ME50102 Energy Management Principles
- ME50103 Industrial Energy Assessment: Tools and Applications
- ME59700 Industrial Energy Audit

ME 50103/ME 59700 –Industrial Energy Assessment: Tools and Applications
This course provides fundamental knowledge of industrial energy auditing, waste stream auditing, and productivity auditing. It makes extensive use of DOE software to analyze and justify assessment recommendations. The first offering of the course (ME 59700) was as a hybrid, live lectures with video streaming. I modified it for the second offering to be completely online, but due to student feedback and the need for a live element to deal with industry applications, demonstrations, etc. it will henceforth always be a hybrid course.

The course description is as follows:
ME-50103 – INDUSTRIAL ENERGY ASSESSMENT: TOOLS AND APPLICATIONS
Credit (3): Class (3). Hybrid with video streaming. Course synthesizes advanced energy efficiency, energy auditing, and energy management methods and practices, as well as waste-stream and productivity assessments in industry. Tools to analyze and document savings for various applications will be stressed, many of which are provided by the US Department of Energy. Topics include energy audit process, energy bill analysis, economic analysis, measurement instrumentation, building envelop, electrical system, HVAC system, waste heat recovery, lighting, cogeneration, and other prevalent industrial systems and applications. Industrial scale energy audits will be conducted by student teams.

Future Course Development Plans:
Depending on graduate student enrollment, I plan to develop two more graduate courses in the Sustainable Energy focus area that support the departments goal for preeminence in Energy.

(future) TECH 58100 – Thermal Renewable Energy Systems
This course provides an in-depth look at renewable energy systems with thermodynamics as guiding principles of the technology, such as solar thermal and geothermal. Students become familiar with the basics of thermodynamics and then see how those basic principles apply to make these technologies work.

(future) TECH 58100 – Electrical Renewable Energy Systems
This course provides an in-depth look at renewable energy systems with electricity and magnetism as guiding principles of the technology, such as photovoltaics, wind, and hydroelectric. Students become familiar with the basic physics of electricity and magnetism and then see how those basic principles apply to make these technologies work.

THE NUMBER OF STUDENT GRADUATE COMMITTEES THE CANDIDATE HAS SERVED ON OR CHAIRED:
I have co-chaired one thesis committee and currently chair a second thesis committee. I chaired or co-chaired eight directed project committees, been an active member on for thesis committees and nine directed project committees. This is an excellent way to help graduate students achieve advanced learning and is a win-win proposition despite the increased commitment. I have listed

the students below, Jing and Arash are still working on their theses, Cameron, Chad, Mark, Jacob, and Jon decided to go to industry before completing the degree, and the rest have received their degrees and are working in industry.

Mentor (Graduate-Thesis-Chair/Co-Chair)

- Amin Amini, Thesis, Masters of Science in Mechanical Engineering, IUPUI, 2017
- Jing Li, Thesis, Masters of Science in Mechanical Engineering, IUPUI, 2015

Mentor (Graduate-Thesis-Member)

- Arash Edalatnoor, Thesis, Masters of Science in Mechanical Engineering, IUPUI, 2015
- Cameron Lancaster, Thesis, Masters of Science in Mechanical Engineering, IUPUI, 2015
- Drew Witte, Thesis, Masters of Science in Electrical Engineering, IUPUI, 2014
- Akram Khatib, Thesis, Masters of Science in Mechanical Engineering, IUPUI, 2014

Mentor (Graduate-Directed Project-Chair/Co-Chair)

- Chad Eckerle, Directed Project, Masters of Science in Technology, IUPUI, 2013
- David Campolongo, Directed Project, Masters of Science in Technology, IUPUI, 2012
- Bryan Weddle, Directed Project, Masters of Science in Technology, IUPUI, 2012
- Mark Lewis, Directed Project, Masters of Science in Technology, IUPUI, 2011
- Jacob Faiola, Directed Project, Masters of Science in Technology, IUPUI, 2011
- Jon Wang, Directed Project, Masters of Science in Technology, IUPUI, 2011
- Modibo Traore, Directed Project, Masters of Science in Technology, IUPUI, 2011
- Collin Green, Directed Project, Masters of Science in Technology, IUPUI, 2010

