



American Society for Engineering Education Industrial Engineering Division Newsletter

FALL 2012

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FINAL CALL FOR PAPERS – 2013 ASEE ANNUAL CONFERENCE

By now, you should have received a few reminders about the deadline for abstract submissions to the ASEE Annual Conference in Atlanta, GA, June 23-26, 2013. This is a final encouragement to submit an abstract to the IED by **5 pm Eastern Time on Friday, September 21, 2012**. We have a goal of offering 16-20 excellent papers at the conference and you can help us meet that goal by presenting your best work related to IE education.

Relevant submissions are welcome from all engineering disciplines. Abstract considerations include all levels of innovation, technical merit, demonstrated outcomes and relevance to industrial engineering education. The IED is a publish-to-present division. Both abstracts and papers must be accepted to present. Submissions must include content related to educational issues. Only papers submitted to the IED and presented at the conference are eligible for the division's *Best Paper Award*, or *New Industrial Engineering Educator Outstanding Paper Award*.

Abstract submission is open. All abstracts must be loaded electronically through the ASEE paper management system by **5 pm Eastern Time on Friday, September 21, 2012**.

Authors of accepted abstracts will be invited to submit full-length papers for peer review, and all accepted papers will be considered for appropriate award recognition. Manuscript reviews include accuracy, completeness, readability and rigor of presentation. If your abstracts are accepted, **draft papers are due on December 7, 2012 – a month earlier than last year**.

Additional information, including the Author's Kit with deadlines and instructions, are available via the ASEE website: [2013 Authors' Kit](#).

If you have any questions, please contact the IED program chair, Rick Olson at r_olson@sandiego.edu or (619) 260-6853.

OTHER DEADLINES

The ASEE Annual Conference abstract submission deadline isn't the only date you should have on your calendar. Here are some other dates that you should keep in mind. Some are conference opportunities for faculty, and some are student project opportunities, but there's something here for everyone.

Conference Deadlines

- Nov 16, 2012 Abstract deadline for the 2013 Industrial and Systems Engineering Research Conference (ISERC) in San Juan, PR. [Conference Page](#)
- Jan 1, 2013 Abstract deadline for the 2013 Frontiers in Education Conference in Oklahoma City. [Call for papers](#)

Student Competition Deadlines

- Sep 28, 2012 Deadline to register for the 2013 IIE/Arena Student Simulation Competition. [Simulation Contest](#)
- Jan 26, 2013 Submission deadline for IIE Student Chapter 2013 You-Tube Video Contest. The 2013 web page is not up, yet, but the rules and submission guidelines are the same as for the 2012 contest. [2012 You-Tube Video Contest](#).
- Jun 10, 2013 Submission deadline for student entries into the 2012-2013 Material Handling Student Design Competition. [CIC/MHE Student Design Competition](#)

IE DIVISION AWARDS

One of the highlights of the Annual Conference is the presentation of awards to members who have contributed outstanding papers to the conference or who have served the IE Division with distinction. These awards were presented at the 2012 Annual Conference in San Antonio. Special thanks to Gene Dixon for taking photos during the awards.

Best Paper Award

Ana Vila-Parrish and Dianne Raubenheimer received the award for the best paper at the 2012 Annual Conference for their paper, *"Integrating Project Management & Lean-Six Sigma Methodologies in an Industrial Engineering Capstone Course"*

New Industrial Engineering Educator Outstanding Paper Award

Two awards were presented at the 2012 Annual Conference for papers presented at the 2011 conference. The awards went to:

Heidi A. Taboada and Jose F. Esperitu for *"Experiences while incorporating sustainability engineering into the industrial engineering curricula."*

Elizabeth Cudney, Ivan Guardiola, and Susan Murray for their paper *"Using a Social Networking Game To Teach Operations Research and Management Science Fundamental Concepts."*



Ivan Guardiola (l) receiving his New Industrial Engineering Educator Outstanding Paper award from IED Chair Abhijit Gosavi



Dianne Raubenheimer (l) and Ana Vila-Parrish

Distinguished Service Award

This award recognizes exemplary service to the Industrial Engineering Division. This year the award was presented to Kim LaScola Needy in recognition of her continuing support of the IED as an author, presenter, officer, and director for many years.



