# Technical Sessions Table of Contents

**Wednesday, October 12**

<table>
<thead>
<tr>
<th>Session</th>
<th>Title</th>
<th>Speaker(s)</th>
<th>Room</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A</td>
<td>A Developmental and Adaptive Problem Based Learning (PBL) Model Across the Curriculum: From Theory to Practice in Integrating and Assessing PBL Experiences across the James Madison University Engineering Curriculum</td>
<td>Olga Pierrakos (James Madison University, USA), Robin Anderson (James Madison University, USA), Elise Barrella (James Madison University, USA)</td>
<td>170A</td>
</tr>
<tr>
<td>1B</td>
<td>NSF Programs that support Engineering Education Research</td>
<td>Ece Yaprak (National Science Foundation, USA), Karen Crosby (National Science Foundation, USA), Olga Pierrakos (National Science Foundation, USA), Abby Ilumoka (National Science Foundation, USA), Yvette Pearson Weatherton (National Science Foundation, USA), Elliot Douglas (National Science Foundation, USA), James Moore (National Science Foundation, USA)</td>
<td>170B</td>
</tr>
<tr>
<td>1C</td>
<td>Peer Grading Development Cycle</td>
<td>Shawn Lupoli (UMBC, USA)</td>
<td>130B</td>
</tr>
<tr>
<td>2A</td>
<td>Tips for Turning Good Ideas into Competitive National Science Foundation Engineering Education CAREER Proposals: A Grant Writing Workshop</td>
<td>Olga Pierrakos (National Science Foundation, USA)</td>
<td>170A</td>
</tr>
</tbody>
</table>
2B: Integrated Faculty Course Assessment Report (FCAR) Model with Traditional Rubric-Based (GR) Model to Enhance Automation of Student Outcomes Evaluation
5:00 PM – 8:00 PM
Room: 170B

INTEGRATED FACULTY COURSE ASSESSMENT REPORT (FCAR) MODEL WITH TRADITIONAL RUBRIC-BASED (GR) MODEL TO ENHANCE AUTOMATION OF STUDENT OUTCOMES EVALUATION.....11
Fong Mak (Gannon University, USA)
Ramakrishnan Sundaram (Gannon University, USA)

2C: Academic coaching tools for increased retention: empowering engineering students in their education
5:00 PM – 8:00 PM
Room: 130B

ACADEMIC COACHING TOOLS FOR INCREASED RETENTION: EMPOWERING ENGINEERING STUDENTS IN THEIR EDUCATION.....15
Jennifer Groh (Purdue University, USA)
Thursday, October 13

**T1A: Panel: Business & Engineering Education: A Multiple Stakeholder Perspective**  
10:00 AM - 12:00 PM  
Room: 170A

**BUSINESS & ENGINEERING EDUCATION: A MULTIPLE STAKEHOLDER PERSPECTIVE.....17**

Diane H. Parente (Penn State Erie, The Behrend College, USA)  
Dipo Onipede (Penn State Erie, The Behrend College, USA)  
Greg P. Dillon (Penn State Erie, The Behrend College, USA)

**T1B: Panel: Changing Your Department: Examples from Revolutionizing Engineering Departments**  
10:00 AM - 12:00 PM  
Room: 170B

**PANEL: CHANGING YOUR DEPARTMENT: EXAMPLES FROM REVOLUTIONIZING ENGINEERING DEPARTMENTS.....19**

Ella L. Ingram (Rose-Hulman Institute of Technology, USA)

**T1C: Design and Design Education**  
Chair: Manuel Castro (Spanish University for Distance Education – UNED, Spain)  
10:00 AM - 12:00 PM  
Room: 130B

**DEVELOPING A MEASURE OF QUALITY FOR ENGINEERING DESIGN ARTIFACTS.....21**

Molly Hathaway Goldstein (Purdue University, USA)  
Camilo Vieira Mejia (Purdue University, USA)  
Robin Adams (Purdue University, USA)  
Şenay Purzer (Purdue University, USA)  
Mitch Zielinski (Purdue University, USA)

**AN ADAPTIVE E-LEARNING PLATFORM FOR THE QUALIFICATION FOR WORKING ON ELECTRIC VEHICLES.....28**

Heiko Fechner (University of Wuppertal, Germany)  
Benedikt Schmuelling (University of Wuppertal, Germany)  
Karl-Heinz Saes (TÜV NORD Bildung GmbH & Co. KG, Germany)

**DESIGN OF SOCIAL SYSTEMS: THE CASE OF A UNIQUE COURSE.....33**

Doron Faran (ORT Braude academic college, Israel)

**KNOWLEDGE TRANSFER: DOES MORE EXPERIENCE YIELD IMPROVED DESIGN QUALITY?.....38**

DeLean Tolbert (Purdue University, USA)  
Reis Lehman (Purdue University, USA)  
Guannan Liu (Purdue University, USA)  
Benjamin Sadler (Purdue University, USA)  
Monica Cordella (Purdue University, USA)

**A DESIGN STUDIO COURSE IN APPLICATION DEVELOPMENT: LESSONS LEARNED.....42**

Steven R. Haynes (The Pennsylvania State University, USA)  
David R. Mudgett (The Pennsylvania State University, USA)
FIVE YEARS OF EXTRA CREDIT IN A STUDIO-BASED COURSE: AN EFFORT TO INCENTIVIZE
SOCIALLY USEFUL BEHAVIOR.....50
Edward F. Gehringer (NC State University, USA)
Zhewei Hu (NC State University, USA)
Yang Song (NC State University, USA)

TID: Game-Based Learning: Development and Evaluation
Chair: Kevin Hadley (South Dakota School of Mines and Technology, USA)
10:00 AM - 12:00 PM
Room: 130C

USING GAMIFICATION FOR ENGAGEMENT AND LEARNING IN ELECTRICAL AND COMPUTER
ENGINEERING CLASSROOMS.....56
Emily Marasco (University of Calgary, Canada)
Laleh Behjat (University of Calgary, Canada)
Marjan Eggermont (University of Calgary, Canada)
William Rosehart (University of Calgary, Canada)
Mohammad Moshirpour (University of Calgary, Canada)
Ron Hugo (University of Calgary, Canada)

MOBILE SERIOUS GAME PROPOSAL FOR ENVIRONMENTAL AWARENESS OF CHILDREN.....60
Eunice P. S. Nunes (Universidade Federal de Mato Grosso (UFMT), Brazil)
Alessandro R. Luz (Universidade Federal de Mato Grosso (UFMT), Brazil)
Eduardo M. Lemos (Universidade Federal de Mato Grosso (UFMT), Brazil)
Cristiano Maciel (Universidade Federal de Mato Grosso (UFMT), Brazil)
Alexandre Anjos (Universidade Federal de Mato Grosso (UFMT), Brazil)
Luciana Borges (Universidade Federal de Mato Grosso (UFMT), Brazil)
Clodoaldo Nunes (Instituto Federal de Educação, Ciência e Tecnologia de Mato Grosso (IFMT), Brazil)

METHODOLOGY AND A TECHNOLOGICAL FRAMEWORK TO MAXIMIZE LEARNING IN A
DEVELOPMENT OF SERIOUS GAMES DISTANCE COURSE
AND THE EVALUATION OF LEARNING.....N/A
Heraclito A. Pereira, Jr. (Federal University of Espirito Santo, Brazil)
Alberto F. De Souza (Federal University of Espirito Santo, Brazil)
Crediné S. De Menezes (Federal University of Espirito Santo, Brazil)

EDUCATIONAL GAMES DEVELOPMENT: ISSUES AND CHALLENGES.....N/A
Daniela C. C. Peixoto (Centro Federal de Educação Tecnológica, Brazil)
Rodolfo F. Resende (Universidade Federal de Minas Gerais, Brazil)
Clayton Isaias P. S. Pádua (Universidade Federal de Minas Gerais, Brazil)

CROWDLEARNING: A FRAMEWORK FOR COLLABORATIVE PERSONALIZED LEARNING.....68
Thilak Balasubramanian (University of New Mexico, USA)
Trilce Estrada (University of New Mexico, USA)

DESIGN AND EVALUATION OF A COMPUTER BASED GAME FOR EDUCATION.....77
Maria Julian-Mateos (Universidad Carlos III de Madrid, Spain)
Pedro J. Muñoz-Merino (Universidad Carlos III de Madrid, Spain)
Carlos Delgado Kloos (Universidad Carlos III de Madrid, Spain)
Davínia Hernández-Leo (Universitat Pompeu Fabra, Spain)
Diego Redondo-Martínez (Centro para Adultos CEPA Distrito, Spain)

October 12-15, 2016 Erie, Pennsylvania
2016 IEEE Frontiers in Education Conference
A FRAMEWORK TO TEACH MIDDLE SCHOOL STUDENTS MATHEMATICS AND SCIENCE USING ROBOTS.....N/A
Abdelmalek Halawani (David Yellin Academic College of Education, Israel)
Eli Kolberg (Bar-Ilan University, Israel)

TOWARDS THE STEM KNOWLEDGE HOMOGENIZATION OF PRE-UNIVERSITY STUDENTS IN 21ST CENTURY: MOOC: THE LANGUAGE FOR ENGINEERING.....85
M.R. Estela-Carbonell (Universitat Politècnica de Catalunya, BarcelonaTech, Spain)
A. Codina (Universitat Politècnica de Catalunya, BarcelonaTech, Spain)
J. Poblet-Puig (Universitat Politècnica de Catalunya, BarcelonaTech, Spain)
P. Pardo (Universitat Politècnica de Catalunya, BarcelonaTech, Spain)
M.A. Puigvi (Universitat Politècnica de Catalunya, BarcelonaTech, Spain)
E. Pujadas (Universitat Politècnica de Catalunya, BarcelonaTech, Spain)
S. Valls (Universitat Politècnica de Catalunya, BarcelonaTech, Spain)
M.D. Alvarez (Universitat Politècnica de Catalunya, BarcelonaTech, Spain)
E. Guaus (Universitat Politècnica de Catalunya, BarcelonaTech, Spain)
C. Hervada-Sala (Universitat Politècnica de Catalunya, BarcelonaTech, Spain)
J. Macanás (Universitat Politècnica de Catalunya, BarcelonaTech, Spain)
A. Masip-Alvarez (Universitat Politècnica de Catalunya, BarcelonaTech, Spain)
M. Morillo (Universitat Politècnica de Catalunya, BarcelonaTech, Spain)
F. Nejjari (Universitat Politècnica de Catalunya, BarcelonaTech, Spain)

EMPLOYING PROJECT-BASED LEARNING TO ADDRESS THE NEXT GENERATION MATHEMATICS STANDARDS IN HIGH SCHOOLS.....90
Afrin Naz (West Virginia University Institute of Technology, USA)
Mingyu Lu (West Virginia University Institute of Technology, USA)
Kenan Hatipoglu (West Virginia University Institute of Technology, USA)
Karen Rambo-Hernandez (West Virginia University, USA)

LABDUINO: AN OPEN SOURCE TOOL FOR SCIENCE EDUCATION.....95
Diogo Guimarães Carvalho (C.E.S.A.R.edu, Brazil)
Walquiria Castelo Branco Lins (C.E.S.A.R.edu, Brazil)

USING SPACED REPETITION AND GAMIFICATION TO ENHANCE K-12 STUDENT SCIENCE LITERACY WITH ON-DEMAND MOBILE SHORT READS.....100
Martin K.-C. Yeh (Penn State University, USA)
Abtin Toshtzar (Penn State University, USA)
Laura Guertin (Penn State University, USA)
Yu Yan (Penn State University, USA)

BROADENING AND SUSTAINING AN AIR QUALITY K-12 CURRICULUM THROUGH A DIGITAL LIBRARY AND UNDERGRADUATE SERVICE LEARNING COURSE.....104
Daniel Knight (University of Colorado Boulder, USA)
Ashley Collier (University of Colorado, Boulder, USA)
Michael Hannigan (University of Colorado Boulder, USA)
Katya Hafich (University of Colorado, Boulder, USA)
TII: Cybersecurity
Chair: Willie L. Brown, Jr (University of Maryland Eastern Shore, USA)
10:00 AM - 12:00 PM
Room: 140B

HOW STUDENTS REASON ABOUT CYBERSECURITY CONCEPTS.....109
Travis Schepnik (University of Maryland Baltimore County, USA)
Alan T. Sherman (University of Maryland, Baltimore County, USA)
David DeLatte (University of Maryland, Baltimore County, USA)
Dhananjay Phatak (University of Maryland, Baltimore County, USA)
Linda Oliva (University of Maryland, Baltimore County, USA)
Julia Thompson (University of Illinois at Urbana-Champaign, USA)
Geoffrey L. Herman (University of Illinois at Urbana-Champaign, USA)

DEVELOPING AND EVALUATING A HANDS-ON LAB FOR TEACHING LOCAL AREA NETWORK VULNERABILITIES.....114
Jinseng Xu (North Carolina A&T State University, USA)
Xiaohong Yuan (North Carolina A&T State University, USA)
Anna Yu (North Carolina A&T State University, USA)
Jung Hee Kim (North Carolina A&T State University, USA)
Taehee Kim (North Carolina A&T State University, USA)
Jinghua Zhang (Winston-Salem State University, USA)

TEACHING MOBILE COMPUTING AND MOBILE SECURITY.....118
Xiaohong Yuan (North Carolina Agricultural & Technical State University, USA)
Kenneth Williams (North Carolina Agricultural & Technical State University, USA)
Kelvin Bryant (North Carolina Agricultural & Technical State University, USA)
Jinseng Xu (North Carolina Agricultural & Technical State University, USA)
Albert Esterline (North Carolina Agricultural & Technical State University, USA)
Scott McCrackard (Virginia Tech, USA)
Anyi Liu (Purdue University Fort Wayne, USA)
Charles Hardnett (Gwinnett Technical College, USA)
Selvarajah Moharanajah (Clafin University, USA)
Litany H. Lineberry (Voorhees College, USA)
Rachel Rutledge (Charleston County School District, USA)

WIRELESS COMMUNICATIONS ENGINEERING EDUCATION VIA AUGMENTED REALITY.....124
Cem Sahin (Drexel University, USA)
Dan Nguyen (Drexel University, USA)
Simon Begashaw (Drexel University, USA)
Brandon Katz (Drexel University, USA)
James Chacko (Drexel University, USA)
Logan Henderson (Drexel University, USA)
Jennifer Stanford (Drexel University, USA)
Kapil R. Dandekar (Drexel University, USA)

A MODULAR APPROACH TO TEACHING CRITICAL INFRASTRUCTURE PROTECTION CONCEPTS TO ENGINEERING, TECHNOLOGY AND COMPUTING STUDENTS.....131
Sumita Mishra (Rochester Institute of Technology, USA)
Trudy Howles (Rochester Institute of Technology, USA)
Rajendra K. Raj (Rochester Institute of Technology, USA)
Carol J. Romanowski (Rochester Institute of Technology, USA)
Jennifer Schneider (Rochester Institute of Technology, USA)
Alicia McNett (Pennsylvania College of Technology, USA)
Daryl J. Dates (Corning Community College, USA)
FOSTERING AN ENTREPRENEURIAL MINDSET IN "DIGITAL SYSTEMS" CLASS THROUGH A PRODUCER-CUSTOMER MODEL.....138
Nozar Tabrizi (Kettering University, USA)

EXPLORING DIFFERENCES IN PERCEIVED INNOVATIVE THINKING SKILLS BETWEEN FIRST YEAR AND UPPERCLASSMEN ENGINEERS.....147
Kirsten A Davis (Virginia Tech, USA)
Catherine T. Amelink (Virginia Tech, USA)

ENTREPRENEURIAL CURRICULUM IN AN ENGINEERING TECHNICAL COMMUNICATION COURSE: LOOKING FOR IMPACT ON CREATIVITY AND MINDSET.....154
Benjamin J. Call (Utah State University, USA)
Wade H. Goodridge (Utah State University, USA)
Melissa Scheaffer (Utah State University, USA)

RE-COMMERCE: A NEW PARADIGM FOR INNOVATION AND SUSTAINABILITY IN CSET EDUCATION.....159
L. Eric James (University of Southern Maine, USA)

ENTREPRENEURSHIP AND TECHNOLOGY: DEVELOPING 21ST CENTURY SKILLS.....N/A
Jose Luis Martin Nuñez (Universidad Politécnica de Madrid, Spain)
Gema Maria Fernández Merchán (HMS Gestión de Proyectos Chile, Chile)
Ana Vázquez Martínez de Miguel (Universidad Politécnica de Madrid, Spain)
Cristian Bravo Román (Fundación Telefónica Chile, Chile)