Mentor (Graduate-Directed Project-Member)

- Mike Sacro, Directed Project, Masters of Science in Technology, IUPUI, 2015
- Austin Strong, Directed Project, Masters of Science in Technology, IUPUI, 2014
- Mike Hutchins, Directed Project, Masters of Science in Technology, IUPUI, 2014
- Laban Zurowski, Directed Project, Masters of Science in Technology, IUPUI, 2014
- Eric Olsen, Directed Project, Masters of Science in Technology, IUPUI, 2013
- LeVern McFadden, Directed Project, Masters of Science in Technology, IUPUI, 2013
- Jie Zhou, Directed Project, Masters of Science in Technology, IUPUI, 2012
- Courtney Thornberry, Directed Project, Masters of Science in Technology, IUPUI, 2011
- Michael Dinges, Directed Project, Masters of Science in Technology, IUPUI, 2010

Although the students below are not graduate students, they required a mentor to help with their degree requirements or to give an experience that would ideally lead to graduate school. To date, I am aware that Trien has applied for graduate school at several locations, and Jordan has been accepted into graduate school at IUPUI.

Mentor (Undergraduate-International Internship)

- Dennis Ganaus. 2014.Cooperative State University at Mannheim, Germany (Supervised the international research component of the Bachelors of Science Degree in Service Engineering at IUPUI)
- Frederic Zarzecki. 2011. ESIEE University at Amiens, France (Supervised the international research component of the Bachelors of Science Degree in Electrical Engineering at IUPUI)

Mentor (Undergraduate-McNair Scholar)

- Jordan Rhodes. 2011. Sustainable Design project

Mentor (Undergraduate-Multidisciplinary Undergraduate Research initiative (MURI))

- Delaram Moghaddam, 2012-2013 MURI project
- Rawda Hamid, 2012-2013 MURI project
- Trien Nguyen, 2012-2013 MURI project
- Ronald Hnin, 2012-2013 MURI project
- Mike Testerman, 2011-2012 MURI project
- Scott Polley, 2011-2012 MURI project
- Gideon Lian, 2011-2012 MURI project
- Dan Robinson, 2011-2012 MURI project
- Caleb Harbert, 2010-2011 MURI project
- Scott Polley, 2010-2011 MURI project
- Thurston Tresler, 2010-2011 MURI project
- Rhonda Dufour, 2009-2010 MURI project
- Daric Fitzwater, 2009-2010 MURI project
- Elizabeth Freije, 2009-2010 MURI project
- Baihaqi Ismail, 2009-2010 MURI project
- Ryan Mason, 2009-2010 MURI project
- Amirtaher Abdollahi Namin, 2009-2010 MURI project
- Nick Snyder, 2009-2010 MURI project

TEACHING OR ADVISING GRANTS:

Active Grants

- Goodman, D. (PI, 100% effort). "Supplemental IAC Funding to Develop Ultrasonic Leak Detection Tools for Non-air Industrial Gasses". ($51,984). 2015-2016.
  This grant will fund two graduate students and one undergraduate student to develop a software tool to predict gas leak flow rates by converting ultrasonic signal and then performing energy and cost analysis. The tool will be uploaded to the US Department of Energy's website and will be used by all Industrial Assessment Centers and available to the general public.
- Goodman, D. (PI), Tabas, J. "International Engineering in Malta", IUPUI Office for Study Abroad Grant ($6,000) 2015 (70% effort).
- Goodman, D. (PI), Tabas, J. "International Engineering in Malta", IUPUI Yurtseven Grant ($3,000) 2015 (70% effort).
  Both of these grants being combined to develop a new study abroad class that is focused on engineering and technology, there are no study abroad courses at IUPUI like this course. Students will study an engineering issue (such as desalinization) at an international location (Malta or France for the first few years) and develop possible solutions. Then students will travel to the site, inspect local technology and expertise, modify their designs, and present to a panel of local experts. Cultural experiences and interactions will be included.
- Chen, J (PI, 40% effort), Goodman, D. (Co-PI, 25% effort), Razban, A (Co-PI, 25% effort), Anwar, S (Co-PI, 5% effort), Xie, J (Co-PI, 5% effort) "DE-FOA-0000490 Establishing an Industrial Assessment Center". ($1,320,000). 2011-2016.
  The grant has provided the space and opportunity to train approximately ten students per year in the methods of energy, waste, and productivity assessments and to take them to