Kim LaScola Needy receiving the Distinguished Service Award from Jane Fraser (I) and Abhijit Gosavi

FOR JANE'S A JOLLY GOOD FELLOW...

The fellow grade of membership is conferred by ASEE in recognition of outstanding contributions to engineering or engineering technology. One of our own, Jane Fraser received this well-deserved recognition at the awards banquet in San Antonio. Jane serves as Professor and Department Chair in the Department of Engineering at Colorado State University Pueblo, and she's been active in the IE Division since she was a junior faculty member. Jane was also the inaugural recipient of the IE Division Lifetime Achievement award in 2010.

Consequently, when Lesley Strawderman's sought an inaugural contribution for a series of teaching tips, she went straight to Jane. You should have already received this in email from Lesley, but it's worth repeating...



TEACHING TIP – FROM JANE FRASER

My biggest teaching tip is to three hole punch the handouts. Of course that tip sounds trivial. Here is why I think it is big. Most students take handouts and put them in a notebook; if the handouts are ready to put into the notebook, I have made the student's life a little easier. So, "three hole punch the handouts" is shorthand for me for "think about learning from the student's viewpoint." Whenever I am thinking about a class, I try to think about how the students will view the class and I ask myself, "What can I do to help the students learn better?" For example, I ask myself how students might misunderstand some concept or how I can connect the concept to real world topics they will be familiar with. Seeing the subject from the student viewpoint is not easy, but I think trying to do that makes me a better teacher. I tell my students: I set high standards, but I will do just about anything to help you meet those standards.

Do you know an outstanding IE faculty that has wisdom to share? Have you or a colleague used a classroom innovation that should be highlighted? Is there a case study you've found useful in your classroom? Does your IE department have a new curriculum? We want to know about it! Send your names and ideas to [Lesley Strawderman](#) and they may be used in future emails.

IED 2012 ANNUAL CONFERENCE BUSINESS MEETING SUMMARY

The annual business meeting of the IED was held at 12:30 on Wednesday, June 29, 2011. Sixteen members of the division attended the meeting that was led by outgoing Chair Abhijit Gosavi.

PIC Report – Abhijit Gosavi on behalf of Stephanie Adams

Abhijit presented the report on behalf of Stephanie Adams who serves as the Professional Interest Council (PIC) rep for the divisions closely aligned with IED. The highlights of the presentation were:

- The session evaluations of technical sessions were suspended at the 2012 conference. Their use at the 2013 conference will be at the discretion of the program chairs.
- Membership fees will be increasing from \$69 to \$84 for people who receive a hard copy of *Prism*. People who receive only on-line access will be able to select a \$69 membership.
- There have been incidents of faculty members using their student's registration and name badges to take advantage of their lower registration fees. The ASEE board is considering measures to prevent this including restructuring fees.
- The PIC best paper is currently selected by one person. A proposal is being considered to form a five-person selection committee. This should improve the evaluation of papers in PICs with diverse disciplines.

Program Chair Report – Lesley Strawderman

Twenty-six abstract proposals were received for the 2012 Annual Conference. Thirteen people reviewed the submissions and draft papers. Ultimately, Seventeen papers were accepted and presented at the conference in four sessions. This was a significant increase from 18 abstract submissions and 9 papers in 2 sessions at Vancouver in 2011. Approximately 25 people attended each session; a strong turnout, especially for the last day of the conference.

During general discussion of the conference, it was decided that the IE Division will use evaluation forms at the 2013 Conference. It will be the responsibility of the session chairs to print, distribute, and collect the forms, which will be summarized, by the program chair.