UNPACKING THE IMPACT OF ENGINEERING ENTREPRENEURSHIP EDUCATION THAT LEVERAGES THE LEAN LAUNCHPAD CURRICULUM.....163
Aileen Huang-Saad (University of Michigan, USA)
Christina Morton (University of Michigan, USA)
Julie Libarkin (Michigan State University, USA)

APPLICABILITY OF ONLINE MECHANICS OF MATERIALS COURSE FOR ENGINEERING UNDERGRADUATE STUDENTS.....170
Devayan Birl (Iowa State University, USA)
Benjamin Ahn (Iowa State University, USA)

LET US LEARN TOGETHER! DO COMPLEMENTARY ABILITIES FOSTER PAIR COLLABORATION IN WEB-BASED LEARNING?.....173
Patrícia Alves Rodrigues (University of São Paulo, Brazil)
Leônidas de O. Brandão (University of São Paulo, Brazil)
Anarosa Alves Franco Brandão (Universidade de São Paulo, Brazil)
SURVEYING THE MOTIVATIONS OF GROUPS OF LEARNERS
IN HIGHLY-TECHNICAL STEM MOOCS.....181
Brittany Mihaelec-Adkins (Purdue University, USA)
Nathan Hicks (Purdue University, USA)
Kerrie A. Douglas (Purdue University, USA)
Heidi Diefes-Dux (Purdue University, USA)
Peter Berman (Purdue University, USA)
Krishna Madhavan (Purdue University, USA)

OPTIMIZING THE MANAGEMENT OF DISTANCE COURSES THOUGH MULTI-AGENT SYSTEM.....N/A
Neila Batista Xavier (Ciência e Tecnologia do Amazonas, Brazil)
José Francisco de Magalhães Netto (Universidade Federal do Amazonas, Brazil)

CAN ONLINE DELIVERY RESULT IN COMPARABLE ACHIEVEMENT OF COURSE OUTCOMES AND
STUDENT SUCCESS IN DIFFERENT COMPUTER SCIENCE COURSES?.....187
Waleed Farag (Indiana University of Pennsylvania, USA)
Sanwar Ali (Indiana University of Pennsylvania, USA)

MOOE: A NEW ONLINE EDUCATION MODE: VIRTUAL SIMULATION EXPERIMENT MOOE
PLATFORM FOR FPGA.....194
Ying Li (Beihang University, P.R. China)
Jianwei Niu (Beihang University, P.R. China)
Zhang Jiong (Beihang University, P.R. China)
Xin Ren (Beihang University, P.R. China)

TII: Digital Design
Chair: Brian Skromme (Arizona State University, USA)
10:00 AM - 12:00 PM
Room: 160B

LEVERAGING THE FINAL PROJECT TO IMPROVE STUDENT MOTIVATION
IN INTRODUCTORY DIGITAL DESIGN COURSES.....202
Andrew Danowitz (California Polytechnic State University, USA)

CIRCUIT DIAGRAMS VS. PHYSICAL CIRCUITS: THE EFFECT OF REPRESENTATIONAL
FORMS DURING ASSESSMENT.....207
Kayla DesPortes (Georgia Institute of Technology, USA)
Aditya Anupam (Georgia Institute of Technology, USA)
Neeti Pathak (Georgia Institute of Technology, USA)
Betsy DiSalvo (Georgia Institute of Technology, USA)

EXPLORING UNDERGRADUATE ENGINEERING STUDENTS' CONCEPTUAL LEARNING
OF COMPLEX CIRCUIT CONCEPTS IN AN INTRODUCTORY COURSE.....216
Nicole P. Pitterson (Oregon State University, USA)
Ruth Streveler (Purdue University, USA)
Cordelia Brown (Auburn University, USA)

USING THE BASYS-3 TRAINER TO SUPPORT VHDL IN DIGITAL LOGIC
FUNDAMENTALS COURSE.....224
Jennifer L. Bonniwell (Marquette University, USA)
Susan C. Schneider (Marquette University, USA)
STUDYING HOW DIGITAL LOGIC INSTRUCTORS SOLVE CANONICAL PROBLEMS.....228
Geoffrey L. Herman (University of Illinois at Urbana-Champaign, USA)

T1J: Problem-Based Learning
Chair: Cheryl Carrico (Virginia Tech, USA)
10:00 AM - 12:00 PM
Room: 160C

A FRAMEWORK FOR APPLYING PROBLEM-BASED LEARNING TO COMPUTING EDUCATION.....233
Ariane Nunes Rodrigues (Universidade Federal de Pernambuco, Brazil)
Simone C. dos Santos (Universidade Federal de Pernambuco, Brazil)

PBL-TUTOR CANVAS: A TOOL BASED ON BACKWARD DESIGN TO PLAN PBL IN COMPUTING EDUCATION.....240
Tiago Carvalho Vidal (Informatics Center of Federal University of Pernambuco, Brazil)
Simone C. Dos Santos (Informatics Center of Federal University of Pernambuco, Brazil)
Rosângela Saraiva Carvalho (Informatics Center of Federal University of Pernambuco, Brazil)

DEVELOPMENT OF PROFESSIONAL COMPETENCY THROUGH PROFESSIONAL IDENTITY FORMATION IN A PBL CURRICULUM.....248
Bart Johnson (Itasca Community College, USA)
Ron Ulseth (Iron Range Engineering, USA)

PBLMAESTRO: A VIRTUAL LEARNING ENIRONMENT FOR THE IMPLEMENTATION OF PROBLEM-BASED LEARNING APPROACH IN COMPUTER EDUCATION.....257
Felipe Soares de Oliveira (Center of Informatics, Brazil)
Simone Santos (Center of Informatics, Brazil)

EFFECTS OF BILATERAL PROBLEM-BASED LEARNING PROGRAM FOR ENGINEERING STUDENTS: CASE OF A JOINT COURSE WITH JAPAN AND THAILAND.....266
Eri Ota (Tokyo Institute of Technology, Japan)
Proadpran Punyabukkana (Chulalongkorn University, Thailand)

T2A: Special Session: Exploring Learning Opportunities in Engineering Education Using 2D, 3D and Immersive Video-Augmented Online Technologies
1:30 PM - 3:00 PM
Room: 170A

SPECIAL SESSION: EXPLORING LEARNING OPPORTUNITIES IN ENGINEERING EDUCATION USING 2D, 3D AND IMMERSIVE VIDEO-AUGMENTED ONLINE TECHNOLOGIES.....275
Sasha Nikolic (University of Wollongong, Australia)
Mark J. W. Lee (Charles Sturt University, Australia)

T2B: Special Session: I-Corps™ for Learning: Sustaining and Scaling STEM Education Innovations for Impact
1:30 PM - 3:00 PM
Room: 170B

I-CORPS™ FOR LEARNING: SUSTAINING AND SCALING STEM EDUCATION INNOVATIONS FOR IMPACT.....277
Rocio C. Chavela Guerra (American Society for Engineering Education, USA)
Karl A. Smith (University of Minnesota, USA)
STEM EDUCATION PROGRAM EVALUATION SURVEY: A REPORT OF EXPERIENCE.....279
Jose Reginaldo Hughes Carvalho (Federal University of Amazonas, Brazil)
Elaine H. T. de Oliveira (Federal University of Amazonas, Brazil)
Irene Andrea V. A. Carvalho (Federal University of Amazonas, Brazil)

BRINGING CORPORATE SOCIAL RESPONSIBILITY INTO
THE PETROLEUM ENGINEERING CLASSROOM.....287
Carrie J. McClelland (Colorado School of Mines, USA)
Jessica M. Smith (Colorado School of Mines, USA)
Nicole M. Smith (Colorado School of Mines, USA)

ACADEMY-INDUSTRY COLLABORATION AND THE EFFECTS OF THE INVOLVEMENT OF
UNDERGRADUATE STUDENTS IN REAL WORLD ACTIVITIES.....292
Elaine Venson (University of Brasilia, Brazil)
Rejane Figueiredo (University of Brasilia, Brazil)
Wander Silva (University of Brasilia, Brazil)
Luiz C. M. Ribeiro Júnior (University of Brasilia, Brazil)

JOINT ASSESSMENT AND EVALUATION OF SENIOR DESIGN PROJECTS
BY FACULTY AND INDUSTRY.....300
Samuel J. Dickerson (University of Pittsburgh, USA)
Steven P. Jacobs (University of Pittsburgh, USA)
Adrian M. Garcia (University of Pittsburgh, USA)
David V. P. Sanchez (University of Pittsburgh, USA)

COURSE DESIGN FOR INTERNET OF THINGS USING LAB
OF THINGS OF MICROSOFT RESEARCH.....307
Gu-Min Jeong (Kookmin University, Korea)
Phuc Huu Truong (Kookmin University, Korea)
Tae-Yang Lee (Kookmin University, Korea)
Jin-Woo Choi (Kookmin University, Korea)
Miran Lee (Microsoft Research, Korea)

GENERATION OF CRITICAL MASS IN EDUCATION: AN INITIATIVE TO ENGAGEMENT.....313
Elaine H. T. Oliveira (Federal University of Amazonas, Brazil)
Horacio A. B. F. Oliveira (Federal University of Amazonas, Brazil)
Jose R. Hughes Carvalho (Federal University of Amazonas, Brazil)

T2D: Game-Based Learning: Skill Development
Chair: Joseph Ranalli (Penn State - Hazleton Campus, USA)
1:30 PM - 3:00 PM
Room: 130C

GENERAL STRATEGY FOR DEVELOPMENT OF TEAMWORK SKILLS.....320
Kevin Hadley (SDSM&T, USA)
Kenneth Reid (Virginia Polytechnic Institute and State University, USA)
Laura Beckmann (SDSM&T, USA)

SPLAT! ER, SHMUP? A POSTMORTEM ON A CAPSTONE PRODUCTION EXPERIENCE.....327
Adrienne Decker (Rochester Institute of Technology, USA)
Christopher A. Egert (Rochester Institute of Technology, USA)
Andrew Phelps (Rochester Institute of Technology, USA)
A FRAMEWORK TO HELP ANALYZE IF CREATING A GAME TO TEACH A LEARNING OBJECTIVE IS WORTH THE WORK.....336
Peter Jamieson (Miami University, USA)
Lindsay Grace (American University, USA)

LEARNING MATHEMATICS THROUGH SERIOUS GAMES: AN ENGAGEMENT FRAMEWORK.....343
Opeyemi Dele-Ajayi (Northumbria University, United Kingdom)
Rebecca Strachan (Northumbria University, United Kingdom)
Jonathan Sanderson (Northumbria University, United Kingdom)
Alison Pickard (Northumbria University, United Kingdom)

STUDENTS' DEVELOPMENT OF INFORMATION-SEEKING SKILLS IN A COMPUTER-AIDED QUEST.....348
Vadim Shmelev (ITMO University, Russia)
Maria Karpova (ITMO University, Russia)
Nikita Kogtikov (ITMO University, Russia)
Alexey Dukhanov (ITMO University, Russia)

T2E: Algorithmic Assessment Methods
Chair: Salem Ali A. Elsaiah (Bucknell University, USA)
1:30 PM - 3:00 PM
Room: 140A

USING WAVELETS TO CATEGORIZE STUDENT ATTENTION PATTERNS.....352
M. Jean Mohammadi-Aragh (Mississippi State University, USA)
John E. Ball (Mississippi State University, USA)
Donna Jaison (Mississippi State University, USA)

MEASURING AND VISUALIZING LEARNING WITH MARKOV MODELS.....360
Fatima Abu Deeb (Brandeis University, USA)
Kristian Kime (Brandeis University, USA)
Rebecca Torrey (Brandeis University, USA)
Timothy Hickey (Brandeis University, USA)

INVESTIGATING CURRENT APPROACHES TO ASSESSING TEACHING EVALUATION IN ENGINEERING DEPARTMENTS.....369
Nicole Pitterson (Oregon State University, USA)
Shane Brown (Oregon State University, USA)
Keisha Ann Villanueva (Oregon State University, USA)
Ann Sitomer (Oregon State University, USA)

USING THE RANDOM FOREST CLASSIFIER TO ASSESS AND PREDICT STUDENT LEARNING OF SOFTWARE ENGINEERING TEAMWORK.....376
Dragutin Petkovic (San Francisco State University, USA)
Marc Sosnick-Pérez (San Francisco State University, USA)
Kazunori Okada (San Francisco State University, USA)
Rainer Todtenhoefer (University of Applied Sciences, Fulda, Germany)
Shihong Huang (Florida Atlantic University, USA)
Nidhi Miglani (San Francisco State University, USA)
Arthur Vigil (San Francisco State University, USA)

A SYSTEMATIC MAPPING ON PEDAGOGICAL PATTERNS.....383
Maria Lydia Fioravanti (University of São Paulo, Brazil)
Ellen Francine Barbosa (University of São Paulo, Brazil)
T2F: Computational Thinking
Chair: Leônidas O. Brandão (University of São Paulo, Brazil)
1:30 PM - 3:00 PM
Room: 140B

TEACHING PROGRAMMING BASED ON COMPUTATIONAL THINKING.....392
Ying Li (Beihang University, P.R. China)

CAN COMPUTATIONAL THINKING HELP ME? A QUANTITATIVE STUDY OF ITS EFFECTS ON EDUCATION.....399
Rivanilson S. Rodrigues (Federal University of Campina Grande, Brazil)
Wilkerson L. Andrade (Federal University of Campina Grande, Brazil)
Lívia M. R. Sampaio Campos (Federal University of Campina Grande, Brazil)

A REVIEW OF MODELS FOR INTRODUCING COMPUTATIONAL THINKING, COMPUTER SCIENCE AND COMPUTING IN K-12 EDUCATION.....407
Fredrik Heintz (Linköping University, Sweden)
Linda Mannila (Åbo Akademi University, Finland)
Tommy Färnqvist (Linköping University, Sweden)

TRACKING AND VISUALIZING TIME MANAGEMENT FOR SELF-REGULATED LEARNERS.....416
Mario Manso-Vázquez (University of Vigo, Spain)
Manuel Caeiro-Rodriguez (University of Vigo, Spain)
Martín Llamas-Nistal (University of Vigo, Spain)

INTRODUCING BEA INTO SELF-REGULATED LEARNING TO PROVIDE FORMATIVE ASSESSMENT SUPPORT.....421
Manuel Caeiro-Rodriguez (University of Vigo, Spain)
Martín Llamas-Nistal (University of Vigo, Spain)
Fernando Mikic-Fonte (University of Vigo, Spain)

T2G: STEAM
Chair: James J. Sluss, Jr. (The University of Oklahoma, USA)
1:30 PM - 3:00 PM
Room: 140C

MUSIC EDUCATION MEETS COMPUTER SCIENCE AND ENGINEERING EDUCATION.....425
Carlos N. Silla Jr. (Pontificia Universidade Católica do Paraná (PUCPR), Brazil)
André L. Przybysz (Federal University of Technology of Parana (UTFPR), Brazil)
Wellington V. Leal (Federal University of Technology of Parana (UTFPR), Brazil)

THE UNIVERSITY OF CENTRAL FLORIDA STEAM PROGRAM: WHERE ENGINEERING EDUCATION AND ART MEET.....432
Carla Poindexter (The University of Central Florida, USA)
Debra Reinhart (The University of Central Florida, USA)
Bonnie Swan (The University of Central Florida, USA)
Victoria McNeil (The University of Central Florida, USA)

STEAM APPROACH BY INTEGRATING THE ARTS AND STEM THROUGH ORIGAMI IN K-12.....439
Jamie L Kennedy (Drexel University, USA)
Erica Lee (GAMP High School, USA)
Adam Fontecchio (Drexel University, USA)
DEVELOPMENT OF COURSE MODULES FOR MULTIDISCIPLINARY STEM EDUCATION.....444
Andreas Spanias (Clarkson University, USA)
Mahesh K. Banavar (Clarkson University, USA)
Henry Braun (Arizona State University, USA)
Photini Spanias (Arizona State University, USA)
Yongpeng Zhang (Prairie View A&M University, USA)

ROBOTIC EDUCATIONAL TOOL TO ENGAGE STUDENTS ON ENGINEERING.....449
Pedro Plaza Merino (Siemens Rail Automation, SAU, Spain)
Elio Sanristobal Ruiz (Spanish University for Distance Education (UNED), Spain)
German Carro Fernandez (Spanish University for Distance Education (UNED), Spain)
Manuel Castro Gil (Spanish University for Distance Education (UNED), Spain)

T2I: Program Assessment and Program Development
Chair: Doron Faran (ORT Braude College, Israel)
1:30 PM - 3:00 PM
Room: 160A

QUALITY IMPROVEMENT WITH AUTOMATED ENGINEERING PROGRAM EVALUATIONS USING PERFORMANCE INDICATORS CLASSIFIED BASED ON BLOOM'S 3 DOMAINS.....453
Wajid Hussain (Islamic University, Saudi Arabia)
M. F. Addas (Islamic University, Saudi Arabia)
Fong Mak (Gannon University, USA)