approximately six industrial manufacturing facilities per student to acquire real world application experience.
I am actively mentoring the following students:

- Amin Amini
- Arash Edalatnoor
- Jing Li
- Nathan Ip
- Michael W. Malguarnera
- Brad Zeedyk
- Amruth Bhargav
- Allen Wu
- Arjun Chahal
- John Flowers
- AbdulHadi Mahmoud Ayoub
- Aaron Kreutzjans

These students completed the training, completed at least six audits, and received an Industrial Assessment Certificate from the US Department of Energy:

- Akram G. Khatib
- Shane Frazier
- Samantha Nervo
- Malek Shafe Nofal
- Amber Clark
- Jason Cambridge
- Robert Baker
- Richard Holcomb

The following students completed training but did not finish the program:

- Martin Lennartz
- Wassim Mahrouka
- Ameya Sharma
- Jared Engelberth
- Reggie Krow
- Cameron Lancaster

Evidence that Teaching & Grants impact ECONOMIC DEVELOPMENT
I and/or my students have conducted forty-nine industrial assessments and three service projects, plus another underway, with Indiana companies. The companies have taken the data from the reports and implemented changes that resulted in operating cost savings over $805,000. On average when I enter a facility with my students, the company will implement over 40% of my recommendations and that will save energy, reduce greenhouse gases, and move approximately $24,000 from operating expenses to their profit margin (based on the 71% of reports that are final).

Future:

This grant can be renewed every five years, with a successful re-application. I will discuss the metrics and the economic impact in another section, but the metrics show that we are doing well. I will do whatever is necessary to maintain this grant for the rest of my career because this is an amazing opportunity for our students to gain real world experience, apply sustainable principles, make valuable industry contacts for internships and jobs, and it must not be allowed to end.

Completed Grants

I am a firm supporter of the MURI grant program and I intend to continue to utilize this internal resource to give research experiences to my students on an ongoing basis.

- Goodman, D. (PI), Durkin, R., Stephens, C. "Aquaponics", IUPUI Multidisciplinary Undergraduate Research Institute (MURI) Grant (13,500) 2014 (50% effort).
  This funded 8 students to design and construct an urban aquaponics lab at the IUPUI Greenhouse and plan optimization experiments.
- Goodman, D. (PI), Mikesky, A., Tabas, J. "Web Interface-Phase 1", IUPUI Multidisciplinary Undergraduate Research Institute (MURI) Grant ($6,000) 2012 (40% effort).
  This funded four students to develop a new online learning environment that, among other things, reduced the uncertainty associated with whether the registered student actually takes their own online quiz/exam.
- Izadian, A. (PI), Goodman, D. "Renewable Energy Conversion", IUPUI Multidisciplinary Undergraduate Research Institute (MURI) Grant ($8,885) 2012 (20% effort).
  This funded five students to develop a control algorithm for a novel inverter. It also led to an unsuccessful NSF proposal.
- Goodman, D. (PI). "Sustainable Technology Certificate", IUPUI Curriculum Enhancement Grant (CEG) ($30,000) 2011 (35% effort).
  This grant funded for faculty from for different program within the school to develop six new courses for the first sustainability certificate at IUPUI. The certificate provided approximately 12 of the 45 points to award IUPUI a silver rating with Sustainability Tracking, Assessment, and Rating System (STARS) which places us fifth among urban universities and **higher than IU and Purdue** among universities in Indiana.
- Goodman, D. (PI), Mikesky, A., Tabas, J. "Energy Harvesting-Phase 2", IUPUI Multidisciplinary Undergraduate Research Institute (MURI) Grant ($10,685) 2011 (80% effort).
  This grant funded six students to follow up on the thermal harvest shirt and develop a method to convert the energy into electricity using heat pipes and thermo-electric ceramics.
- Goodman, D. (PI), Mikesky, A., Tabas, J., Izadian, A. "Energy Harvesting", IUPUI Multidisciplinary Undergraduate Research Institute (MURI) Grant ($8,885) 2010 (80% effort).
  This grant funded five students to develop a shirt that harvested human thermal energy.
- Goodman, D. (PI), Fox, P., Cowan, D. J., "Eco Ready Shelter", IUPUI Multidisciplinary Undergraduate Research Institute (MURI) Grant ($11,900) 2009 (35% effort).