In San Antonio, the traditional ASEE Sunday picnic was replaced by a mixer highlighting the divisions, followed by a catered reception in the exhibition hall. The strong consensus was that these events were preferred over the picnic. The IE table was staffed throughout the event by division officers who distributed bookmarks listing information about IED technical sessions. Several ideas for making the mixer more valuable as a recruiting and information sharing opportunity were suggested including highlighting division award recipients and offering raffle prizes to IED members in attendance. It was determined that organizing the mixer should be the responsibility of the program chair-elect, so Heidi Taboada will be doing this next year. Please send her suggestions of how the mixer can be made more valuable to you.

Installation of New Officers

Leonardo Bedoya-Valencia was elected to become the new. Terri Lynch-Caris and Jane Fraser's terms as directors expired. Terri agreed to continue in the role while Jane relinquished her position to Lawrence Whitman.

The current IED board is:

Division Chair:	Lesley Strawderman (strawderman@ise.msstate.edu) (662) 325-7214
Program Chair:	Rick Olson (r_olson@sandiego.edu) (619) 260-6853
Program Chair-Elect:	Heidi Taboada (hataboada@utep.edu) (915) 747-5734
Secretary/Treasurer:	Leonardo Bedoya-Valencia (l.bedoyavalencia@colostate-pueblo.edu) (719) 549-2788
Awards/Past Division Chair:	Abhijit Gosavi (gosavia@mst.edu) (573)341-4624

Directors: Terri Lynch-Caris (tlynch@kettering.edu) (810) 762-9859
Jessica Matson (matson@tntech.edu) (931) 372-3260
Kim LaScola Needy (kneedy@uark.edu) (479) 575-6029
Lawrence Whitman (larry.whitman@wichita.edu) (316) 978-5907

Newsletter Editor: Rick Olson

Webmaster: Lawrence Whitman

New Business – Lesley Strawderman

Lesley Strawderman assumed the role of division chair took a few minutes to outline three initiatives that she hopes to pursue during her tenure in office:

1. Continue to improve the quality and value of the technical sessions at the Annual Conference by increasing the number of abstract submissions, the quality of the accepted papers, and the attendance at the sessions. Adding a panel discussion or distinguished speaker should be a goal of the IED. Because of the limited number of session slots, this may be done in coordination with the Engineering Economy and Systems Engineering divisions.
2. Increase the participation of young faculty by helping them to understand the benefits of presenting their innovative pedagogic work and networking with senior faculty from around the country. IE Department heads and college deans may be contacted to help encourage young faculty. Limited travel grants for first-time conference attendees should be considered.
3. Extend innovation in IE education beyond the Annual Conference. Her recent email message with teaching tips from Jane Fraser is one example of how Lesley thinks the IED can provide value to members throughout the year. If you have ideas that you would like her to consider, or teaching tips you'd like to share, send them to [Lesley Strawderman](#)

#ASEEIED

The next time you read an interesting article, or web page related to IE education, or have a great idea that can be summarized in 160 characters or less, share it with your ASEE-IED colleagues through Twitter. Use the hash tag *#ASEEIED* to help people find your IE education-related tweet and you may soon rival Lady Gaga and Justin Bieber as the most followed people on Twitter.

HOW CAN YOU HELP THE IED?

As is the case with every division in ASEE, the success of the IED depends on the participation of its members. As mentioned earlier in this newsletter, the members attending the business session in Vancouver identified a series of goals for the upcoming year. We are hoping you can help us to achieve these goals in specific ways:

- Make a special effort to encourage your colleagues to join ASEE, and the IED
- Submit a paper to the Annual Conference
- Volunteer to review abstracts and papers submitted to the IED
- Nominate a deserving recipient for IED awards
- Come to the IED Business meeting and share your good ideas
- Represent IE at Regional ASEE Conferences
- Share your ideas with the board

IED 2012 ANNUAL CONFERENCE TECHNICAL SESSIONS

The IED sponsored four sessions at the 2012 Annual conference in San Antonio. Seventeen papers were presented in those sessions. The topics were wide-ranging and included such diverse topics as using a project-based learning bio-mimicry project in an ergonomics course, to study-abroad participation by IE students, to fostering university/industry collaboration. The papers are identified below along with an abbreviated version of the original abstracts. The full papers are available through <http://www.asee.org/search/proceedings>.