ALIGNING QUALITY ASSURANCE AT THE COURSE UNIT AND EDUCATIONAL PROGRAM LEVELS.....462
Björn Jörsson (Reykjavik University, Iceland)
Marta Kristin Lárusdóttir (Reykjavik University, Iceland)
Mats Daniels (Uppsala University, Sweden)
Alison Clear (EIT, New Zealand)
Tony Clear (Auckland University of Technology, New Zealand)
Roger McDermott (RGU, United Kingdom)

A FRAMEWORK FOR A SIMPLE AND EFFECTIVE ASSESSMENT AND CQI PROCESS.....471
William Lasher (Penn State Behrend, USA)
Russel L. Warley (Penn State Behrend, USA)
Jonathan Meckley (Penn State Behrend, USA)

COMPLEMENTARY TRAINING PROGRAMME FOR ELECTRICAL AND COMPUTER ENGINEERING STUDENTS THROUGH AN INDUSTRIAL-ACADEMIC COLLABORATION.....476
Felipe R. Monteiro (Federal University of Amazonas, Brazil)
Phillipe A. Pereira (Federal University of Amazonas, Brazil)
Lucas C. Cordeiro (Federal University of Amazonas, Brazil)
Cicero F. F. Costa Filho (Federal University of Amazonas, Brazil)
Marly G. F. Costa (Federal University of Amazonas, Brazil)

T2I: Credentials and Accreditation
Chair: Paul B. Crilly (United States Coast Guard Academy, USA)
1:30 PM - 3:00 PM
Room: 160B

SUCCESSFUL ACCREDITATION OF THE ELECTRICAL ENGINEERING PROGRAM OFFERED IN TWO CAMPUSES AT CARIBBEAN UNIVERSITY.....485
Hermes E. Calderón (Caribbean University, Puerto Rico)
Ramón Vásquez (Caribbean University, Puerto Rico)
Diego Aponte Roa (Caribbean University, Puerto Rico)
Maritza Del Valle (Caribbean University, Puerto Rico)
CREDENTIALING IN THE CSET EDUCATION CHANGE PROCESS.....491
Jennifer Karlin (University of Southern Maine, USA)
Rebecca Bates (Minnesota State University, Mankato, USA)
Cheryl Allendoerfer (University of Washington, USA)
Dan Evert (North Dakota State University, USA)
Ron Ulseth (Itasca Community College, USA)

AN ANALYSIS OF THE USE OF BADGES IN AN EDUCATIONAL EXPERIMENT.....496
José A. Ruínez-Valiente (Universidad Carlos III de Madrid, Spain)
Pedro J. Muñoz-Merino (Universidad Carlos III de Madrid, Spain)
Carlos Delgado Kloos (Universidad Carlos III de Madrid, Spain)

ENGINEERING DIPLOMA CURRICULUM NITTTR-MSBTE MODEL 2016.....504
S.K. Gupta (NITTTR, India)
Joshua Earnest (NITTTR, India)

FINDING GOOD FRIENDS TO LEARN FROM AND TO INSPIRE.....509
Jens Bennedsen (University of Aarhus, Denmark)
Siegfried Rouvrais (Institut Mines Telecom, France)

T2J: Conceptions and Misconceptions
Chair: Tanya Kunberger (Florida Gulf Coast University, USA)
1:30 PM - 3:00 PM
Room: 160C

A FACTOR ANALYSIS OF STATICS CONCEPT INVENTORY DATA
FROM PRACTICING CIVIL ENGINEERS.....517
Oai Ha (Oregon State University, USA)
Shane Brown (Oregon State University, USA)

USING SIMULATION AND STRUCTURED GROUP WORK
TO ADDRESS STATISTICAl MISCONCEPTIONS.....521
Scott Streiner (University of Pittsburgh, USA)
Mary Besterfield-Sacre (University of Pittsburgh, USA)
Sam Donovan (University of Pittsburgh, USA)

ENABLING DEEP CONCEPTUAL LEARNING IN COMPUTING COURSES
THROUGH CONFLICT-BASED COLLABORATIVE LEARNING.....528
Swaroop Joshi (The Ohio State University, USA)
Neelam Soundarajan (The Ohio State University, USA)

THE DEVELOPMENT OF A CONCEPT INVENTORY FOR ENGINEERING GRAPHICS.....537
Steven Y. Nozaki (The Ohio State University, USA)
Sheryl A. Sorby (The Ohio State University, USA)
Nancy E. Study (Penn State Behrend, USA)
Heidi M. Steinhauser (Embry-Riddle Aeronautical University, USA)
Mary Sadowski (Purdue University, USA)
Ronald Miller (Colorado School of Mines, USA)

THE IMPACT OF SUPERVISED HOMEWORK SESSIONS AND SAT-MATH SCORES
ON ACADEMIC PERFORMANCE IN AN ADVANCED UNDERGRADUATE COURSE.....541
Waterloo Tsutsui (Purdue University, USA)
Michael C. Loui (Purdue University, USA)
<table>
<thead>
<tr>
<th>Session</th>
<th>Title</th>
<th>Chair/Author</th>
<th>Date/Time</th>
<th>Room</th>
</tr>
</thead>
<tbody>
<tr>
<td>T3A</td>
<td><strong>Special Session: Innovation T-Ball: Everybody Wins!!</strong></td>
<td>Stephanie Cutler (The Pennsylvania State University, USA)</td>
<td>3:30 PM – 5:00 PM</td>
<td>170A</td>
</tr>
<tr>
<td></td>
<td><strong>INNOVATION T-BALL: EVERYBODY WINS!!</strong></td>
<td>Thomas Litzinger (The Pennsylvania State University, USA)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sarah Zappe (The Pennsylvania State University, USA)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Michael Alley (The Pennsylvania State University, USA)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T3B</td>
<td>Panel: Launching Curricular Guidelines for Computer Engineering: CE2016</td>
<td>John Impagliazzo (Hofstra University, USA)</td>
<td>3:30 PM – 5:00 PM</td>
<td>170B</td>
</tr>
<tr>
<td></td>
<td><strong>LAUNCHING CURRICULAR GUIDELINES FOR COMPUTER ENGINEERING: CE2016</strong></td>
<td>Susan Conry (Clarkson University, USA)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Eric Durant (Milwaukee School of Engineering, USA)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Joseph Hughes (Georgia Tech, USA)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Russ Meier (Milwaukee School of Engineering, USA)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T3C</td>
<td>Educating Students on Professional Ethics</td>
<td>James Huff (Harding University, USA)</td>
<td>3:30 PM – 5:00 PM</td>
<td>130B</td>
</tr>
<tr>
<td></td>
<td><strong>PUBHUB: A WEB-BASED COMPENDIUM TO CATALYZE UNDERGRADUATE RESEARCH PUBLICATION</strong></td>
<td>Rebecca Ligrani (Penn State University, USA)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Irena Gorski (Penn State University, USA)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sarah Ritter (Penn State University, USA)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Khanjan Mehta (Penn State University, USA)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>WHAT DO FIRST-YEAR ENGINEERS AND OTHERS CONSIDER CHEATING??</strong></td>
<td>Brian E. Moyer (University of Pittsburgh at Johnstown, USA)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>HOW SOFTWARE WORKS: COMPUTATIONAL THINKING AND ETHICS BEFORE CS1??</strong></td>
<td>Andrew Scott (Western Carolina University, USA)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Scott Barlowe (Western Carolina University, USA)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>MACROETHICS INSTRUCTION IN CO-CURRICULAR SETTINGS:</strong></td>
<td>Daniel W. Knight (University of Colorado Boulder, USA)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>THE DEVELOPMENT AND RESULTS OF A NATIONAL SURVEY??</td>
<td>Angela R. Bielefeldt (University of Colorado Boulder, USA)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Nathan E. Canney (Seattle University, USA)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Christopher Swan (Tufts University, USA)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>A COMMUNICATIVE APPROACH TO EXPLORING THE DEVELOPMENT OF ETHICAL TEAM PROCESSES OVER TIME??</strong></td>
<td>Megan Kenny Feister (Purdue University, USA)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Carla B. Zoltowski (Purdue University, USA)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Patrice M. Buzzanell (Purdue University, USA)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>David Torres (Purdue University, USA)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
T3D: Game-Based Learning: Stakeholder Perspectives
Chair: Swaroop Joshi (The Ohio State University, USA)
3:30 PM – 5:00 PM
Room: 130C

UNDERSTANDING THE ATTITUDE AND INTENTION TOWARDS ADOPTING VIRTUAL REALITY TECHNOLOGY IN CLASSROOM.....N/A
JooYeon Christina Ri (Santa Clara University, USA)
Simon G. M. Koo (Ananse, Inc., USA)

STUDENT PERSPECTIVES ON APPLICATION OF GAME-BASED LEARNING WITHIN A GRADUATE-LEVEL ENGINEERING COURSE.....586
Cheryl Bodnar (Rowan University, USA)
Renee Clark (University of Pittsburgh, USA)
Jesse Davis (University of Pittsburgh, USA)
Tom Congedo (University of Pittsburgh, USA)
Daniel Cole (University of Pittsburgh, USA)

GAMIFYING AN ONLINE APPROACH FOR PROMOTING GAME DEVELOPMENT LEARNING AND CONTEST: AN EXPERIENCE REPORT.....591
Murilo Rocha Regalado (Federal University of Rio Grande do Norte - UFRN, Brazil)
Eduardo Aranha (Federal University of Rio Grande do Norte - UFRN, Brazil)
Thiago Reis da Silva (Federal Institute of Education, Science and Technology of Maranhão – IFMA, Brazil)

THE EFFECTS OF GAMIFICATION ON ENGINEERING LAB ACTIVITIES.....599
Eunsik Kim (The Pennsylvania State University, USA)
Ling Rothrock (The Pennsylvania State University, USA)
Andris Freivalds (The Pennsylvania State University, USA)

T3E: Student Perceptions of Evaluation and Assessment
Chair: Rogério Garcia (São Paulo State University, Brazil)
3:30 PM – 5:00 PM
Room: 140A

FRESHMAN ENGINEERING STUDENT PERCEPTIONS OF ACADEMIC FEEDBACK – A CASE STUDY FROM DIGITAL SYSTEMS 1.....605
Rangith Baby Kuriakose (University of Technology, South Africa)

STUDENT ACCEPTANCE AND PERFORMANCE OF A VIRTUAL PLATFORM FOR TRAINING AND EVALUATION OF STATICS COURSE.....611
Jorge Luis Restrepo Ochoa (EAFIT University, Colombia)
Jaime Leonardo Barbosa Pérez (EAFIT University, Colombia)
Julian Arenas Berrio (EAFIT University, Colombia)

STUDENT REFLECTIONS ON STANDARDS-BASED GRADED ASSIGNMENTS.....617
Heidi A. Diefes-Dux (Purdue University, USA)

T3F: Learning Software Development
Chair: Carlos Silla (Pontifícia Universidade Católica do Paraná, Brazil)
3:30 PM – 5:00 PM
Room: 140B

UNCOVERING DIFFICULTIES IN LEARNING FOR THE INTERMEDIATE PROGRAMMER.....622
Adrienne Decker (Rochester Institute of Technology, USA)
David Simkins (Rochester Institute of Technology, USA)
DEBUGGING STUDENTS' DEBUGGING PROCESS.....630
Axel Böttcher (Munich University of Applied Sciences, Germany)
Kathrin Schlierkamp (Munich University of Applied Sciences, Germany)
Daniela Zehetmeier (Munich University of Applied Sciences, Germany)
Veronika Thurmer (Munich University of Applied Sciences, Germany)

7 SURPRISING LESSONS LEARNED FROM TEACHING IOS PROGRAMMING TO 30,000+ MOOC STUDENTS.....637
Parham Aarabi (University of Toronto, Canada)
Narges Norouzi (University of Toronto, Canada)
Jack Wu (University of Toronto, Canada)
Michael Spears (University of Toronto, Canada)

EXAMINING THE INTERMEDIATE PROGRAMMERS UNDERSTANDING OF THE LEARNING PROCESS.....641
David Simkins (Rochester Institute of Technology, USA)
Adrienne Decker (Rochester Institute of Technology, USA)

PROGRAMMING CASE STUDIES AS CONTEXT FOR ACTIVE LEARNING ACTIVITIES IN THE CLASSROOM.....645
Yonglei Tao (Grand Valley State University, USA)
Jagadeesh Nandigam (Grand Valley State University, USA)

T3G: Mathematics and Statistics
Chair: Jacqueline McNeil (University of Louisville, USA)
3:30 PM – 5:00 PM
Room: 140C

USING INQUIRY-BASED LEARNING IN ENGINEERING STATISTICS COURSES.....649
Christopher Golubski (University of Texas at Austin, USA)

IMPLEMENTING SCHEMA-BASED ASSESSMENT IN ENGINEERING STATISTICS COURSES.....652
Walter M. Stroup (The University of Texas at Austin)
Christopher Golubski (The University of Texas at Austin, USA)

THE INFLUENCE OF EDUCATIONAL LEARNING PATHS IN ACADEMIC SUCCESS OF MATHEMATICS IN ENGINEERING UNDERGRADUATE.....655
Maria Emilia Bigotte (Engineering Institute of Polytechnic Institute of Coimbra, Portugal)
Anabela Gomes (Engineering Institute of Polytechnic Institute of Coimbra, Portugal)
João Ricardo Branco (Engineering Institute of Polytechnic Institute of Coimbra, Portugal)
Teresa Pessoa (University of Coimbra, Portugal)

INTERNET-BASED TUTORIAL PROVIDING MATHEMATICAL COMPLEMENTS FOR TECHNICAL MASTER STUDENTS: TIMEMATHCOM.....661
M. Rosa Estela-Carbonell (Universitat Politècnica de Catalunya, BarcelonaTech, Spain)
Pedro Diez (Universitat Politècnica de Catalunya, BarcelonaTech, Spain)

A DYNAMIC LEARNING MODEL FOR ACCELERATED PRE-MATRICULATION MATHEMATICS PROGRAMS: A WORK-IN-PROGRESS.....666
Henry Griffith (Michigan State University, USA)
Angela Griffith (Wright State University, USA)
T3H: Computer-Based Learning and Courseware Technologies
Chair: Charles Wallace (Michigan Technological University, USA)
3:30 PM – 5:00 PM
Room: 160A

INFORMATION RESOURCE BASED ON SCIENTIFIC SOFTWARE AS A CORE OF INTERDISCIPLINARY LEARNING RESOURCES.....669
Maria Karpova (ITMO University, Russia)
Vadim Shmelev (ITMO University, Russia)
Alexey Dukhanov (ITMO University, Russia)

EXPLORATION OF THE COMPUTER HARDWARE EXPERIMENT TEACHING METHOD BASED ON THE CLOUD PLATFORM.....674
Quan Chengbin (Tsinghua University, P.R. China)
Chen Yongqiang (Tsinghua University, P.R. China)
Li ShanShan (Tsinghua University, P.R. China)
Zhao Youjian (Tsinghua University, P.R. China)

INTEGRATING INTERNET OF THINGS (IOT) INTO STEM UNDERGRADUATE EDUCATION: CASE STUDY OF A MODERN TECHNOLOGY INFUSED COURSEWARE FOR EMBEDDED SYSTEM COURSE.....679
Jing (Selena) He (Kennesaw State University, USA)
Dan Chia-Tien Lo (Kennesaw State University, USA)
Ying Xie (Kennesaw State University, USA)
Jonathan Lartigue (Kennesaw State University, USA)

WEX-HIL: DESIGN OF A WIRELESS EXTENSIBLE HARDWARE-IN-THE-LOOP REAL-TIME SIMULATOR FOR ELECTRIC VEHICLE APPLICATIONS.....668
Yong-Kyu Jung (Gannon University, USA)
Fong Mak (Gannon University, USA)
Fnu Qinggele (Gannon University, USA)
Idrees Alzahid (Gannon University, USA)

E-NABLING EDUCATION: CURRICULA AND MODELS FOR TEACHING STUDENTS TO PRINT HANDS.....697
Stephen Jacobs (RIT MAGIC Center, USA)
Jon Schull (RIT MAGIC Center, USA)
Perry White (RIT MAGIC Center, USA)
Richard Lehrer (RIT MAGIC Center, USA)
Akanksha Vishwakarma (RIT MAGIC Center, USA)
Andrea Bertucci (RIT MAGIC Center, USA)

T3I: Student Beliefs and Motivation
Chair: Mounir Ben Ghalla (The University of Texas Rio Grande Valley, USA)
1:30 PM – 3:00 PM
Room: 160B