This grant funded seven students to develop a disaster relief housing unit out of shipping containers. One of the students continued on with graduate school and is now a lecturer for the department.

- El-Mounayri, H. (PI), Goodman, D., Wasfy, T., Vice, C. "Renewable Energy Living Lab", IUPUI Multidisciplinary Undergraduate Research Institute (MURI) Grant ($11,200) 2009 (30% effort).
  This grant funded five students to develop a model for how to make the California Street parking garage into a living lab for researchers in the Lugar Center.

EVIDENCE OF COMMUNITY SERVICE

On a national and global level, I am working to develop various ways for third world countries to have creative and affordable access to energy. I have been on two international assessment trips since I began at IUPUI—one to Haiti after the earthquake and one to Ecuador, to look into ways to help improve the lives of the local population through utilizing my expertise. My contributions to the community are in the form of

- International Outreach with a student club
- Consulting with non-profit organizations

Paolo Friere, in Pedagogy of the Oppressed, explained that knowledge emerges when humans interact with the world, in the world, and with each other (1970). Kolb developed a model for structuring the learning experience, but rather than implement it in a traditional classroom I utilized a student organization (1984). As advisor to the IUPUI chapter of Engineers Without Borders (EWB), I traveled with students to do an assessment for a center for the blind in Santo Domingo, Ecuador in March of 2010. The students and I surveyed two potential building sites, meet with officials from the local government, meet with the local non-profit beneficiary Luz y Sombre (organization for the blind), and visited cultural sites. After returning, students reflected and wrote about the experience and then I mentored the students as they completed the design for a new educational/community center. The center would provide a place for blind people to learn how to live independently and provide a place for social gatherings. The design was completed in 2013 and sent up to EWB-USA so that other universities could bid on the construction phase.

Working with the Haitian Association of Indiana, I also collaborated with IUPUI professors Dr. Jan Cowan and Joe Tabas to perform an assessment in Haiti in April of 2010 after their devastating earthquake. I examined ways that the local population could utilize materials readily available to them to improve their standard of living. Joe and I came up with ideas related to building materials, renewable energy, and water purification. Jan developed an idea to make a computer lab out of shipping containers. Through class projects and individual effort, we developed blueprints for a new computer lab with photovoltaic panels (my contribution) and Dr. Cowan sent the drawings to Université Quisqueya in Port-au-Prince, Haiti.

In October of 2012, I was approached by Rotary International -Crawfordsville Chapter (RI) and decided to collaborate on a solar powered well water project for Carrefour Sanon, Haiti. I have used the project in two classes and have finalized a design that will power five wells. I also designed a photovoltaic power system that will power lighting in one school and lighting and refrigeration loads in one clinic. I am currently working on a design to electrify the whole village with renewable energy. RI has committed to start the well project and plans to start in the summer of 2015, but they are seeking external funding for the electrification projects. I am also working with them on the proposal development and plan to submit applications to US AID and the World Bank in late 2014. The impact could be considerable; the village has approximately 30,000 people in the area and the young girls are typically tasked to collect water, which is a five mile trek down the mountain, and essentially ends their chance at acquiring an education.