Assessing the Viability of Bench Top Versus Full-scale Industrial Lathes to Teach Fundamental Machining Concepts

Dr. Dave Yearwood (University of North Dakota) and Dr. Alex Johnson (University of North Dakota)

Abbreviated Abstract: Maintaining quality technology, manufacturing, or engineering programs requires institutional support, dedicated faculty and students, and specialized equipment to provide immersive experiences. However, the cost of updating or replacing outdated and unsafe equipment presents a unique challenge for educational institutions faced with stagnant or decreasing budgets. Two issues were examined in a recent study: 1. To ascertain the extent to which less costly bench-top metal lathes can be used as viable alternatives in provide students with an understanding about the design and creation of manufactured items and 2. Determine the levels of acceptance by faculty and industry about the use of smaller lathes as viable alternatives to their industrial size cousins. A study was conducted into the use of bench-top metal lathes in a post-secondary educational institution. The results of the study demonstrated that there were no significant differences in tolerances achieved from bench-top metal lathes when compared to their large-scale industrial cousins. In addition, faculty and industry's acceptance suggests that bench-top metal lathes are acceptable substitutes in the laboratory settings.

This Videogame is Just Like My Plant!

Mr. Leonardo Rivera (Universidad Icesi), Mr. Andrés López (Universidad Icesi), and Mr. Andrés Calderón (Universidad Icesi)

Abbreviated Abstract: This paper presents a learning experience that was developed using the commercial videogame Rise of Nations for a graduate course on Manufacturing and Operations Strategy. This is a historical strategy game in which players compete by taking civilizations through progressive development stages. The game was employed under the Serious Games paradigm, in which a game is considered serious when it is used with an objective other than entertainment. This paper explains the objectives of the use of the game in the class, the regulations and learning guides that were employed, the experiences the students lived, the main points the students take away from the use of the game and other experiences that take place in the class in addition to the delivery of contents and development of skills. This experience took place at Universidad Icesi, in Cali, Colombia.

Impact of an Updated Robotics Laboratory in an Industrial Engineering Program

Dr. Richard A. Pitts Jr. (Morgan State University)

Abbreviated Abstract: When robotics courses are combined with hands-on laboratory modules, robotics provides a means for student to utilize their analytical skills learned in other STEM courses to solve real-world problems in the areas of transportation, scheduling, manufacturing, logistics, and many others.

With a Course, Curriculum and Lab Improvement (CCLI) grant project sponsored by the National Science Foundation from 2009 - 2011, an updated Industrial Robotics and Automated Manufacturing (IRAM) laboratory was developed. Utilizing this newly updated laboratory at Morgan State University (MSU), students are now able to use modern equipment within a set of courses in the areas of advanced material handling systems, robotics and automation, computer-aided manufacturing, and flexible manufacturing systems. The integration of these courses with a hands-on laboratory approach allows the students to get a new and innovative type of training learn how to use robotic-related software to model systems. In addition, students can determine solutions for various manufacturing and service scenarios and engage in realistic applications of manufacturing systems through the new lab modules.

The CCLI project has had a significant and broad impact and the results show that the students have gained much from them. Due to the interest in taking these new elective courses, the number of under-represented students (women and minorities) who graduate with this new background has increased in the IE department at MSU. In addition, the readiness of these engineering students entering into graduate research programs and the engineering workforce has also increased.

Teaching Control Charts for Attributes Using the Mouse Factory

Dr. Douglas H. Timmer (University of Texas, Pan American), Dr. Miguel Gonzalez (University of Texas, Pan American), Dr. Connie M. Borrer (Arizona State University, West), and Prof. Douglas C. Montgomery (Arizona State University)

Abbreviated Abstract: The Mouse Factory contains a set of web-based, active learning modules for teaching statistical quality control. This paper will present teaching control charts for attributes using the Mouse Factory. The current pedagogy in today's classrooms is based upon lectures and homework problems from textbooks. This approach typically focuses on the knowledge and application domains of Bloom's Taxonomy. The current pedagogy removes students from applying higher order cognitive skills. By using the Mouse Factory, students must select the most appropriate improvement project to undertake, design a sampling plan, implement a control chart and evaluate the effectiveness of the implement control chart. Assessment of student behavior and attitudes will be discussed and evaluated.