MEASURING ENGINEERING EPISTEMIC BELIEFS IN UNDERGRADUATE ENGINEERING STUDENTS.....701
Courtney Faber (The College of New Jersey, USA)
Penelope Vargas (Clemson University, USA)
Lisa Benson (Clemson University, USA)
UNDERSTANDING STUDENTS' PERCEPTION OF ACADEMIC AND PROFESSIONAL RELEVANCE IN STEM COURSES.....708
Yun-Hsin (Cynthia) Chen (Franklin W. Olin College of Engineering, USA)
Allison Tau (Franklin W. Olin College of Engineering, USA)
Yevgeniya V. Zastavker (Franklin W. Olin College of Engineering, USA)
Jonathan D. Stolk (Franklin W. Olin College of Engineering, USA)
Alex Dillon (Franklin W. Olin College of Engineering, USA)
Michael D. Gross (Wake Forest University, USA)

INTERNALIZATION AND EXTERNALIZATION IN THE CLASSROOM: HOW DO THEY EMERGE AND WHY IS IT IMPORTANT?.....713
Pinar Demeteci (Franklin W. Olin College of Engineering, USA)
Caz Nichols (Franklin W. Olin College of Engineering, USA)
Yevgeniya V. Zastavker (Franklin W. Olin College of Engineering, USA)
Jonathan D. Stolk (Franklin W. Olin College of Engineering, USA)
Alex Dillon (Franklin W. Olin College of Engineering, USA)
Michael D. Gross (Wake Forest University, USA)

TRAIT MINDFULNESS IN AN ENGINEERING CLASSROOM: AN EXPLORATION OF THE RELATIONSHIP BETWEEN MINDFULNESS, ACADEMIC SKILLS, AND PROFESSIONAL SKILLS.....718
Beth Rieken (Stanford University, USA)
Mark Schar (Stanford University, USA)
Sheri Sheppard (Stanford University, USA)

CAREER GOALS, SELF-EFFICACY AND PERSISTENCE IN ENGINEERING STUDENTS.....726
Philip R. Brown (Virginia Tech, USA)
Holly M. Matusovich (Virginia Tech, USA)

T3J: Design Education
Chair: Charlotte de Vries (Pennsylvania State University Erie, USA)
3:30 PM – 5:00 PM
Room: 160C

ENGINEERS' WRITTEN FEEDBACK ON DESIGN.....731
Farshid Marbouti (San Jose State University, USA)
Heidi A. Diefes-Dux (Purdue University, USA)
Monica E. Cardella (Purdue University, USA)
Ali Shafaat (Purdue University, USA)

AN AUTOMATIC GENERATOR AND CORRECTOR OF MULTIPLE CHOICE TESTS WITH RANDOM ANSWER KEYS.....736
Francisco de Assis Zampirolli (Federal University of ABC, Brazil)
Valério Ramos Batista (Federal University of ABC, Brazil)
José Artur Quilici-Gonzalez (Federal University of ABC, Brazil)

A LEARNING TOOL TO DEVELOP SUSTAINABLE PROJECTS.....744
Fermin Sánchez-Carracedo (Universitat Politecnica de Catalunya - BarcelonaTech, Spain)
Jose Cabre (Universitat Politecnica de Catalunya - BarcelonaTech, Spain)
Marc Alier (Universitat Politecnica de Catalunya - BarcelonaTech, Spain)
Eva Vidal (Universitat Politecnica de Catalunya - BarcelonaTech, Spain)
David López (Universitat Politecnica de Catalunya - BarcelonaTech, Spain)
Carme Martin (Universitat Politecnica de Catalunya - BarcelonaTech, Spain)
Jordi Garcia (Universitat Politecnica de Catalunya - BarcelonaTech, Spain)
INJECTION OF BUSINESS CODING STANDARDS AND PRACTICES TO EMBEDDED SOFTWARE COURSES.....753
Donald V. MacKellar Jr. (Gannon University, USA)

EXPLORING STUDENTS' EXPERIMENTATION STRATEGIES IN ENGINEERING DESIGN USING AN EDUCATIONAL CAD TOOL.....761
Ying Ying Seah (Purdue University, USA)
Camilo Vieira (Purdue University, USA)
Chandan Dasgupta (Purdue University, USA)
Alejandra J. Magana (Purdue University, USA)
### Friday, October 14

**F1A: Panel: Developments in Global Software Engineering Education**  
10:00 AM - 12:00 PM  
Room: 170A

**DEVELOPMENTS IN GLOBAL SOFTWARE ENGINEERING EDUCATION...766**  
Tony Clear (Auckland University of Technology, New Zealand)  
Sarah Beecham (University of Limerick, Ireland)  
John Barr (Ithaca College, USA)  
Mats Daniels (Uppsala University, Sweden)  
Michael Oudshoorn (Wentworth Institute of Technology, USA)  
John Noll (University of Limerick, Ireland)

**F1B: Panel: Integrating Systems Engineering and Systems Thinking into Undergraduate Engineering Education**  
10:00 AM - 12:00 PM  
Room: 170B

**INTEGRATING SYSTEMS ENGINEERING AND SYSTEMS THINKING INTO UNDERGRADUATE ENGINEERING EDUCATION...770**  
Rick Adcock (Cranfield University Centre for Systems Engineering, United Kingdom)  
Alice Squires (Washington State University, USA)  
Peggy Brouse (George Mason University, USA)  
Mario Simoni (Rose-Hulman Institute of Technology, USA)  
Fred Looft (Worcester Polytechnic Institute, USA)

**F1C: Faculty Development: Transferring Innovation**  
Chair: Molly Hathaway Goldstein (Purdue University, USA)  
10:00 AM - 12:00 PM  
Room: 130B

**THE CONNECTED LEARNER: ENGAGING FACULTY TO CONNECT COMPUTING STUDENTS TO PEERS, PROFESSION AND PURPOSE...774**  
Mary Lou Maher (University of North Carolina at Charlotte, USA)  
Bojan Cukic (University of North Carolina at Charlotte, USA)  
Larry Mays (University of North Carolina at Charlotte, USA)  
Steven Rogelberg (University of North Carolina at Charlotte, USA)  
Celine Latulipe (University of North Carolina at Charlotte, USA)  
Jamie Payton (University of North Carolina at Charlotte, USA)  
Audrey Rorrer (University of North Carolina at Charlotte, USA)  
Tonya Frevert (University of North Carolina at Charlotte, USA)

**ACADEMICS’ EXPERIENCE OF TEACHING OPEN ENDED GROUP PROJECTS: A PHENOMENOGRAPHIC STUDY...782**  
Marianne Voogt (Uppsala University, Sweden)  
Chuan Sheng Chen (Uppsala University, Sweden)  
Neena Thota (Uppsala University, Sweden)

**PROVIDING MEANINGFUL CHANGE IN THE ENGINEERING CLASSROOM...789**  
Matthew S. Barner (Oregon State University, USA)  
Shane A. Brown (Oregon State University, USA)
LESSONS IN TRANSFER: BETTER UNDERSTANDING OF ENGINEERING STUDENTS' METACOGNITIVE DEVELOPMENT.....792
Sarah A. Williams (Virginia Tech, USA)
John Morelock (Virginia Tech, USA)
Holly Matusovich (Virginia Tech, USA)
Patrick Cunningham (Rose-Hulman Institute of Technology, USA)

THE USE OF ONLINE MATERIALS IN UNDERGRADUATE COMPUTER SCIENCE CLASSROOMS: EXAMINING FACTORS FOR ADOPTING NEW CURRICULUM AND INSTRUCTION.....796
Tim Weston (University of Colorado, USA)
Beth Quinn (University of Colorado, USA)

AN ADAPTABLE MODEL FOR TEACHING MOBILE APP DEVELOPMENT.....801
Andrey Esakia (Virginia Tech, USA)
D. Scott McCrickard (Virginia Tech, USA)

F1D: Self-Regulated Learning
Chair: Madalene Spezialetti (Trinity College, USA)
10:00 AM - 12:00 PM
Room: 130C

CHARACTERISTICS OF SELF-REGULATION OF ENGINEERING STUDENTS TO PREDICT AND IMPROVE THEIR ACADEMIC PERFORMANCE.....810
Julieta Noguez (Tecnologico de Monterrey, Mexico)
Luis Neri (Tecnologico de Monterrey, Mexico)
Andres Gonzalez-Nucamendi (Tecnologico de Monterrey, Mexico)
Victor Robledo-Rella (Tecnologico de Monterrey, Mexico)

RESEARCH EXPERIENCES FOR UNDERGRADUATES (REU) ON SELF-REGULATED LEARNING IN ENGINEERING EDUCATION.....818
Ning Fang (Utah State University, USA)
Oenardi Lawanto (Utah State University, USA)
Wade Goodridge (Utah State University, USA)
Idalis Villanueva (Utah State University, USA)

STUDENT SELF-REGULATION IN CAPSTONE DESIGN COURSES:
A CASE STUDY OF TWO PROJECT TEAMS.....823
Oenardi Lawanto (Utah State University, USA)
Andreas Febrarian (Utah State University, USA)

FACILITATING HABITUAL REFLECTION IN STUDENTS - APPLICATION TO AN ENGINEERING CAPSTONE PROJECT.....828
Michael Marsolek (Seattle University, USA)
Nathan Canney (Seattle University, USA)
**F1E: Robotics**

**Chair:** Jose Reginaldo Hughes Carvalho (Federal University of Amazonas, Brazil)

**Room:** 140A

---

**INTRODUCING COMPUTER ENGINEERING MAJOR FOR FIRST YEAR STUDENTS USING ROBOTIC PROJECTS...**

George El-Howayek (Valparaiso University, USA)

---

**TEACHING DESIGN WITH A TINKERING-DRIVEN ROBOT HACK...**

Tom J. Zajdel (University of California, Berkeley, USA)  
Michel M. Maharbiz (University of California, Berkeley, USA)

---

**ROBOTIC FOOTBALL DANCE TEAM: AN ENGINEERING FINE-ARTS INTERDISCIPLINARY LEARNING EXPERIENCE...**

Danielle Desmond (Valparaiso University, USA)  
Madeline Horton (Valparaiso University, USA)  
Adam Morrison (Valparaiso University, USA)  
Sami Khorboly (Valparaiso University, USA)

---

**UTILIZING ENGINEERING TO TEACH NON-TECHNICAL DISCIPLINES: CASE STUDIES OF ROBOTICS WITHIN MIDDLE SCHOOL ENGLISH AND HEALTH CLASSES...**

Emily Hammer (Carnegie Mellon University, USA)  
Lauren Zito (Carnegie Mellon University, USA)  
Jennifer Cross (Carnegie Mellon University, USA)  
Brett Slezak (Allegheny Valley School District, USA)  
Sue Mellon (Allegheny Valley School District, USA)  
Heather Harapko (Allegheny Valley School District, USA)  
Michele Welter (Allegheny Valley School District, USA)

---

**ROBOTICS INTEGRATION TO CREATE AN AUTHENTIC LEARNING ENVIRONMENT IN ENGINEERING EDUCATION...**

Ahmad Khanlari (University of Toronto, Canada)

---

**F1F: Programming Courses and Concepts**

**Chair:** Clifford De Raffaele (Middlesex University Malta, Malta)

**Room:** 140B

---

**EVOLVING AN INTRODUCTORY PROGRAMMING COURSE: IMPACTS OF STUDENT SELF-EMPOWERMENT, GUIDED HANDS-ON TIMES, AND SELF-DIRECTED TRAINING...**

Patrick Seeling (Central Michigan University, USA)

---

**MEASUREMENT RANGE INCREMENT IN A METHOD FOR EVALUATING PANORAMIC UNDERSTANDING OF PROGRAMMING...**

Dick Martinez Calderon (Kobe University, Japan)  
Kin Man (Kobe University, Japan)  
Hidenari Kiyomitsu (Kobe University, Japan)  
Kazuhiko Ohtsuki (Kobe University, Japan)  
Yukinobu Miyamoto (Kobe Institute of Computing, Japan)  
Yi Sun (Kobe Institute of Computing, Japan)  
Masami Hirabayashi (Institute of Advanced Media Arts and Sciences, Japan)

---

**TOWARDS AN M-LEARNING REQUIREMENTS CATALOG FOR THE DEVELOPMENT OF EDUCATIONAL APPLICATIONS FOR THE TEACHING OF PROGRAMMING...**

Anderson S. Marcelino (Institute of Science and Computational Mathematics (ICMC-USP), Brazil)  
Ellen Barbosa (Institute of Science and Computational Mathematics (ICMC-USP), Brazil)
EXAMINING STUDENTS' CONCERNS RELATED TO ONLINE DELIVERY OF AN INTRODUCTORY COMPUTER PROGRAMMING COURSE.....880
Asad Azemi (Pennsylvania State University, USA)

EVIDENCE-BASED RE-DESIGN OF AN INTRODUCTORY COURSE "PROGRAMMING IN C".....884
Dion Timmermann (Hamburg University of Technology, Germany)
Christian Kautz (Hamburg University of Technology, Germany)
Volker Skwarek (Hamburg University of Applied Sciences, Germany)

INCLASS ASSISTANT, ENHANCING STUDENT CLASS PARTICIPATION.....889
Yolanda Martinez-Trevino (Tecnologico de Monterrey, Mexico)

F1G: Service and Learning
Chair: Carla Zoltowski (Purdue University, USA)
10:00 AM - 12:00 PM
Room: 140C

STUDENT OUTCOMES OF SHORT-TERM INTERNATIONAL HUMANITARIAN ENGINEERING FIELDWORK.....894
A.R. Nassar (The Pennsylvania State University, USA)
K. Holmes (The Pennsylvania State University, USA)
K. Mehta (The Pennsylvania State University, USA)

TEACHING FIRST YEAR ENGINEERING STUDENTS ENGINEERING DESIGN PROCESS AND PROBLEM SOLVING THROUGH SERVICE LEARNING PROJECTS.....903
Lin Zhao (Gannon University, USA)
Karinna Vernaza (Gannon University, USA)

SERVING WITH ENGINEERING SKILLS WITHIN 15 MILES OF CAMPUS: THE SCHOLARS OF EXCELLENCE IN ENGINEERING AND COMPUTER SCIENCE PROGRAM.....910
Theresa M. Vitolo (Gannon University, USA)
Barry J. Brinkman (Gannon University, USA)
Karinna M. Vernaza (Gannon University, USA)
Scott E. Steinbrink (Gannon University, USA)

HOW SERVICE LEARNING CAN BE OFFERED AS CAPSTONE.....916
Ali Shafaaat (Purdue University, USA)
Behzad Esmaeili (University of Nebraska-Lincoln, USA)
Farshid Marbouti (San Jose State University, USA)
Brandon Fulk (Purdue University, USA)

USING THE EFFORT OF ACADEMIC PROJECTS FOR THE COMMUNITY SERVICE: A SOFTWARE ENGINEERING PRACTICAL APPROACH.....920
Jakeline Marcos-Abed (Tecnologico de Monterrey, Mexico)

COMMUNITY PARTNERS' PERSPECTIVES ON THE OUTCOMES FROM INTERNATIONAL SERVICE-LEARNING PROGRAMS: PROJECT SCOPE AND METHOD.....924
Neha Choudhary (Purdue University, USA)
Brent K. Jesiek (Purdue University, USA)
**F1H: Pathways to Engineering Degrees**

**Chair:** Beth Myers (University of Colorado Boulder, USA)  
**10:00 AM - 12:00 PM**  
**Room:** 160A

---

**CURRICULAR CHOICE AND TECHNICAL–NON-TECHNICAL BALANCE IN COMPUTER SCIENCE AND ENGINEERING DEGREE PROGRAMS....928**  
M.H. Forbes (University of Colorado Boulder, USA)  
A.R. Bielefeldt (University of Colorado Boulder, USA)  
J.F. Sullivan (University of Colorado Boulder, USA)

**A RANDOM WALK ON THE MAJOR PATH SPACE: EXAMINING STUDENT PROGRESSION AS A RANDOM PROCESS USING MARKOV CHAINS.....N/A**  
George Ricco (University of Kentucky, USA)  
James Ryan (Chubb Insurance, USA)

**EXAMINING ENGINEERING STUDENTS' MAJOR SELECTION: DEVELOPING BASELINE QUANTITATIVE RESULTS TO INVESTIGATE MAJOR SELECTION AND CHANGE.....935**  
Jamie L. Paulson (The Ohio State University, USA)  
Rachel L. Kajfez (The Ohio State University, USA)  
Krista M. Kecskemety (The Ohio State University, USA)

**COMBINING PROJECTS AND INFORMATIONAL SESSIONS TO CREATE A COMPREHENSIVE INTRODUCTION TO THE DEPARTMENT.....940**  
Rebecca M. Reck (Kettering University, USA)  
Girish Krishnan (University of Illinois at Urbana-Champaign, USA)