Being able to refrigerate vaccines should also improve medical conditions. Starting in 2015, my plan is to visit Haiti each summer with 2-4 students, for at least three years, to build the initial solar electric arrays and train local entrepreneurs in the design and construction technics necessary to maintain and spread the solar powered well technology.

TEACHING GOALS/PHILOSOPHY:

I utilize an approach drawing from constructivist perspectives as they relate to science/energy learning. Constructivism is rooted in the premise that the human world is different from the natural/physical world and therefore must be studied differently (Guba and Lincoln, 1990). It is most closely associated with Piaget's theory of genetic epistemology as a psychological theory of learning (1951, 1970). This theory defines learning as a process in which the active learner individually builds meaning from their own experiences into a cognitive structure (Piaget, 1951, 1970). The theory of social constructivism builds on the concept that learning is located in the individual's mind but acknowledges that the construction is influenced by sources of information from the social as well as physical world of experience (von Glasersfeld, 1998). Constructivist theory states that learning occurs when an individual experiences cognitive dissonance—when the individual realizes that his or her pre-existing concepts do not "fit" new experiences and result in "learning moments." One of the practical applications of social interaction in constructivist theory is to intentionally provide experiences of cognitive dissonance to encourage cognitive change. A practical example would include group discussions around an energy exhibit which may lead individuals to become aware of new information that contradicts their ideas about hydrogen or of alternate interpretations of electrolysis, etc. that differ from their own and promote cognitive dissonance and motivate learning. I strive in my classroom, both in person and online, to encourage this sort of group discussion to lead to cognitive dissonance and quality learning of the material.

TEACHING LOAD:

Per departmental guidelines, the teaching load for pre-tenured faculty is seven equivalent credit hours per semester or 14 equivalent credit hours per year. With the exception of the overload in the fall of 2012, the teaching load has been consistent with department norms with respect to the number of credit hours per year. The department does not adjust the load for the number of students mentored on graduate thesis or directed projects, undergraduate students mentored on MURI grants, or the mentoring of students on the IAC grant.

EVIDENCE OF QUALITY OF TEACHING, ADVISING, OR MENTORING AS EVALUATED BY STUDENTS:

Students deserve a quality education for their tuition, but they are not unbiased or expert in judging teaching methodology or effectiveness. As is normal per Brent and Felder, students have been resistant to new student centered methods (e.g. think-pair-share, roundtable grading, group work, present problem with no lecture and guide them to negotiate a solution) (2009). Gray and Bergmann reveal that I will continue to have lower student evaluation scores because of these methods (2003). However, the literature shows that my methods are effective, so I have continued to use them but I have also used the evaluations to improve my communication about the new constructivist, problem solving, student-centered learning methods I have used to improve the students understanding of what quality is and to hopefully offset some of the resistance to change (Gray, 2003). I have also used student feedback to improve my organization of OnCourse materials and my grading response time. I weigh the results of student work so that

in the end, “getting it” is more important than any struggles along the way, but, per Langbein’s article, this grading method will negatively affect student evaluations (2008). This is because grading systems which are weighted more heavily with points at the end and which are curved at the end of the course allow students to see lower grades during evaluation than they will eventually receive as their overall grades. Although my scores would be higher using traditional methods, they are not as effective for long-term success. Once students enter the work force, they appreciate my methods much more. One student (Elias) stated, “Any way I could not say it physically and I'm emailing you to say thank you! It was a busy very productive semester and you have done a great job on advising as well as scheduling. You are a good teacher and project manager. (Fall-13-ECET-491)” Amber stated, “It's been great working with you and thank you for teaching me so much! (Fall-12-ME-597)” Nathan commented, “I'm definitely happy I took your class because of all the relevant information I learned involving lighting, industrial systems, HVAC units, boilers, etc. and other applications involved with energy auditing, and I know it has given me much more information than I would have otherwise got from just reading textbooks. (Fall-13-ME-501)” In addition to improved communication, my scores have risen because many students in the capstone course have participated in interviews before evaluation and realized the value of my methods and others have worked on course-industry projects and learned how my material has prepared them for industry.