Raising the Level of Participation in Study Abroad by Industrial Engineering Undergraduate Students

Dr. Kim LaScola Needy (University of Arkansas), Dr. Edward A. Pohl (University of Arkansas), and Mr. Eric Specking (University of Arkansas)

Abbreviated Abstract: This paper discusses the development of a survey administered to undergraduate Industrial Engineering at the University of Arkansas to determine why more students do not study abroad. The survey examines why students choose not to study abroad, funding levels needed to study abroad, and where students want to study abroad. Results from this survey indicate that students are highly interested in studying abroad, but that the primary reason that they do not engage in this experience is a shortage of finances. Strategies are discussed to raise the level of participation in study abroad by Industrial Engineering students.

Highly Relevant and Productive Collaborations Between Industries and Universities

Dr. Mahesh C. Aggarwal (Gannon University) and Dr. Karinna M. Vernaza (Gannon University)

Abbreviated Abstract: Engineering education is enhanced by collaborations between industries and universities that provide a platform for students' internships, research, and development of professional and leadership skills. Universities must continue to take an active role to strengthen and grow these partnerships that provide benefits to all involved. This paper will focus on models established at a medium size Master's I Institution. Gannon University has established programs in collaboration with local industry that have proven to achieve the following objectives: (1) to establish an academia-industry collaborative graduate program and a Graduate Research Program (GRP), (2) to demonstrate the effectiveness of programs as a strategy to build up a talent pool of engineering professionals, and (3) to extend the pipeline for engineering professionals who enter existing leadership programs at local industries.

This paper presents general models by which universities approach these and other types of collaborations. The paper describes the successful methods that have been employed by Gannon University and explores other methods that can be implemented or adapted in different size institutions.

Assessment of TQM in the 21st Century

Dr. Mysore Narayanan (Miami University)

Abbreviated Abstract: Total Quality Management (TQM) is an idea that is based on existing philosophies and techniques in response to declining productivity and sales in the worldwide trade market due to inferior quality. Total quality management is a series of procedures and philosophies taken to create an environment, or culture, of success. This paper explores the possibilities of incorporating these principles judiciously in to the classroom activities. Although the idea of total quality management is new, the basic principles have been used for centuries. However, the total quality management movement can be attributed to starting with W. Edwards Deming, Joseph M. Juran, and Philip Crosby. Each scholar has his own criteria for quality management, but there are many similarities between them. TQM is an approach in which all the company's people are involved in constantly improving the quality of products, services, and business processes. Total quality management is a tool that can help a company achieve total customer satisfaction through better quality products. In this presentation, the author discusses how to assess the benefits of TQM in a classroom environment. He also provides an example and discusses the results and the implications.

Assessment of Student Performances in Operations Research Class Delivered by an Innovative Approach

Mr. Yaseen Mahmud (Morgan State University) and Dr. Masud Salimian (Morgan State University)

Abbreviated Abstract: Operations Research (OR) provides the core foundation skills and knowledge set for Industrial Engineers (IE). It is one of the first courses to introduce crucial skills in its algorithmic approach to problem solving and abstract mathematical modeling of real systems. It provides the mathematical science of optimization that underpins functionality of the optimization tools and algorithms used by IE's. It is a gateway course for IE specializations such as Simulation, Production Planning and Control, Logistics, and similar analytical courses.

Given such critical importance, it is crucial for IE students to:

1. Develop understanding of the concepts of decision variables, constraints, and measures of performance.
2. Develop skills in creating abstract mathematical programming models (LP, ILP, NLP) from real world problems.
3. Develop operational skills in carrying out procedural steps necessary for algorithms (the HOW skill).
4. Develop in-depth knowledge of the logic behind algorithms and their concepts, and learn to extend them to new horizons (the WHY and WHAT-IF skills).