**ADDRESSING MISCONCEPTIONS ABOUT ENGINEERING THROUGH STUDENT-INDUSTRY INTERACTION IN A VIDEO-AUGMENTED 3D IMMERSIVE VIRTUAL WORLD.....945**  
Sasha Nikolic (University of Wollongong, Australia)  
Mark J. W. Lee (Charles Sturt University, Australia)  
Tom Goldfinch (University of Wollongong, Australia)  
Christian H. Ritz (University of Wollongong, Australia)

---

**F1I: Graduate Student Education**

**Chair:** Wendy Fisher (Colorado School of Mines, USA)  
**10:00 AM - 12:00 PM**  
**Room:** 160B

---

**CONSIDERATIONS FOR THE DESIGN OF A HANDS-ON WIRELESS COMMUNICATIONS GRADUATE COURSE BASED ON SOFTWARE-DEFINED RADIO.....951**  
Miguel Bazdresch (Rochester Institute of Technology, USA)

**CUSTOMIZING BIOINFORMATICS GRADUATE PROGRAMS FOR DIVERSIFIED STUDENT BACKGROUNDS.....956**  
Huanmei Wu (School of Informatics and Computing Indianapolis, USA)  
Oindrila Raha (School of Informatics and Computing Indianapolis, USA)  
Jian Zhang (Shenzhen Polytechnic, P.R. China)
AN EXPERIENCE REPORT OF INTER-INSTITUTIONAL ENGINEERING DEGREE PROGRAMS IN THE AMAZON REGION.....963
Vicente F. de Lucena Jr. (Federal University of Amazonas, Brazil)
Jose Pinheiro Queiroz Neto (Federal Institute of Education, Science and Technology, Brazil)
Juliana M.V.M. de Lucena (Federal Institute of Education, Science and Technology, Brazil)

THE DISSERTATION INSTITUTE: MOTIVATING DOCTORAL ENGINEERING STUDENTS TOWARD DEGREE COMPLETION.....971
Indhira M. Hasbún (Virginia Tech, USA)
Holly M. Matusovich (Virginia Tech, USA)
Stephanie G. Adams (Virginia Tech, USA)

UNDERSTANDING THE ROLE OF KNOWLEDGE RELATED TO FINANCIAL RESOURCES ON DECISIONS TO ATTEND GRADUATE SCHOOL.....976
Marian S. Kennedy (Clemson University, USA)
Shelby K. Laniar (Clemson University, USA)
Katherine M. Ehlert (Clemson University, USA)
Kathryn K. Pegues (Clemson University, USA)
Karen A. High (Clemson University, USA)
Julia L. Sharp (Clemson University, USA)

F1J: Integrating Business and Engineering
Chair: Donald V. MacKellar, Jr. (Gannon University, USA)
10:00 AM - 12:00 PM
Room: 160C

USING INNOVATION AS A CATALYST FOR INTEGRATING BUSINESS AND ENGINEERING EDUCATION.....981
David W. Keck (University of Nebraska - Lincoln, USA)
Ian J. Cottingham (University of Nebraska - Lincoln, USA)

THEORY-BASED COURSE DESIGN FOR PROFESSIONAL MASTER’S DEGREE PROGRAM IN BUSINESS ENGINEERING.....988
Brit-Maren Block (Leuphana University of Lueneburg, Germany)

SYSTEMS ENGINEERING AS INTEGRATOR BETWEEN ENGINEERING AND BUSINESS.....996
Barend W Botha (University of Johannesburg, South Africa)

INNOVATIVE BUSINESS ANALYSIS CURRICULUM FOR COMPUTER SCIENCE, IT AND ENGINEERING PROGRAMS.....1003
Vladimir Uskov (Bradley University, USA)
Urvashi Singh (Bradley University, USA)
Mounica Yalamanchili (Bradley University, USA)
Archana Penumatsa (Bradley University, USA)

MASTER’S OF ENGINEERING MANAGEMENT: GRADUATION RATES LAGGING BEHIND GROWTH RATE.....1009
A. Marnewick (University of Johannesburg, South Africa)
JHC Pretorius (University of Johannesburg, South Africa)

USING EXTERNAL BUSINESS PLAN COMPETITIONS TO DRIVE INNOVATION AND EFFECTIVE CROSS-DISCIPLINARY COLLABORATION.....1017
Davide Piovesan (Gannon University, USA)
Anne Schmitz (Gannon University, USA)
Kurt Hersch (Gannon University, USA)
**F2A: Special Session: Considering students' intrinsic motivations and positive emotions in course design: Are they ends, means, or threats?**

1:30 PM - 3:00 PM  
Room: 170A

---

**CONSIDERING STUDENTS' INTRINSIC MOTIVATIONS AND POSITIVE EMOTIONS IN COURSE DESIGN: ARE THEY ENDS, MEANS, OR THREATS?.....1021**

Jonathan D. Stolk (Franklin W. Olin College of Engineering, USA)  
Yevgeniya V. Zastavker (Franklin W. Olin College of Engineering, USA)  
Alex Dillon (Franklin W. Olin College of Engineering, USA)  
Michael D. Gross (Wake Forest University, USA)

---

**F2B: Special Session: Open Sourcing Education for Data Engineering and Data Science**

1:30 PM - 3:00 PM  
Room: 170B

---

**OPEN SOURCING EDUCATION FOR DATA ENGINEERING AND DATA SCIENCE.....1025**

David E Drummond (Insight Data Engineering, USA)

---

**F2C: Faculty Development: Careers**

Chair: Divya Nalla (Nalla Malla Reddy Engineering College, India)

1:30 PM - 3:00 PM  
Room: 130B

---

**ASIAN-AMERICAN WOMEN ENGINEERING FACULTY: A LITERATURE REVIEW USING AN INTERSECTIONAL FRAMEWORK OF RACE, CLASS, AND GENDER.....1026**

Nikitha Sambamurthy (Purdue University, USA)  
Joyce B. Main (Purdue University, USA)  
Matilde Sánchez-Peña (Purdue University, USA)  
Monica F. Cox (The Ohio State University, USA)  
Ebony McGee (Vanderbilt University, USA)

---

**THE FACTORS AFFECTING THE PERSISTENCE OF LATINA FACULTY: A LITERATURE REVIEW USING THE INTERSECTIONALITY OF RACE, GENDER, AND CLASS.....1033**

Matilde Sánchez-Peña (Purdue University, USA)  
Joyce Main (Purdue University, USA)  
Nikitha Sambamurthy (Purdue University, USA)  
Monica Cox (The Ohio State University, USA)  
Ebony McGee (Vanderbilt University, USA)

---

**THE CAREER GOALS OF NON-TENURE-TRACK FULL-TIME ENGINEERING FACULTY.....1042**

Cliff Fitzmorris (University of Oklahoma, USA)  
Randa Shehab (University of Oklahoma, USA)  
Deborah Trytten (University of Oklahoma, USA)

---

**TEACHING PATHWAYS IN THE ACADEMY: A NARRATIVE STUDY OF ENGINEERING FACULTY AT INSTITUTIONS WITH VARYING TEACHING AND RESEARCH ACTIVITY.....1048**

Natascha M. Trellinger (Purdue University, USA)  
Brent K. Jesiek (Purdue University, USA)

---

**PERCEPTIONS OF TREATMENT FOR UNDERREPRESENTED MINORITY FACULTY IN ENGINEERING.....1053**

Juan M. Cruz (Virginia Tech, USA)  
Indhira M. Hasbún (Virginia Tech, USA)  
Stephanie G. Adams (Virginia Tech, USA)  
Joan M. Banks-Hunt (Virginia Tech, USA)  
Gilda A. Barabino (CUNV City College, USA)
### F2D: Diversity: Intersectionality

**Chair:** Javier A. Kypuros (The University of Texas Rio Grande Valley, USA)

**Room:** 130C

**ENGINEERING COMPETITION TEAM RECRUITMENT AND INTEGRATION STRATEGIES** 1058

- Deborah A. Trytten (University of Oklahoma, USA)
- Ryan Browning (University of Oklahoma, USA)
- Catherine Thomas (University of Oklahoma, USA)
- Cindy Foor (University of Oklahoma, USA)
- Randa Shehab (University of Oklahoma, USA)
- Susan Walden (University of Oklahoma, USA)
- Celia Pan (Toyota Financial Services, USA)

**REPRESENTATIONS OF UNDERREPRESENTED CHARACTERS IN ENGINEERING CHILDREN BOOKS** 1067

- Hoda Ehsan (Purdue University, USA)
- Xinrui (Rose) Xu (Purdue University, USA)
- Monica Cardella (Purdue University, USA)

**ANALYSIS OF MULTI-MODAL SPATIAL VISUALIZATION WORKSHOP INTERVENTION ACROSS GENDER, NATIONALITY, AND OTHER ENGINEERING STUDENT DEMOGRAPHICS** 1072

- Jacob L. Segil (University of Colorado at Boulder, USA)
- Jacquelyn F. Sullivan (University of Colorado Boulder, USA)
- Beth A. Myers (University of Colorado Boulder, USA)
- Derek T. Reamon (University of Colorado Boulder, USA)
- Marissa H. Forbes (University of Colorado Boulder, USA)

**SUPPORTING ECONOMICALLY DISADVANTAGED STUDENTS FROM NICARAGUA IN STEM-C FIELDS** 1077

- Iva Bojic (Singapore-MIT Alliance for Research and Technology, Singapore)
- Juan F. Arratia (Ana G. Méndez University System, USA)
- Vedran Podobnik (University of Zagreb, Croatia)
- Milos Grgic (University of Zagreb, Croatia)

**INVESTIGATING THE IMPACT OF A HYBRID SUMMER TRANSITION PROGRAM** 1081

- Lauren Griggs (Virginia Commonwealth University, USA)
- Falcon Rankins (Virginia Commonwealth University, USA)
- JK Stringer (Virginia Commonwealth University, USA)
- Rosalyn Hargraves (Virginia Commonwealth University, USA)

### F2E: PK-12: Teacher Development

**Chair:** Aaron Johnson (Tufts University, USA)

**Room:** 140A

**TRAINING TEACHERS TO INTEGRATE ENGINEERING INTO NON-TECHNICAL MIDDLE SCHOOL CURRICULUM** 1086

- Emily Hamner (Carnegie Mellon University, USA)
- Jennifer Cross (Carnegie Mellon University, USA)
- Lauren Zito (Carnegie Mellon University, USA)
- Debra Bernstein (TERC, USA)
- Karen Mutch-Jones (TERC, USA)
RESEARCH MODELS WITH DISSEMINATION ACTIVITIES FOR RESEARCH EXPERIENCE FOR TEACHERS (RET).....1095
Mangilal Agarwal (Indiana University-Purdue University Indianapolis, USA)
Brandon Sorge (Indiana University-Purdue University Indianapolis, USA)
Grant Fore (Indiana University-Purdue University Indianapolis, USA)
Dan Minner (Indiana University-Purdue University Indianapolis, USA)
Charles Feldhaus (Indiana University-Purdue University Indianapolis, USA)
Maher Rizkalla (Indiana University-Purdue University Indianapolis, USA)

ENGAGING K-12 TEACHERS IN ENGINEERING THROUGH A PROFESSIONAL DEVELOPMENT PROGRAM: IMPLEMENTATION STRATEGIES, RESULTS AND LESSONS LEARNED.....1101
Mounir Ben Ghalia (The University of Texas Rio Grande Valley, USA)
Ralph Carlson (The University of Texas Rio Grande Valley, USA)
Veronica Estrada (The University of Texas Rio Grande Valley, USA)
Hasina Huq (The University of Texas Rio Grande Valley, USA)
Jaime Ramos (The University of Texas Rio Grande Valley, USA)

K-12 STEM EDUCATION: BRINGING THE ENGINEERING MAKER SPACE, STUDENT-CENTERED LEARNING, CURRICULUM, AND TEACHER TRAINING TO MIDDLE SCHOOLS.....1108
Joan M. Banks-Hunt (Virginia Tech University, USA)
Stephanie Adams (Virginia Tech University, USA)
Susan Ganter (Virginia Tech University, USA)
Juan Cruz Bohorquez (Virginia Tech University, USA)

AN EXPERIENTIAL APPROACH TO UNDERSTANDING THE ENGINEERING DESIGN PROCESS.....N/A
Sarah Gray (University of San Diego, USA)
Maaron Tesfaye (University of San Diego, USA)
Rishika Daryanani (University of San Diego, USA)
Odesna Dalrymple (University of San Diego, USA)
Susan Lord (University of San Diego, USA)

F2F: Advanced Computer Science Courses
Chair: Eric Durant (Milwaukee School of Engineering, USA)
1:30 PM - 3:00 PM
Room: 140B

TEACHING MOBILE APPLICATION DEVELOPMENT THROUGH LECTURES, INTERACTIVE TUTORIALS, AND PAIR PROGRAMMING.....1113
Mohammed Seyam (Virginia Tech, USA)
D. Scott McCrickard (Virginia Tech, USA)
Shuo Niu (Virginia Tech, USA)
Andrey Esakia (Virginia Tech, USA)
Woongsup Kim (Dongguk University, Korea)

TEACHING GENETIC ALGORITHM-BASED PARAMETER OPTIMIZATION USING PACMAN.....1122
Carlos N. Silla Jr. (Pontificial Catholic University of Paraná, Brazil)

USE OF MODEL-BASED DESIGN TO TEACH EMBEDDED SYSTEMS PROGRAMMING.....N/A
Nannan He (Minnesota State University at Mankato, USA)
Han-way Huang (Minnesota State University at Mankato, USA)

IMMEDIATE FEEDBACK TOOL IN TEACHING DATABASE AND ITS CONTRIBUTION TO THE LEARNING OF STUDENTS ON COMPUTER SCIENCE COURSE.....N/A
Monael Pinheiro Ribeiro (Federal University of ABC, Brazil)
Gabriel Paulon (Federal University of ABC, Brazil)
Adriana Keiko Nishida (Federal University of ABC, Brazil)
TEACHING-LEARNING FIREWALL CONFIGURATION USING A VISUAL MODELING WEB BASED TOOL: THE SP2MODEL AND ITS APPLICATION TO COMPUTER SCIENCE COURSE.....1128
Helton Molina Sapia (Universidade Estadual Paulista “Júlio de Mesquita Filho”, Brazil)
Rogério Eduardo Garcia (Universidade Estadual Paulista “Júlio de Mesquita Filho”, Brazil)
Celso Olivete Júnior (Universidade Estadual Paulista “Júlio de Mesquita Filho”, Brazil)
Danillo Roberto Pereira (Universidade Estadual Paulista “Júlio de Mesquita Filho”, Brazil)
Kleber Manrique Trevisani (Instituto Federal de Educação Ciência e Tecnologia de São Paulo, Brazil)

F2G: Mobile Devise Enabled Learning
Chair: Yi Wu (Penn State Erie, the Behrend College, USA)
1:30 PM - 3:00 PM
Room: 140C

AN ANDROID APP FOR SPATIAL ACOUSTIC ANALYSIS AS A LEARNING TOOL.....1136
Thomas H. DePue (Clarkson University, USA)
Benjamin Robistow (Clarkson University, USA)
Robert Newman (Clarkson University, USA)
Kevin Mack (Clarkson University, USA)
Mahesh K. Banavar (Clarkson University, USA)
Tianqi Yang (Clarkson University, USA)
Dana Barry (Clarkson University, USA)
Paul Curtis (Arizona State University, USA)
Andreas Spanias (Arizona State University, USA)
Whitni Watkins (Systems Librarian, USA)

CONTINUANCE USE INTENTION OF PRIMARY SCHOOL LEARNERS TOWARDS MOBILE MATHEMATICAL APPLICATIONS.....1141
Marisa Venter (Central University of Technology, South Africa)
Lizette de Wet (University of the Free State, South Africa)

QUALITY EVALUATION OF MOBILE LEARNING APPLICATIONS.....1150
Gustavo Williams Soad (University of São Paulo (USP), Brazil)
Nemesio F. Duarte Filho (Federal Institute of São Paulo (IFSP), Brazil)
Ellen Francine Barbosa (University of São Paulo (USP), Brazil)

DISCOVERING STUDENTS MOBILE LEARNING EXPERIENCES IN HIGHER EDUCATION IN NIGERIA.....1158
Solomon S. Oyelere (University of Eastern Finland, Finland)
Jarkko Suhonen (University of Eastern Finland, Finland)
Shaibu A. Shonola (University of Warwick, United Kingdom)
Mike S. Joy (University of Warwick, United Kingdom)

DEVELOPMENT OF A MOBILE-FRIENDLY CLASSROOM SUPPORT SYSTEM TO IMPROVE STUDENTS’ PRESENTATION SKILLS.....1165
Junko Toyoshima (Hosei University, Japan)
Soichiro Fujii (Hosei University, Japan)
Yuji Tokiwa (Hosei University, Japan)