In the first three years, when I was learning to teach, students provided many constructive comments such as: “The instructor took too long to grade assignments (Fall-09-ECET-231).” I reflected on the comment and modified assignments, moving some to online, adding peer review, and holding myself to a strict two week deadline. Another student stated, “Resources were useful; however OnCourse seemed to be disorganized in the beginning. Everything was of course there; however, navigating through a single folder containing many documents was not ideal (Fall-09-ECET-231).” Upon reflection, I reorganized all the content by assignment; placing templates, rubrics, examples, etc. under separate folders. One student commented, “Need more labs to understand how certain energies work (Fall-09-ECET-499).” To give students more access to labs, equipment, and me, I organized voluntary labs. One student mentioned, “This instructor is very knowledgeable in the subject areas covered by this course. His explanations are sometimes a bit roundabout and not the best, but that is mostly due to an inability to communicate his own understandings effectively to students I believe. Overall, very good professor for this class (Fall-09-MET-499).” This caused me to consider alternate methods of describing concepts and look at learning styles and has improved with experience. The following was probably not meant as a compliment, “Although parts of this class have been extremely frustrating, this has been one of the most interesting classes I've taken at IUPUI (Sp-11-ECET-371)” but points of frustration are often points of active learning where student accommodate or assimilate new knowledge, so after reflecting on the frustrations I made no change to the learning environment. As I have improved, the feedback has diminished so I will look more to peers, conferences, etc. for ways to move towards the upper-end of excellence.

Evaluation scores are shown in Tables 3-5, but the major takeaway is that for every course I’ve taught two or more times (without making a major change) the score has been at or above the program average. I have taught many different courses and made many changes, but I focus on two examples to prove the point. In the first example I taught 491 for the first time in the fall of 2011, I taught it a second time in the spring of 2012 and the score was 3.5/4 versus a department

average of 3.33/4. At this point due to perceived weakness in the rigor of the projects, I was appointed course coordinator and began modifying the lectures, course meetings (individual meeting every other week instead of lecture), project requirements, course schedule, assignments, etc. and implemented the changes over the next two semesters. Since then, I received a score of 3.4 versus a department average of 3.4 in the fall of 2013 and a score of 3.6 versus a department average of 3.4 in the spring of 2014.

Table 3: Student Evaluation Data by Year, AY 2011

Semester	Course	Title	Number of Respondents (Out of Total in Class)	Overall Evaluation (Instructor)	Program Average of Overall Evaluation
Fall 2011	ECET-23100	Electrical Power & Controls	8/10	2.75	3.33
	ECET-49900 (TECH-30000)	Alternative Energy Technology	7/13	2.86	3.33
	ECET-49100	Senior Capstone 2	7/8	3.14	3.33
	TECH-58100	Directed Project Chad Eckerle	-	-	-
		Directed Project Jon Wang	-	-	-
Spring 2012	ECET-49000	Senior Capstone 1	12/20	2.92	3.12
	ECET-49100	Senior Capstone 2	6/10	3.5	3.12
	TECH-58100	Directed Project Chad Eckerle	-	-	-
	CEG Grant	Course Release	-	-	-