This paper presents a novel "competency-based" approach for assessing individual student performance. This approach allows students to observe lectures and ask questions before going "on the clock" during which time they must complete two challenges and a topic test. Experiences from using this model will be presented.

Biomimicry Innovation as a Tool for Design

Dr. Terri M. Lynch-Caris (Kettering University), Dr. Jonathan Weaver (University of Detroit Mercy), and Dr. Darrell K. Kleinke (University of Detroit Mercy)

Abbreviated Abstract: A modified form of Problem-Based Learning (PBL) was employed to apply the ideas of innovation and biomimicry to ergonomics problems. This Biomimicry Innovation Tool (BIT) begins with a focus on nature's laws as a starting point to design and allows students to uncover evidence that will enable the useful application of the laws of nature to solve a technical ergonomics design problem. The BIT blends aspects of problem based learning, innovation, biomimicry, and ergonomics into a single student experience.

The prototype BIT was applied and assessed in an undergraduate ergonomics course. The program the students were in requires alternating twelve-week terms of academics and cooperative education employment. The students began by individually identifying an ergonomics concern at their co-op workplace and providing a one-page written description of the concern. The concern was then passed along to another student to innovate a nature-based solution to the concern. Using a step-by-step approach, students formed an idea that evolved into a

solution. A grading rubric allowed the professor to fairly and objectively evaluate the final presentations. The prototype BIT will be modified based on student assessment data and experiences in the classroom.

A Review of Capstone Course Designs Used in Industrial Engineering Programs

Dr. Denise H. Bauer (University of Idaho, Moscow), Dr. Jessica L. Heier Stamm (Kansas State University), and Dr. Lesley Strawderman (Mississippi State University)

Abbreviated Abstract: Within engineering curricula, capstone courses are an essential element of the undergraduate experience. In capstone (or senior design) courses, seniors are able to use the knowledge gained throughout their studies to analyze a design problem. The capstone course is critical in ensuring that students have the requisite knowledge and can integrate it effectively before embarking into the field as engineering professionals. As such, the course also serves as an important benchmarking tool for engineering programs to ensure they are meeting program outcomes. Not only are capstone courses important for the profession and the academic programs, they are also critical to student success. The design experience they complete in the course has the potential to influence their career trajectory, satisfaction with the academic program, and self-efficacy. The challenge then becomes determining the best capstone model to maximize this potential. A comprehensive understanding of various capstone course models will help determine if there is one best model or if it may depend on characteristics of the program such as geographic location, student body size, and faculty size.

Systems Engineering Education in the U.S.: Textbooks and Programs

Dr. Jane M. Fraser (Colorado State University, Pueblo) and Dr. Abhijit Gosavi (Missouri University of Science & Technology)

Abbreviated Abstract: A previous paper examined the nature of systems engineering, described six possible meanings of the phrase, and made recommendations concerning what industrial engineering programs should teach about systems engineering. This paper expands on that work and provides more evidence for further conclusions by examining the topics covered in textbooks in systems engineering and the topics taught in MS in Systems Engineering programs in the US and elsewhere. We take a fresh look at the textbooks on systems engineering and the similarities and differences in the topics covered in them. While some textbooks are geared towards what constitutes systems thinking, others focus on what systems engineers can do in terms of optimizing the system. Also, some of the newly emerging subjects that are taught within the core of systems engineering programs appear not to be covered in many textbooks. We investigate in particular answers to the question: *How many of books that provide an overview of systems engineering cover these topics?*

We also analyze the content of the 25 largest Master's degree programs in systems engineering. The programs have much in common, but differ in their focus on different industries and on different tools. Some programs seem to have been designed to meet the needs of specific industries and even of specific companies. We use these findings to support conclusions about the nature of systems engineering education and to make recommendations to industrial engineering programs about the appropriate education in this area for industrial engineering students at the undergraduate and graduate levels.