F2H: Professional Skills Development
Chair: Benjamin Ahn (Iowa State University, USA)
1:30 PM – 3:00 PM
Room: 160A

AN EFFECTIVE DESIGN COURSE TO INSPIRE ACTIVE LEARNING IN UNDERGRADUATE EDUCATION.....1170
Salem EIsaiah (Bucknell University, USA)
Peter Mark Jansson (Bucknell University, USA)
IMPLEMENTING LEAN LAUNCHPAD METHODOLOGY INTO AN ENGINEERING PROFESSIONAL DEVELOPMENT COURSE.....1176
Chad E. Davis (University of Oklahoma, USA)
Ronald E. Bolen (University of Oklahoma, USA)

DETERMINING PROGRESS IN WRITING COMPETENCY BY ASSESSING STUDENTS' ARGUMENTATION.....1182
Sofia Cassel (Uppsala University, Sweden)
Aletta Nylén (Uppsala University, Sweden)

ENGINEERING REPORT: A TOOL TO FACILITATE LEARNING FOR REAL-WORLD PROBLEM SOLVING.....1188
Jia-Ling Lin (University of Minnesota Twin Cities, USA)
Paul Imbertson (University of Minnesota Twin Cities, USA)
Kundan Srivastav (University of Minnesota Twin Cities, USA)
William Horn (University of Minnesota Twin Cities, USA)

CONTINUOUS LEARNING THROUGH INLINE TRAINING.....1196
Brian Krisler (Raytheon BBN Technologies, USA)
Richard Alterman (Brandeis University, USA)

F21: Non-Traditional Student Pathways
Chair: Nathan Canney (Seattle University, USA)
1:30 PM - 3:00 PM
Room: 160B

ENTRY PATHWAYS, ACADEMIC PERFORMANCE, AND PERSISTENCE OF NONTRADITIONAL STUDENTS IN ENGINEERING BY TRANSFER STATUS.....1204
Jacqueline C. McNeil (University of Louisville, USA)
Matthew W. Ohland (Purdue University, USA)
Russell A. Long (Purdue University, USA)

FORMATIVE EVALUATION OF AN INNOVATIVE PROGRAM TO PREPARE NON-TECHNICAL MAJORS TO JOIN ADVANCED MANUFACTURING WORKFORCE.....1211
Abe Zeid (Northeastern University, USA)
Claire Duggan (Northeastern University, USA)
Marina Bogard (MassBay Community College, USA)
Chitra Javdekar (MassBay Community College, USA)

EXPLORING THE INTERSECTION OF VETERAN STATUS, AGE, AND ENGINEERING STUDY.....1215
Catherine E. Brawner (Research Triangle Educational Consultants, USA)
Catherine Mobley (Clemson University, USA)
Joyce Main (Purdue University, USA)
Michelle M. Camacho (University of San Diego, USA)
Susan M. Lord (University of San Diego, USA)

A STEM PROGRAM FOCUSED ON TRANSFER STUDENT SUCCESS AT BINGHAMTON UNIVERSITY.....1220
Eric Cotts (Binghamton University, USA)
Jye Fang (Binghamton University, USA)
Wayne Jones (Binghamton University, USA)
David Klotzkin (Binghamton University, USA)
Greta Myers (Binghamton University, USA)
Bruce White (Binghamton University, USA)
**F2i: Philosophy of Engineering and Engineering Education**

**Chair:** Nicole Pitterson (Oregon State University, USA)
**1:30 PM - 3:00 PM**
**Room:** 160C

**MORE BY LUCK THAN GOOD JUDGEMENT: MORAL PURPOSE IN ENGINEERING EDUCATION POLICY MAKING FOR CHANGE.....1224**
John Heywood (Trinity College Dublin, Ireland)

**FRONTIERS IN EDUCATION-HAVE WE MADE A DIFFERENCE? IF SO, WHAT?.....1230**
Edwin C. Jones, Jr (Iowa State University, USA)
James R. Rowland (University of Kansas, USA)

**STATE OF MIXED METHODS RESEARCH IN ENGINEERING EDUCATION: IN-DEPTH EXAMINATION OF JEE ARTICLES, 2010-2015.....1234**
Neha Choudhary (Purdue University, USA)
Brent K. Jesiek (Purdue University, USA)

**BALANCING ENGINEERING AND RELIGIOUS IDENTITIES.....1243**
Kelly J. Cross (University of Illinois Urbana Champaign, USA)

**ISSUES IN STUDENT VALUING OF SOFTWARE ENGINEERING BEST PRACTICES.....1248**
Stephen T. Frezza (Gannon University, USA)

---

**F3A: Special Session: Developing ABET Criteria for Undergraduate Cybersecurity Programs**
**4:00 PM - 5:30 PM**
**Room:** 170A

**DEVELOPING ABET CRITERIA FOR UNDERGRADUATE CYBERSECURITY PROGRAMS.....1252**
Allen Parrish (The United States Naval Academy, USA)
Edward Sobiesk (Army Cyber Institute, USA)

---

**F3B: Special Session: Preparing Engineers for Careers in Social Innovation and Sustainable Development**
**4:00 PM - 5:30 PM**
**Room:** 170B

**PREPARING ENGINEERS FOR CAREERS IN SOCIAL INNOVATION AND SUSTAINABLE DEVELOPMENT.....1254**
Khanjan Mehta (The Pennsylvania State University, USA)
Irena Gorski (The Pennsylvania State University, USA)

---

**F3C: Faculty Development: Culture and Practices**
**Chair:** Ella L. Ingram (Rose-Hulman Institute of Technology, USA)
**4:00 PM - 5:30 PM**
**Room:** 130B

**DO DIFFERENCES EXIST BETWEEN HOW ENGINEERING AND NON-ENGINEERING LECTURERS PERCEIVE THE IMPORTANCE OF TEACHING COMPETENCES?.....1259**
Antoni Perez-Poch (Universitat Politècnica de Catalunya - BarcelonaTech, Spain)
David López (Universitat Politècnica de Catalunya - BarcelonaTech, Spain)

**RESEARCH CULTURE IN ENGINEERING FACULTY: ITS EFFECT ON THE ATTAINMENT OF GRADUATE ATTRIBUTES.....1267**
Divya Nalla (Nalla Malla Reddy Engineering College, India)
Sneha Nalla (Nalla Malla Reddy Engineering College, India)
STUDYING FACULTY COMMUNITIES OF PRACTICE THROUGH SOCIAL NETWORK ANALYSIS.....1274
Shufeng Ma (University of Illinois at Urbana-Champaign, USA)
Geoffrey L. Herman (University of Illinois at Urbana-Champaign, USA)
Matthew West (University of Illinois at Urbana-Champaign, USA)
Jonathan Tomkin (University of Illinois at Urbana-Champaign, USA)
Jose Mestre (University of Illinois at Urbana-Champaign, USA)

USING REFLECTION TO IDENTIFY DISSONANCE, CONSONANCE, AND INTEREST IN TEACHING:
COMPARING DEFINITIONS AND STORIES TO RESOLVE CONFLICT.....1279
Anne LoVerso (Franklin W. Olin College of Engineering, USA)
Adam Coppola (Franklin W. Olin College of Engineering, USA)
Emma Price (Franklin W. Olin College of Engineering, USA)
Gwyneth Phelps (Franklin W. Olin College of Engineering, USA)
Yevgeniya V. Zastavker (Franklin W. Olin College of Engineering, USA)
Jeremy M. Goodman (Franklin W. Olin College of Engineering, USA)

F3D: Diversity and Inclusivity Awareness
Chair: Kelly Cross (University of Illinois Urbana Champaign, USA)
4:00 PM – 5:30 PM
Room: 130C

PARTICIPATORY DESIGN FOR THE DEVELOPMENT OF INCLUSIVE EDUCATIONAL
TECHNOLOGIES: A SYSTEMATIC REVIEW.....1284
Luciana C. L. F. Borges (Universidade Federal de Mato Grosso, Brazil)
Mauricio R. R. Araujo (Universidade Federal de Mato Grosso, Brazil)
Cristiano Maciel (Universidade Federal de Mato Grosso, Brazil)
Eunice P. S. Nunes (Universidade Federal de Mato Grosso, Brazil)

DEVELOPING DIVERSITY AWARENESS OF SOFTWARE ENGINEERS: A DIVERSITY FRAMEWORK
AND ITS APPLICATION IN AN ACADEMIC AND LIFE-LONG LEARNING CONTEXT.....1293
Christina Böhm (University of Vienna, Austria)
Renate Motschnig (University of Vienna, Austria)

EXPLORING STUDENT MOTIVATION TOWARDS DIVERSITY EDUCATION IN ENGINEERING.....1301
Sarah A. Williams (Virginia Tech, USA)
Ben Lutz (Virginia Tech, USA)
Cynthia Hampton (Virginia Tech, USA)
Holly M. Matusovich (Virginia Tech, USA)
Walter C. Lee (Virginia Tech, USA)

AUTISM SPECTRUM DISORDER AND ENGINEERING EDUCATION –
NEEDS AND CONSIDERATIONS.....1306
Mary Pilotte (Purdue University, USA)
Diana Bairaktarova (Virginia Tech, USA)

INTEGRATED CRAYONS FOR ADAPTIVE NEEDS.....1311
Nancy Morris (Gannon University, USA)
Davide Piovesan (Gannon University, USA)
F3E: PK-12: Teaching Computer-Related Topics
Chair: Courtney J Faber (The College of New Jersey, USA)
4:00 PM – 5:30 PM
Room: 130C

APPLYING SCRUM PROJECT MANAGEMENT IN ECE CURRICULUM.....1316
Robert B. Bass (Portland State University, USA)
Branimir Pejinovic (Portland State University, USA)
John Grant (Portland State University, USA)

"CODE YOURSELF" AND "A PROGRAMAR": A BILINGUAL MOOC FOR TEACHING COMPUTER SCIENCE TO TEENAGERS.....1321
Inés Friss de Kereki (Universidad ORT Uruguay, Uruguay)
Areti Manataki (University of Edinburgh, United Kingdom)

ARTIFICIAL INTELLIGENCE AND COMPUTER SCIENCE IN EDUCATION:
FROM KINDERGARTEN TO UNIVERSITY.....1330
Martin Kandlhofer (Graz University of Technology, Austria)
Gerald Steinbauer (Graz University of Technology, Austria)
Sabine Hirschmugl-Gaisch (University of Teacher Education Styria, Austria)
Petra Huber (Children's Office Graz, Austria)

TEXTUAL VS. VISUAL PROGRAMMING LANGUAGES IN PROGRAMMING EDUCATION FOR PRIMARY SCHOOLCHILDREN.....1339
Hidekuni Tsukamoto (Osaka University of Arts, Japan)
Yasuhiro Takemura (Osaka University of Arts, Japan)
Yasumasa Oomori (Joetsu University of Education, Japan)
Isamu Ikeda (Institute of Information Education Support, Japan)
Hideo Nagumo (Niigata Seiryo University, Japan)
Akito Monden (Okayama University, Japan)
Ken-ichi Matsumoto (Nara Institute of Science and Technology, Japan)

COMPETENCY BASED IT EXPERIENCES.....1346
Chengcheng Li (University of Cincinnati, USA)
Hazem Said (University of Cincinnati, USA)
Rebekah Michael (University of Cincinnati, USA)
Marcus Johnson (University of Cincinnati, USA)
Helen Meyer (University of Cincinnati, USA)

F3F: Upper Division Computer Science
Chair: Tony Clear (Auckland University of Technology, New Zealand)
4:00 PM – 5:30 PM
Room: 140B

THE APTNESS OF TANGIBLE USER INTERFACES FOR EXPLAINING ABSTRACT COMPUTER NETWORK PRINCIPLES.....1350
Clifford De Raffaele (Middlesex University Malta, Malta)
Serengul Smith (Middlesex University, United Kingdom)
Orhan Gemikonaklı (Middlesex University, United Kingdom)

COMBINED METHODOLOGY FOR THEORETICAL COMPUTING.....1358
Gabriel Spadon de Souza (Universidade de São Paulo (USP), Brazil)
Pedro Henrique de Andrade Gomes (Universidade Estadual Paulista (UNESP), Brazil)
Ronaldo Celso Messias Correia (Universidade Estadual Paulista (UNESP), Brazil)
Celso Olivete Júnior (Universidade Estadual Paulista (UNESP), Brazil)
Danilo Medeiros Eler (Universidade Estadual Paulista (UNESP), Brazil)
Rogério Eduardo Garcia (Universidade Estadual Paulista (UNESP), Brazil)
ANALYSIS OF STUDENTS' BEHAVIOR IN THE PROCESS
OF OPERATING SYSTEM EXPERIMENTS.....1365
Lei Wang (Beihang University, P.R. China)
Chao Gao (Beihang University, P.R. China)
Tianyu Wo (Beihang University, P.R. China)
Bin Shi (Beihang University, P.R. China)

A TEAM-APPROACH TO PUTTING LEARNER-CENTERED PRINCIPLES TO PRACTICE IN A LARGE
COURSE ON HUMAN-COMPUTER INTERACTION.....1373
Renate Motschnig (University of Vienna, Austria)
Michael Sedlmair (University of Vienna, Austria)
Svenja Schröder (University of Vienna, Austria)
Torsten Möller (University of Vienna, Austria)

JOTHELLO: A JAVA-BASED OPEN SOURCE OTHELLO FRAMEWORK
FOR ARTIFICIAL INTELLIGENCE UNDERGRADUATE CLASSES.....1382
Carlos N. Silla Jr. Pontifical Catholic University of Paran’a (PUCPR), Brazil)
Marcelo Paglione (Federal University of Technology of Parana (UTFPR), Brazil)
Iuri G.P. Mardegan (Federal University of Technology of Parana (UTFPR), Brazil)

F3G: Remote Laboratories
Chair: Glen Archer (Michigan Technological University, USA)
4:00 PM – 5:30 PM
Room: 140C

ADOPTING AN EXERCISE PROGRAM FOR ELECTRONICS ENGINEERING EDUCATION UTILISING
REMOTE LABORATORIES FOR THE AGE OF MOOC.....1389
Dag A. H. Samuelsen (University College of Southeast Norway, Norway)
Olaf H. Graven (University College of Southeast Norway, Norway)

LABSLAND: A SHARING ECONOMY PLATFORM TO PROMOTE EDUCATIONAL REMOTE
LABORATORIES MAINTAINABILITY, SUSTAINABILITY AND ADOPTION.....1396
Pablo Orduña (DeustoTech - Deusto Institute of Technology, Spain)
Luis Rodriguez-Gil (DeustoTech - Deusto Institute of Technology, Spain)
Javier Garcia-Zubia (University of Deusto, Spain)
Ignacio Angulo (DeustoTech - Deusto Institute of Technology, Spain)
Unai Hernández (DeustoTech - Deusto Institute of Technology, Spain)
Esteban Azcuénaga (LabsLand, Spain)

HANDS-ON AND VIRTUAL LABORATORIES TO UNDERGRADUATE CHEMISTRY EDUCATION:
TOWARD A PEDAGOGICAL INTEGRATION.....1402
Saúlo Ramos (ABC Federal University, Brazil)
Edson P. Pimentel (ABC Federal University, Brazil)
Maria das Graças B. Marietto (ABC Federal University, Brazil)
Wagner T. Botelho (ABC Federal University, Brazil)

DESIGN OF A LATIN AMERICAN AND CARIBBEAN REMOTE LABORATORIES NETWORK.....1410
Luís Felipe Zapata Rivera (Florida Atlantic University, USA)
Maria M. Larrodo-Petrie (Florida Atlantic University, USA)

HYBRID TEACHING MODE FOR LABORATORY-BASED REMOTE EDUCATION OF COMPUTER
STRUCTURE COURSE.....1415
Han Wan (Beihang University, P.R. China)
Xiaopeng Gao (Beihang University, P.R. China)
Qian Liu (Beihang University, P.R. China)
**F3H: Engineering Education Research**

**Chair:** Cem Sahin (Drexel University, USA)

4:00 PM – 5:30 PM

**Room:** 160A

---

**GRIT AND FIRST-YEAR RETENTION IN ENGINEERING.....1423**

Dong San Choi (University of Illinois at Urbana-Champaign, USA)
Beth Ann Myers (University of Colorado Boulder, USA)
Michael C. Loui (Purdue University, USA)

---

**MASTERY GRADING OF ENGINEERING HOMEWORK ASSIGNMENTS.....1426**

Jacob Moore (Penn State University, USA)

---

**DEVELOPING A GROUNDED THEORY OF UNDERGRADUATE CIVIL ENGINEERING PROFESSIONAL IDENTITY FORMATION.....1435**

Cassandra Groen (Virginia Tech, USA)
Lisa D. McNair (Virginia Tech, USA)