Table 4: Student Evaluation Data by Year, AY 2012

Semester	Course	Title	Number of Respondents (Out of Total in Class)	Overall Evaluation (Instructor)	Program Average of Overall Evaluation
Fall 2012	ECET-49000	Senior Capstone 1	8/9	2.75	3.22
		Senior Capstone 1	3/3	3	3.22
	ECET-49100	Senior Capstone 2	10/19	3	3.22
		Senior Capstone 2	7/11	2.71	3.22
	TECH-30300	Energy Efficiency & Auditing	5/10	2.6	3.22
	TECH-58100	Energy Assessment	-	-	-
	ECET-49900	Independent Study - April Schelske	-	-	-
		Independent Study - Tony West	-	-	-
	TECH-58100	Directed Project Chad Eckerle	-	-	-
	ME-59700	Industrial Energy Assessment: Tools and Applications	5/7	3.4	-
Spring 2013	TECH-30100	Renewable Energy Systems	-	-	-
	ECET-49100	Senior Capstone 2	23/26	3	3.31
	TECH-58100	Directed Project Chad Eckerle	-	-	-
	TECH-58100	Renewable Energy Technology	co-teach	-	-

Table 5: Student Evaluation Data by Year, AY 2013

Semester	Course	Title	Number of Respondents (Out of Total in Class)	Overall Evaluation (Instructor)	Program Average of Overall Evaluation
Fall 2013	TECH-58100	Energy Assessment	-	-	-
	ECET-49100	Senior Capstone 2	5/13	3.4	3.09
	ME-50103	Industrial Energy Assessment: Tools and Applications	3/8	2.67	NA
Spring 2014	TECH-30100	Renewable Energy Systems	-	-	-
	ECET-49100	Senior Capstone 2	15/17	3.67	3.3
	TECH-58100	Renewable Energy Technology	co-teach	-	-

CONTINUING PROFESSIONAL DEVELOPMENT:

Professional Certification

Certified Energy Auditor, Association of Energy Engineers, #2083. 2013-2016.
I formalized my energy audit experience by attending a workshop and passing the test for the certificate to better inspire and train my students in the Industrial Assessment Center. I chose this certificate because AEE is the premier society in energy efficiency and this certificate is one of only two certifications recognized by the US government for federal audits.

Conferences Attended

- American Society for Engineering Education Annual Conference. Indianapolis, IN. June 15-18, 2014.
  As mentioned previously, ASEE is the premier society for engineering educators and has over 12,000 members and 3-4,000 typically attend the annual conference. The conference has seminars, workshops, and access to educational vendors, all of which educate about what is and is not working in every aspect of engineering education and provides an opportunity to bring the knowledge back to IUPUI.
- US Department of Energy, Directors Conference. New Brunswick, NJ. July. 27-29, 2014.
  The purpose of the meeting is to share best practices, learn about new technologies, and strengthen ties to and encourage collaboration with other government agencies … this year focused on the EPA and the potential to conduct waste water treatment audits.

- Engineering Education Research (EER) Leader NetWorkshop Meeting. Indianapolis, IN June 19, 2014. The goal is to provide support and training for faculty as they step into leadership roles in EER at their home institutions and in the broader engineering education community. The focus of this workshop was on networking and facilitating conversations between individuals and groups at different levels of power. The significance is that this is an ongoing support mechanism for discussing and overcoming barriers to new methods in engineering education.
- American Society for Engineering Education Annual Conference. Indianapolis, IN. June 15-18, 2014.
- US Department of Energy, Directors Conference. Niagara Falls, NY. July. 22-23, 2013.
- American Society for Engineering Education Annual Conference. Atlanta, GA. June 23-26, 2013.
- Society of Automotive Engineers 2013 World Congress. Detroit, MI. April 16-18, 2013.
- American Society for Engineering Education Annual Conference. San Antonio, TX. June 10-13, 2012.
- US Department of Energy, New Directors Training Conference. New Brunswick, NJ. Nov. 13-16, 2011.
- 334th World Energy Engineering Congress. Chicago, IL. Oct. 12-15, 2011.
  This conference is the premier energy efficiency conference, ran by the Association of Energy Engineers which provide the only certifications recognized by the US government. The conference has seminars, workshops, and access to equipment vendors, which are relevant to energy efficiency and energy auditing. I found new text books for three of my related classes.
- WIndiana Conference, Indianapolis, IN July 20-21, 2011.
- American Society for Engineering Education Annual Conference. Vancouver, BC, Canada. June 26-29, 2011.
- American Solar Energy Society Annual Conference. Raleigh, NC. May 17-21, 2011.
- Indiana Campus Compact: Service Engagement Summit. Indianapolis, IN. April 1-2, 2011.
- Engineers Without Borders: Great Lakes Regional Conference. Indianapolis, IN. Nov. 19-21, 2010.
- Lugar Collegiate Energy Summit. Indianapolis, IN. Sep. 17, 2010.
- American Society for Engineering Education Annual Conference. Louisville, KY. June 20-24, 2010.
- IU Energy Workshop. Bloomington, IN. Aug. 6-7, 2009.