A Multi-Disciplinary and Multi-Institutional Approach to Prepare Industrial Engineers to Respond to Future Energy Challenges

Dr. Heidi A. Taboada (University of Texas, El Paso) and Dr. Jose F. Espiritu (University of Texas, El Paso)

Abbreviated Abstract: The University of Texas at El Paso, New Mexico State University, Texas A&M University-Kingsville and Texas State University-San Marcos united efforts to create a regional network of researchers to advance knowledge in renewable energy research and education. This paper introduces the BGREEN (BuildinG a Regional Energy and Educational Network) project and shows how industrial engineers at the different participating institutions will benefit. BGREEN is a multi-disciplinary project which promotes collaboration among different universities, colleges, departments and a federal agency, the United States Department of Agriculture. This type of collaboration is fundamental since the scale and nature of energy challenges requires expertise from a wide variety of disciplines. It has been found that multi-disciplinary approaches to research and education are essential to

understanding and resolving complex environmental and social issues. Through BGREEN, students will experience that most real problems are not defined within a single domain but they cross disciplines. This paper highlights the education component of BGREEN and shows how industrial engineering departments can broaden and strengthen their research areas through the type of multi-disciplinary research performed under this project. The paper also shows how the BGREEN model can be easily replicated at other institutions.

Integrating Project Management, Lean-Six Sigma, and Assessment in an Industrial Engineering Capstone Course

Dr. Ana Vila-Parrish (North Carolina State University) and Dr. Dianne Raubenheimer (Meredith College)

This paper was the recipient of the *Best Paper Award* in the IED at the conference.

Abbreviated Abstract: The ability to effectively manage large, complex projects is a skill required of most engineers in industry today. The skills required to be an effective project manager go far beyond technical engineering content taught in engineering curriculums. Industry sponsored capstone project experiences require students to communicate, deconstruct the large project into manageable pieces, and manage risk and uncertainty. This is a departure from traditional engineering problems that have a right answer and typically have a prescribed solution method. In this paper, we discuss a pilot study that evaluates how a structured framework of project management, mimicking industry practices, affects the problem solving process throughout the project life cycle. Specifically we develop an approach that integrates project management methods and tools with Lean-Six Sigma methods. An additional objective of this research is to develop a better understanding of the unique aspects of the engineering problem solving process. We assessed the student's problem solving strategies, products, and design process reflections using Wolcott's "Steps for Better Thinking" rubric 1.

Redesigning a Lean Simulation Game for More Flexibility and Higher Efficiency

Dr. Hung-da Wan (University of Texas, San Antonio), Miss Yi-Ching Liao (University of Texas, San Antonio), and Dr. Glenn Kuriger (University of Texas, San Antonio)

Abbreviated Abstract: As more companies and organizations embrace lean, effective training and educational programs are in high demand. Due to the practical nature of lean concepts and tools, simulation games have been acknowledged as a very effective pedagogy. Some simulation games can be conducted in a few minutes (e.g., 5S number game), while some others run for several hours. Consequently, it is desirable to revisit the design of simulation games to identify improvement opportunities. In this paper, an existing lean simulation game designed for office operations is investigated for improvement. Using Six Sigma's DMADV methodology, several problems and limitations of the game have been identified and categorized into Flexibility, Efficiency, Effectiveness, and Cost issues. Through cause and effect analysis and several experiments, a revision of the simulation game is proposed with a higher level of modularity and improved standardization and visual aids. The redesigned game is able to accommodate a wider range of number of participants, and it can be set up and implemented with less effort. The redesign of the simulation game provides a new approach to making lean education a leaner and more productive process.