---

**EXPLORING SHAME IN ENGINEERING EDUCATION.....1440**

James L. Huff (Harding University, USA)
Jeremiah Sullins (Harding University, USA)
Nicola W. Sochacka (University of Georgia, USA)
Kathryn M. Youngblood (University of Georgia, USA)
Kerby M. Wood (University of Georgia, USA)
Shari E. Miller (University of Georgia, USA)
Joachim Walth (University of Georgia, USA)

---

**PHYSIOLOGICAL SENSING BASED STRESS ANALYSIS DURING ASSESSMENT.....1444**

Aniruddha Sinha (Tata Consultancy Services Ltd., India)
Pratyusha Das (Tata Consultancy Services Ltd., India)
Rahul Gavas (Tata Consultancy Services Ltd., India)
Debatri Chatterjee (Tata Consultancy Services Ltd., India)
Sanjoy Saha (Jadavpur University, India)

---

**F3I: Engineering Discipline Specific**

**Chair:** Yong-Kyu Jung (Gannon University, USA)

4:00 PM – 5:30 PM

**Room:** 160B

---

**TEACHING MODERN CONTROL THEORY TO UNDERGRADUATES USING A STATE SPACE MODEL OF A SYNCHRONOUS GENERATOR.....1452**

Mohammad Rasouli (Penn State Erie, USA)
Robert Weissbach (Penn State Erie, USA)
Deryck Yeung (Penn State Erie, USA)

---

**TEACHING THE FOUNDATIONS OF THERMODYNAMICS WITH PYRO.....1457**

Christopher R. Martin (Penn State University, USA)
Jacob P. Moore (Penn State University, USA)
Joseph A. Ranalli (Penn State University, USA)

---

**FILLING THE SKILLS GAP IN U.S. MANUFACTURING: PROMOTING INTERNSHIP AND CO-OP EXPERIENCES AND INTEGRATING INDUSTRIAL ENGINEERING COURSES TO IMPROVE STUDENT DESIGN AND MANUFACTURING KNOWLEDGE.....1463**

Paul Lynch (Penn State Behrend, USA)
Faisal Aqlan (Penn State Behrend, USA)
DEVELOPING A SYSTEMATIC FRAMEWORK
TO ENHANCE CONSTRUCTION PROCEDURE DESIGN.....1471
Ali Shaafat (Purdue University, USA)
Hossein Ebrahiminejad (Purdue University, USA)
Farshid Marbouti (San Jose State University, USA)
Monica Cardella (Purdue University, USA)
Amr Kandil (Purdue University, USA)

F3J: Problem Solving
Chair: Axel Böttcher (Munich University of Applied Sciences, Germany)
4:00 PM – 5:30 PM
Room: 160C

DEVELOPING MORE ROBUST PROBLEM SOLVERS
THROUGH DIVERSITY OF COURSE EXPERIENCES.....1474
Elif E. Miskioglu (Bucknell University, USA)

EXPLORING THE ROLE OF SPATIAL COGNITION IN PROBLEM SOLVING.....1481
Gavin Duffy (Dublin Institute of Technology, Ireland)
Sheryl Sorby (Ohio State University, USA)
Steven Nozaki (Ohio State University, USA)
Brian Bowe (Dublin Institute of Technology, Ireland)

ABSTRACTION AND PROBLEM SOLVING IN AN UNDERGRADUATE ELECTRICAL ENGINEERING
CIRCUITS COURSE.....1485
Presentacion Rivera-Reyes (University of Nebraska-Lincoln, USA)
Lance C. Pérez (University of Nebraska-Lincoln, USA)

THINKING ABOUT ASKING: ENCOURAGING A QUESTIONING APPROACH TO REQUIREMENTS
GATHERING AND PROBLEM SOLVING.....1492
Madalene Spezialetti (Trinity College, USA)
Saturday, October 15

S1A: Special Session: Culturally Responsive Practices in K-16 Engineering Education
8:30 AM - 10:00 AM
Room: 170A

SPECIAL SESSION: CULTURALLY RESPONSIVE PRACTICES IN K-16 ENGINEERING EDUCATION.....1496
Renata A. Revelo (University of Illinois at Chicago, USA)
Joel Alejandro Mejia (Angelo State University, USA)
Marlon Mitchell (University of Illinois at Urbana-Champaign, USA)

S1B: Peer Teaching and Learning
Chair: Kassim Tarhini (United States Coast Guard Academy, USA)
8:30 AM - 10:00 AM
Room: 170B

AN EXPERIMENT WITH SEPARATE FORMATIVE AND SUMMATIVE RUBRICS IN EDUCATIONAL PEER ASSESSMENT.....1498
Yang Song (NC State University, USA)
Zhewei Hu (NC State University, USA)
Yifan Guo (NC State University, USA)
Edward F. Gehringer (NC State University, USA)

"TEACHING IS LEARNING": PEDAGOGICAL MATERIAL CREATED AND EVALUATED BY STUDENTS.....1505
Jérémy Barbay (University of Chile, Chile)
Jocelyn Simmonds (University of Chile, Chile)
Adriana Keiko Nishida (Federal University of ABC, Brazil)
Monael Pinheiro Ribeiro (Federal University of ABC, Brazil)

PEER GRADING EXAMS WITH VIDEO RUBRICS.....1510
Shawn Lupoli (University of Maryland, Baltimore County, USA)

A MARKUP LANGUAGE FOR BUILDING A DATA WAREHOUSE FOR EDUCATIONAL PEER-ASSESSMENT RESEARCH.....1515
Yang Song (North Carolina State University, USA)
Ferry Pramudianto (North Carolina State University, USA)
Edward F Gehringer (North Carolina State University, USA)

LEARNING WITH INTERACTIVE TABLETOP DISPLAYS.....1520
Shuo Niu (Virginia Tech, USA)
D. Scott McCrickard (Virginia Tech, USA)
Sophia M. Nguyen (Virginia Tech, USA)

S1C: First and Second Year Programs
Chair: Mark A. Holliday (Western Carolina University, USA)
8:30 AM - 10:00 AM
Room: 130B

HOW IMPORTANT IS HIGH-SCHOOL COMPUTING EXPERIENCE FOR FIRST-YEAR ENGINEERING STUDENT SUCCESS?.....1529
Amber Kemppainen (Michigan Technological University, USA)
Mary Fraley (Michigan Technological University, USA)
Amy Hamlin (Michigan Technological University, USA)
Gretchen Hein (Michigan Technological University, USA)
TARGETED FLIPPED CLASSROOM TECHNIQUE APPLIED TO A CHALLENGING TOPIC.....1534
Joseph Ranalli (Penn State Hazleton, USA)
Jacob Moore (Penn State Mont Alto, USA)

ASSESSMENT OF CLOUD-BASED COMPUTATIONAL ENVIRONMENTS FOR HIGHER EDUCATION.....1538
J. Damian Segrelles (Universitat Politècnica de València, Spain)
Germán Moltó (Universitat Politècnica de València, Spain)

DESIGN OF OPEN SOURCE PLATFORM FOR AUTOMATIC CONTROL SYSTEMS EDUCATION BASED ON COOPERATIVE LEARNING.....1547
Jonathan Alvarez Ariza (Uniminuto, Colombia)

USING DESIGN JOURNALS TO UNCOVER INFORMATION LITERACY HABITS OF FIRST-YEAR STUDENTS.....N/A
Michael Fosmire (Purdue University, USA)
Nastasha Johnson (Purdue University, USA)
Nathan Mentzer (Purdue University, USA)

S1D: Inclusivity and Diversity Initiatives
Chair: Rebekah Michael (University of Cincinnati, USA)
8:30 AM - 10:00 AM
Room: 130C

METHODOLOGY FOR INNOVATION IN THE EDUCATION OF FUTURE ENGINEERS WITH TECHNOCAL AND SOCIAL AWARENESS.....N/A
D. Arias (Pontificia Universidad Catolica del Peru, Peru)
D. Quiroz (Pontificia Universidad Catolica del Peru, Peru)
D. Elias (Pontificia Universidad Catolica del Peru, Peru)

MOTIVATING ATTENDEE’S PARTICIPATION IN DISTANCE LEARNING VIA AN AUTOMATIC MESSAGING PLUGIN FOR THE MOODLE PLATFORM.....1556
Luciano R. de Almeida (University of Brasilia, Brazil)
Joao Paulo C. L. da Costa (University of Brasilia, Brazil)
Rafael T. de Sousa Junior (University of Brasilia, Brazil)
Edson P. de Freitas (Federal University of Rio Grande do Sul, Brazil)
Edna D. Canedo (University of Brasilia, Brazil)
Juliano Pretz (Universidade de Brasilia, Brazil)
Eliakim Zacarias (Universidade de Brasilia, Brazil)
Giovanni Del Galdo (Ilmenau University of Technology, Germany)

INTERDISCIPLINARY SYSTEMS ENGINEERING AND AERONAUTICS SCIENCE EFFORT TO ENHANCE SUAS TRAINING PROGRAM FOR UNDERGRADUATE STUDENTS.....N/A
Luis Daniel Otero (Florida Institute of Technology, USA)
Nicholas Gagliardo (Florida Institute of Technology, USA)
Dennis Dalli (Florida Institute of Technology, USA)
Julie Moore (Florida Institute of Technology, USA)

INSTRUCTIONAL DESIGN PRINCIPLES OF DIVERSITY-FOCUSED PROFESSIONAL DEVELOPMENT MOOC FOR COMMUNITY COLLEGE COMPUTING FACULTY: LIGHTHOUSE CC.....1561
Yunjeong Chang (University of Virginia, USA)
Leslie Cintron (University of Virginia, USA)
Joanne Cohoon (University of Virginia, USA)
James Cohoon (University of Virginia, USA)
Luther Tychonieich (University of Virginia, USA)
MINORITY MERIT: IMPROVING RETENTION WITH COOPERATIVE LEARNING IN A FIRST-YEAR ELECTRONICS COURSE.....1566
Serge Minin (University of Illinois at Urbana-Champaign, USA)
David Varodayan (University of Illinois at Urbana-Champaign, USA)
Christopher Schmitz (University of Illinois at Urbana-Champaign, USA)
Brian Faulkner (University of Illinois at Urbana-Champaign)
Dong San Choi (University of Illinois at Urbana-Champaign, USA)
Geoffrey L. Herman (University of Illinois at Urbana-Champaign, USA)

S1E: Collaborative Teaching and Learning
Chair: Kurt Thoroughman (Washington University in St. Louis, USA)
8:30 AM - 10:00 AM
Room: 140A

THE MICROGENETIC ANALYSIS OF STAGED PEER COLLABORATION FOR INTRODUCTORY PROGRAMMING.....1571
Maria Altebarmakian (Brandeis University, USA)
Richard Alterman (Brandeis University, USA)
Anna Yatskar (Brandeis University, USA)
Kendall Harsch (Brandeis University, USA)
Antonella DiLillo (Brandeis University, USA)

MAKING THE CONNECTION: SUCCESSFUL CROSS CAMPUS COLLABORATION AMONG STUDENTS.....1579
Theresa M. Vitolo (Gannon University, USA)
Kurt E. Hersch (Gannon University, USA)
Barry J. Brinkman (Gannon University, USA)

WHO WANTS TO COLLABORATE? A STEP TOWARDS UNDERSTANDING COLLABORATION AS CHOICE.....1586
Matthew Bojey (University of British Columbia, Canada)
Bowen Hui (University of British Columbia, Canada)

COLLABORATIVE TEACHING: EXPLORING REFLECTIVE PRACTICE TO ADDRESS UNCERTAINTY AVOIDANCE.....1594
Lisa D. McNair (Virginia Tech, USA)
Liesl Baum (Virginia Tech, USA)
Najla Mouchrek (Virginia Tech, USA)

SOCIAL EPISTEMIC COGNITION AND ENGINEERING STUDENTS’ COLLABORATIVE LEARNING IN EMERGING AREAS: AN IMPLEMENTATION CASE STUDY IN A COURSE FOR SOCIAL NETWORKING.....1598
Rosanna Yuen-Yan Chan (The Chinese University of Hong Kong, Hong Kong)

S1F: Programming in the First and Second Years
Chair: Jeong Yang (Texas A&M University-San Antonio, USA)
8:30 AM - 10:00 AM
Room: 140B

TEACHING PROGRAMMING IN THE CONTEXT OF SOLVING ENGINEERING PROBLEMS.....1606
Joseph P. Hoffbeck (University of Portland, USA)
Heather E. Dillon (University of Portland, USA)
Robert J. Albright (University of Portland, USA)
Wayne Lu (University of Portland, USA)
Timothy A. Doughty (University of Portland, USA)
COVERAGE OF CSI PROGRAMMING CONCEPTS IN C++ AND JAVA TEXTBOOKS.....1613
Kirby McMaster (Weber State University, USA)
Brian Rague (Weber State University, USA)
Samuel Sambhasivam (Azusa Pacific University, USA)
Stuart Wolthuis (Brigham Young University-Hawaii, USA)

AN APPROACH FOR THE USE OF LEARNING OBJECTS IN TEACHING
COMPUTER PROGRAMMING CONCEPTS.....1621
Luiz Ricardo Begosso (Centro de Pesquisas em Informatica - Cepein, Brazil)
Luiz Carlos Begosso (Faculdade de Tecnologia de Assis, Brazil)
Raissa Helena Begosso (BS Tecnologia, Brazil)

SWITCHING TO BLEND-ED: EFFECTS OF REPLACING THE TEXTBOOK WITH THE BROWSER
IN AN INTRODUCTORY COMPUTER PROGRAMMING COURSE.....1629
Patrick Seeling (Central Michigan University, USA)

VISUAL PROGRAMMING AND AUTOMATIC EVALUATION OF EXERCISES:
AN EXPERIENCE WITH A STEM COURSE.....1634
Leônidas de Oliveira Brandão (University of São Paulo, Brazil)
Yorah Bosse (Federal Univ. of Mato Grosso do Sul, Brazil)
Marco Aurélio Gerosa (University of São Paulo, Brazil)

S1G: Makers, Making, and Makerspaces
Chair: Tom J. Zajdel (University of California, Berkeley, USA)
8:30 AM - 10:00 AM
Room: 140C

THE ROLE OF VIRTUAL OBJECTS IN PERFORMING ENGINEERING RELATED TASK.....1643
Diana Bairraktarova (Virginia Tech, USA)
Aditya Johri (George Mason University, USA)

EXAMINING TWO LEARNER APPROACHES IN A MAKING ACTIVITY
WITH UNIVERSITY STUDENTS.....1648
Fayette Shaw (Tufts University, USA)
Kristen Wendell (Tufts University, USA)

EXPLORING TRADITIONAL AND WORKBENCH-STYLE KITS TO SUPPORT PROJECT-
AND PROBLEM-BASED LEARNING.....1652
Zane Cochran (Georgia Institute of Technology, USA)
Betsy DiSalvo (Georgia Institute of Technology, USA)

S1H: Project-Based Learning
Chair: Qaiser Malik (National University of Sciences and Technology, Pakistan)
8:30 AM - 10:00 AM
Room: 160A

TEACHING TOUCH SENSING TECHNOLOGIES THROUGH PROJECT-BASED LEARNING.....1659
Nannan He (Minnesota State University at Mankato, USA)
Han-way Huang (Minnesota State University at Mankato, USA)
Ying Qian (Nanjing Institute of Technology, P.R. China)

MAINTREAMING USABILITY IN LOWER LEVEL UNDERGRADUATE DESIGN COURSES.....1666
Allen H. Hoffman (Worcester Polytechnic Institute, USA)
INCORPORATING FEA IN AN UNDERGRADUATE BIOMECHANICS COURSE.....1671
Yi Wu (Pennsylvania State University Erie, the Behrend College, USA)
Amir Khalilollahi (Pennsylvania State University Erie, the Behrend College, USA)
Philip Martone (Pennsylvania State University Erie, the Behrend College, USA)

A CROSS-CURRICULAR APPROACH TO FOSTERING INNOVATION SUCH AS VIRTUAL REALITY
DEVELOPMENT THROUGH STUDENT-LED PROJECTS.....1674
Sherri Harms (University of Nebraska at Kearney, USA)
John Hastings (University of Nebraska at Kearney, USA)

STUDENTS' MOTIVATIONAL ATTITUDES IN INTRODUCTORY STEM COURSES:
THE RELATIONSHIP BETWEEN ASSESSMENT AND EXTERNALIZATION.....1683
Sarah Walters (Franklin W. Olin College of Engineering, USA)
Cesar Santana (Franklin W. Olin College of Engineering, USA)
Yevgeniya V Zastavker (Franklin W. Olin College of Engineering, USA)
Alex Dillon (Franklin W. Olin College of Engineering, USA)
Jonathan D. Stolk (Franklin W. Olin College of Engineering, USA)
Michael Gross (Wake Forest University, USA)