Professional Training

I have attended twenty-plus online webinars, live workshops, seminars, etc. to keep current on the latest technology from vendors. I try to average four per year.

CONTRIBUTIONS TO STUDENT RECRUITMENT AND RETENTION

Student recruitment and retention are key priorities for the IUPUC campus; therefore, I have contributed to the campus mission by attending the following: 1) freshman orientation picnic, 2) acting as a marshal at graduation, and 3) having an open door policy. All these show students that I am accessible and concerned about their future, which will aid retention. As some proof

that students know I care and am accessible, I have written recommendation letters for further graduate studies and post-employment certifications for approximately a dozen students.

SUMMARY AND FUTURE DIRECTIONS

My area of excellence is teaching and the variety of examples above show that I am committed to excellence. I have meet and generally exceeded all metrics published by my department. My area of teaching research has focused on creating a sustainable technology certificate, which we achieved, and I will continue work to create a sustainable degree program because IUPUI needs it to be relevant to future students and posterity. I will also return to my roots, my most cited paper (not listed because it was from my graduate student work) discussed how to develop a web based remote lab for solar collectors. As the world pushes for more online education, I see two options for providing an authentic lab experience: 1) virtual reality and 2) real hardware augmented with sensors, actuators, and cameras. Given the cost of virtual reality, I plan to return to developing remote experience for 'hands-on' student learning. I have already started building a remote lab; all the hardware and data acquisition equipment is in place, I will mentor students to develop sensors, actuators, software, secure interface, etc. elements in the near future and start publishing and seeking grants within the year to fund the mentoring and develop a better lab learning environment.

REFERENCES:

Brent, R. & Felder, R. (2009) Analysis of fifteen years of the national effective teaching institute. Proceedings of the 2009 Annual ASEE Conference, ASEE, June 2009.

Dewey, R. (1938). Experience & Education. New York: Collier Books.

Friere, P. Pedagogy of the oppressed. New York: Continuum, 1970.

Gray, M., & Bergmann, B.R. (2003). Student teaching evaluations: Inaccurate, demeaning, misused, Academe, Volume 89, Issue 5, Sep-Oct 2003, Page 44-46.

Guba, E.G. & Lincoln, Y.S. (1990). Can there be a human science? Constructivism as an Alternate. Person-Centered Review. Volume 5, Issue 2, Page 130-154.

Kolb, D. Experiential learning: Experience as the source of learning and development. Englewood Cliffs: Prentice-Hall, 1984.

Langbein, L. (2008), Management by results: Student evaluation of faculty teaching and the mis-measurement of performance. Economics of Education Review. Vol. 27, Issue 4, August 2008, Page 417-428.

Piaget, J. (1951). The child's conception of the world. NY: Norton.

Piaget, J. (1970). Genetic epistemology. NY: Norton.

Von Glasersfeld, E. (1998). Why constructivism must be radical. In: Larochelle, M., Bednarz,N. & Garrison, J. (eds.) Constructivism and education. Cambridge, MA: Cambridge University Press, Page 23-28.

Vygotsky, L. (1978). Mind in Society. London: Harvard University Press.