An Exercise for Improving the Modeling Abilities of Students in an Operations Research Course

Dr. Leonardo Bedoya-Valencia (Colorado State University, Pueblo) and Prof. Nebojsa I. Jaksic (Colorado State University, Pueblo)

Abbreviated Abstract: An exercise for improving skills of Operations Research (OR) students in formulating optimization problems is developed and implemented. The pilot experiment, as described by Chelst and Edwards (2005), is called the Lego® furniture. In this experiment, a furniture company has two types of resources available: small and large pieces; and produces two types of products: tables and chairs. Industrial Engineering students at the bachelor and master level were given the Lego® furniture problem to formulate as an optimization problem defined by the decision variables, the objective function, and a set of constraints. This exercise serves as an introduction to the OR course. It complements lectures, seminars, and case studies used in this type of courses. The exercise is intended to produce formulation-of-the-problem attitude among the students. The results presented in this work show an improvement in student modeling abilities as well as high student satisfaction with the described experiment. Master level students, already exposed to the concepts of modeling and optimization,

were slightly less satisfied than bachelor level students that have never been exposed to the same concepts. Both, master and bachelor level students showed an improvement in their modeling abilities.

Sustainable Industrial Engineering Modules

Prof. Victoria C. P. Chen (University of Texas, Arlington), Dr. K.J. Rogers (University of Texas, Arlington), Mrs. Andrea M. Graham (University of Texas, Arlington), John F. Dickson (University of Texas, Arlington), Prof. Stephen Mattingly (University of Texas, Arlington), Dr. Melanie L. Sattler (University of Texas, Arlington), and Dr. Yvette Pearson Weatherton (University of Texas, Arlington)

Abbreviated Abstract: Engineering Sustainable Engineers, a program sponsored by National Science Foundation, was designed to improve undergraduate student knowledge of and competency in addressing sustainability issues in engineering design and problem solving. The program involves collaboration among faculty in Civil, Industrial, and Mechanical Engineering at the University of Texas at Arlington. One of the key program elements is development and implementation of 12 sustainability modules for implementation in 17 undergraduate engineering courses. Six of these modules were implemented in Industrial Engineering Courses: • “Sustainability: What Does It Mean for Industrial Engineers?” (Introduction to Industrial Engineering), • “How Can Engineering Probability Help Achieve Sustainability?” (Engineering Probability), • “Life Cycle Sustainability Economics” (Economics for Engineers), • “How Can Operations Research Help Achieve Sustainability?” (Operations Research), • “Sustainability Metrics” (Metrics and Measurement), • “Engineering Design: Seeking Sustainable Solutions” (Industrial Engineering Capstone Design). Each module includes objectives, PowerPoint lecture slides, discussion questions, homework problems, and assessment questions. This paper will provide more information about the specific topics covered in each module, module implementation, and assessment results.

A Metric-based, Hands-on Quality and Productivity Improvement Simulation Involving Lean and Sigma Concepts For First-year Engineering Lab Students

Dr. Yosef S. Allam (Embry-Riddle Aeronautical University, Daytona Beach), Dr. Scott Sink (Ohio State University), Mr. Joseph M. Cerrato (Ohio State University), and Dr. John A. Merrill (Ohio State University)

Abbreviated Abstract: A new hands-on quality and productivity lab involving lean and six sigma concepts for first-year engineering students was created at the First-year Engineering Program within the Engineering Education Innovation Center at The Ohio State University. First, students are presented introductory material in the regular (non-lab) class period prior to the lab session. This first class session starts with an overview of typical organizational departments and functions, the importance of engineering as it relates to management and production, and how lean practices can impact profit. Students are also assigned roles for the lab activity and given basic information and terminology about lean, sigma, and production operations. At the start of the lab period, the second phase of the quality and productivity hands-on lab, students immediately assume their roles in one of two competing value-adding organizations or as the organizations’ customers. Students cooperatively deliberate, problem solve, and reorganize their production systems to achieve profitability using the terms, concepts, and analytical approaches they have gleaned. Production lines typically improve and show profit in the second run. In the third phase of the quality and productivity lab, students complete a team technical writing assignment to report the results of the lab and discuss further improvements.

Student survey feedback indicates students favor the lab and enjoy the activities and problem-solving with peers. Instructional staff training required on production systems concepts for those lacking industrial engineering backgrounds, lab setup and parts procurement for the product assemblies, and classroom and lab logistics preparation and management present the most significant challenges to running the quality and productivity lab.

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