S11: Undergraduate Research
Chair: Asad Azemi (Pennsylvania State University, USA)
8:30 AM - 10:00 AM
Room: 160B

UNDERSTANDING UNDERGRADUATE ENGINEERING RESEARCHERS
AND HOW THEY LEARN.....1687
Lisa C. Benson (Clemson University, USA)
Marian S. Kennedy (Clemson University, USA)
Katherine M. Ehler (Clemson University, USA)
Penelope M. D. Vargas (Clemson University, USA)
Courtney J. Faber (The College of New Jersey, USA)
Rachel L. Kajfez (The Ohio State University, USA)
Anne M. McAlister (The Ohio State University, USA)

IMPROVING STUDENT LEARNING EXPERIENCE VIA EXTRACURRICULAR UNDERGRADUATE
RESEARCH IN NEAR-SPACE BALLOONING.....1692
Wookwoun Lee (Gannon University, USA)
Nicholas B. Conklin (Gannon University, USA)

A SUB-ORBITAL EXPERIMENTAL PAYLOAD FOR ENGAGING UNDERGRADUATE ENGINEERING
STUDENTS IN INTERDISCIPLINARY RESEARCH.....1697
Nicholas B. Conklin (Gannon University, USA)
Wookwoun Lee (Gannon University, USA)

INTEGRAL AND TRANSFORMATIVE ENGINEERING COURSEWORK IN FORMATIVE RESEARCH
FOR UNDERGRADUATE CURRICULA.....1705
Carlos Mugruza-Vassallo (Universidad de Lima, Peru)

USING ARCHIVAL MATERIALS TO STUDY THE INFLUENCE OF PUBLIC POLICY ON A
HYDROELECTRIC PROJECT.....1713
Andrew Rose (University of Pittsburgh at Johnstown, USA)
S2A: Special Session: Making the Multiple Institution Database for Investigating Engineering Longitudinal Development (MIDFIELD) More Accessible to Researchers
10:30 AM - 12:00 PM
Room: 170A

MAKING THE MULTIPLE INSTITUTION DATABASE FOR INVESTIGATING ENGINEERING LONGITUDINAL DEVELOPMENT (MIDFIELD) MORE ACCESSIBLE TO RESEARCHERS.....1718
Matthew W. Ohland (Purdue University, USA)
Russell A. Long (Purdue University, USA)
Richard A. Layton (Rose-Hulman Institute of Technology, USA)
Susan M. Lord (University of San Diego, USA)
Marisa K. Orr (Louisiana Tech University, USA)
Catherine E. Brawner (Research Triangle Educational Consultants, USA)

S2B: Special Session: Designing The Engineer's Way
10:30 AM - 12:00 PM
Room: 170B

FIE 2016 SPECIAL SESSION - DESIGNING THE ENGINEER'S WAY.....1721
Susan K. Donohue (University of Virginia, USA)
Larry G. Richards (University of Virginia, USA)

S2C: Computer-Based Learning and Courseware Technologies II
Chair: Sven Esche (Stevens Institute of Technology, USA)
10:30 AM - 12:00 PM
Room: 130B

ONLINE PROGRAMMING TUTORS OR PAPER STUDY GUIDES?.....1725
Wendy Fisher (Colorado School of Mines, USA)
Cyndi Rader (Colorado School of Mines, USA)
Tracy Camp (Colorado School of Mines, USA)

IMPACT OF STEP-BASED TUTORING ON STUDENT LEARNING IN LINEAR CIRCUIT COURSES.....1731
B.J. Skromme (Arizona State University, USA)
V. Seetharam (Arizona State University, USA)
X. Gao (Arizona State University, USA)
B. Korrapati (Arizona State University, USA)
B.E. McNamara (Arizona State University, USA)
Y.-F. Huang (University of Notre Dame, USA)
D.G. Robinson (Colorado State University, USA)

IMPACT OF STATIC AND DYNAMIC VISUALIZATION IN IMPROVING OBJECT-ORIENTED PROGRAMMING CONCEPTS.....1740
Brandon Earwood (Texas A&M University-Kingsville)
Jeong Yang (Texas A&M University-Kingsville, USA)
Young Lee (Texas A&M University-Kingsville, USA)

IMPACT OF COLLABORATIVE LEARNING ON STUDENT PERCEPTION OF VIRTUAL COMPUTER LABORATORIES.....1745
Abdullah Konak (Penn State Berks, USA)
Michael R. Bartolacci (Penn State Berks, USA)
Sadak Kulturel-Konak (Penn State Berks, USA)
Mahdi Nasereeddin (Penn State Berks, USA)
DISCRETE MATHEMATICS FOR COMPUTING STUDENTS:  
A PROGRAMMING ORIENTED APPROACH WITH ALLOY.....1749
Leo C. Ureel, II (Michigan Technological University, USA)  
Charles Wallace (Michigan Technological University, USA)

S2D: Diversity: Women and Girls 
Chair: Alison Clear (EIT, New Zealand)  
10:30 AM - 12:00 PM  
Room: 130C

TRAVEL GRANTS WHICH FACILITATE ENGINEERING LEADERSHIP IDENTITY IN FEMALE ENGINEERING STUDENTS.....1754
Mayari I. Serrano (Purdue University, USA)  
Jennifer L. Groh (Purdue University, USA)

EVIDENCE-BASED PLANNING TO BROADEN THE PARTICIPATION OF WOMEN IN ELECTRICAL AND COMPUTER ENGINEERING.....1758
Diane Rover (Iowa State University, USA)  
Joseph Zambreno (Iowa State University, USA)  
Mani Mina (Iowa State University, USA)  
Phillip Jones (Iowa State University, USA)  
Lora Leigh Chrystal (Iowa State University, USA)

PRE- TO POST-CONFERENCE DIFFERENCES: CELEBRATIONS OF WOMEN IN COMPUTING.....1765
Gloria Childress Townsend (DePauw University, USA)  
Kay Sloan (Rockman et al, USA)

GIRLS' INTEREST IN STEM.....1773
Henriette D. Burns (Washington State University, USA)  
Kristin Lesseig (Washington State University, USA)  
Nancy Staus (Oregon State University, USA)

A METHODOLOGICAL REFINEMENT FOR STUDYING THE STEM GRADE-POINT PENALTY.....1778
Jonathan Tomkin (University of Illinois at Urbana Champaign, USA)  
Matthew West (University of Illinois at Urbana-Champaign, USA)  
Geoffrey L. Herman (University of Illinois at Urbana-Champaign, USA)

S2E: PK-12: Perceptions of STEM 
Chair: Martin Kandlhofer (Graz University of Technology, Austria)  
10:30 AM - 12:00 PM  
Room: 140A

PERPECTIVE OF TEENAGERS ON TRAITS AND RESEARCH ASSOCIATED WITH ELECTRICAL AND COMPUTER ENGINEERS AND THEIR RESEARCH.....1783
Jennifer Winkus (Michigan Technological University, USA)  
Glen Archer (Michigan Technological University, USA)

WHAT THEY SAY: BLACK CHILDREN TALK ABOUT LEARNING ENGINEERING.....1790
DeLean Tolbert (Purdue University, USA)  
Monica Cardella (Purdue University, USA)

LONG TERM EFFECTS OF EDUCATIONAL ROBOTS ON A GRADE 9 GIRL'S PERCEPTIONS OF SCIENCE AND MATH.....1794
Ahmad Khanlari (University of Toronto, Canada)
A SOFTWARE DEVELOPMENT COURSE BASED ON SERVER-SIDE JAVASCRIPT.....1798
Mark A. Holliday (Western Carolina University, USA)
Andrew S. Scott (Western Carolina University, USA)

REPORT OF A DISTANCE LEARNING COURSE OF SPECIALIZATION
IN INFORMATION TECHNOLOGY AT A BRAZILIAN PUBLIC UNIVERSITY.....1803
Guiou Kobayashi (Federal University of ABC, Brazil)
Francisco de Assis Zampirolli (Federal University of ABC, Brazil)
José Artur Quilici-Gonzalez (Federal University of ABC, Brazil)

WHO IS THE ENGINEERING TECHNOLOGY GRADUATE AND WHERE DO THEY GO?.....1810
Anne M. Lucietto (Purdue University, USA)

ELICITING FEATURES TO BUILD COLLABORATIVE LEARNING OBJECTS.....N/A
Bruno Elias Penteado (University of São Paulo, Brazil)
Fernando Tiosso (University of São Paulo, Brazil)

EVALUATION OF ACOUSTICAL POSITION DETERMINATION IN A CLASSROOM SCENARIO.....1817
Robin Nicolay (University of Rostock, Germany)
Thomas Mundt (University of Rostock, Germany)

A CASE STUDY OF STUDENTS' ENGAGEMENT
IN A CONTROL SYSTEMS HOMEWORK PROBLEM.....1824
Jessica Swenson (Tufts University, USA)
Kristen Wendell (Tufts University, USA)

A QUANTITATIVE CASE STUDY ON STUDENTS' STRATEGY
FOR USING AUTHORIZED CHEAT-SHEETS.....1828
Yang Song (NC State University, USA)
Yifan Guo (NC State University, USA)
David Thuente (NC State University, USA)

PRE-COLLEGE STUDENTS' USE OF SYSTEMS ENGINEERING METHODS IN DESIGN.....1837
Aaron W. Johnson (Tufts University, USA)
Sara Willner-Giwerc (Tufts University, USA)
Paul T. Grogan (Stevens Institute of Technology, USA)
Ethan E. Danahy (Tufts University, USA)

PEER LEARNING ASSISTANTS IN UNDERGRADUATE COMPUTER SCIENCE COURSES.....1845
Inna Pivkina (New Mexico State University, USA)
THE IMPACT OF NEAR-PEER MENTORING ON SELF-EFFICACY IN AN INTRODUCTORY ENGINEERING COURSE.....1849
Tanya Kunberger (Florida Gulf Coast University, USA)
Chris Geiger (Florida Gulf Coast University, USA)

GUIDELINES TO PRODUCING STRUCTURED INTEROPERABLE DATA FROM OPEN ACCESS REPOSITORIES: AN EXAMPLE OF INTEGRATION OF DIGITAL REPOSITORIES OF HIGHER EDUCATIONAL INSTITUTIONS FROM LATAM.....1853
Nelson Piedra (Universidad Técnica Particular de Loja, Ecuador)
Janneth Chicaiza (Universidad Técnica Particular de Loja, Ecuador)
Jorge Lopez-Vargas (Universidad Técnica Particular de Loja, Ecuador)
Edmundo Tovar Caro (Universidad Politécnica de Madrid, Spain)

ESTABLISHING LEARNING COMMUNITIES AMONG ENGINEERING FRESHMEN THROUGH PEER-GROUP TUTORING PROGRAM.....1862
Ben Oni (Tuskegee University, USA)
Vimal Viswanathan (Tuskegee University, USA)

S21: Retention of First Year Students
Chair: Ciaran Moore (Victoria University of Wellington, New Zealand)
10:30 AM - 12:00 PM
Room: 160B

ENGAGE AND EDUCATE: ENGINEERING LABORATORY ACTIVITIES FOR FIRST-YEAR ENGINEERING STUDENTS.....1867
Ramakrishnan Sundaram (Gannon University, USA)

ENRICHED STUDENT GUIDANCE AND ENGAGEMENT IN LOWER LEVEL ENGINEERING GATEKEEPER COURSES.....1872
Horacio Vasquez (The University of Texas Rio Grande Valley, USA)
Arturo A. Fuentes (The University of Texas Rio Grande Valley, USA)
Javier A. Kypuros (The University of Texas Rio Grande Valley, USA)

TECHNOLOGY-ENABLED, AFTER-HOURS, ASYNCHRONOUS, PEER-LED SUPPLEMENTARY INSTRUCTION AND MENTORING IN ENGINEERING GATEKEEPER COURSES.....1880
Javier A. Kypuros (The University of Texas Rio Grande Valley, USA)
Arturo A. Fuentes (The University of Texas Rio Grande Valley, USA)
Horacio Vasquez (The University of Texas Rio Grande Valley, USA)
Stephen W. Crown (The University of Texas Rio Grande Valley, USA)
Virgil Pierce (The University of Texas Rio Grande Valley, USA)

S3A: Panel: Teaching Teachers to Teach Diverse Students in Computer Science: Content and Resources for In-person and Online Delivery
1:30 PM – 3:00 PM
Room: 170A

TEACHING TEACHERS TO TEACH DIVERSE STUDENTS IN COMPUTER SCIENCE: CONTENT AND RESOURCES FOR IN-PERSON AND ONLINE DELIVERY.....1883
James P. Cohoon (University of Virginia, USA)
Joanne M. Cohoon (University of Virginia, USA)
Leslie G. Cintron (University of Virginia, USA)
S3B: Special Session: The Behavioral Economics of Instructional Decision Making
1:30 PM – 3:00 PM
Room: 170B

THE BEHAVIORAL ECONOMICS OF INSTRUCTIONAL DECISION MAKING.....1885
Cory Hixson (Rowan University, USA)
Stephanie Cutler (Penn State, USA)
James J. Pembridge (Embry-Riddle Aeronautical University, USA)

S3C: Redesigning Laboratory Experiences
Chair: Joshua Earnest (National Institute of Technical Teachers Training and Research, Bhopal, India)
1:30 PM – 3:00 PM
Room: 130B

PRACTICAL LABORATORY CLASSES TO IMPROVE ENGAGEMENT AND ACHIEVEMENT AMONGST ENGINEERING STUDENTS TAKING FIRST-YEAR MATHEMATICS.....1888
Ciaran Moore (Victoria University of Wellington, New Zealand)
Craig Watterson (Victoria University of Wellington, New Zealand)
James Eldridge (Victoria University of Wellington, New Zealand)

CHANGE THE TRADITIONAL WAY OF TEACHING ELECTRIC DRIVES LABORATORY WITH DESIGN OF EXPERIMENT.....1895
Lin Zhao (Gannon University, USA)
Fong Mak (Gannon University, USA)

A HANDS-ON MODULAR LABORATORY ENVIRONMENT TO FOSTER LEARNING IN CONTROL SYSTEM SECURITY.....1901
Pallavi P. Deshmukh (Virginia Tech, USA)
Cameron D. Patterson (Virginia Tech, USA)
William T. Baumann (Virginia Tech, USA)

EVALUATION OF A VIDEO GAME ADAPTATION FOR MECHANICAL ENGINEERING EDUCATIONAL LABORATORIES.....1910
Yizhe Chang (Stevens Institute of Technology, USA)
El-Sayed Aziz (Stevens Institute of Technology, USA)
Zhou Zhang (Stevens Institute of Technology, USA)
Mingshao Zhang (Stevens Institute of Technology, USA)
Sven K. Esche (Stevens Institute of Technology, USA)

S3D: Innovative Use of Tools
Chair: Georges El-Howayek (Valparaiso University, USA)
1:30 PM – 3:00 PM
Room: 130C

ENHANCE HANDS ON EXPERIENCE OF SYSTEM AND CONTROL USING LOW COST LEGO KITS.....1916
Yi Wu (Pennsylvania State University Erie, the Behrend College, USA)
Charlotte de Vries (Pennsylvania State University Erie, the Behrend College, USA)
Oludipo Onipede (Pennsylvania State University Erie, the Behrend College, USA)
Melanie Ford (Pennsylvania State University Erie, the Behrend College, USA)

A SATELLITE GROUND STATION FOR TEACHING DIGITAL AND WIRELESS COMMUNICATIONS.....1922
Miguel Bazdresch (Rochester Institute of Technology, USA)
Sneha Velayudhan (Rochester Institute of Technology, USA)
William Johnson (Rochester Institute of Technology, USA)
APPLICATION OF LOW-COST 3D SCANNING TECHNOLOGIES TO THE DEVELOPMENT OF EDUCATIONAL AUGMENTED REALITY CONTENT.....1926
Jorge D. Camba (University of Houston, USA)
Alejandro Bonnet De Leon (Universidad de La Laguna, Spain)
Jorge de la Torre (Universidad de La Laguna, Spain)
Jose Luis Saarin (University de La Laguna, Spain)
Manuel Contero (Universidad Politécnica de Valencia, Spain)

TEACHERS' PERCEPTIONS ON TRADITIONAL AND NON-TRADITIONAL DATA VISUALIZATION FOR PEDAGOGICAL DECISION-MAKING.....N/A
Maria Cavalcanti (Federal University of Alagoas, Brazil)
Ranilson Paiva (Federal University of Campina Grande, Brazil)
Patricia Espinheira Ospina (Federal University of Pernambuco, Brazil)
Ig Ibeto Bittencourt (Federal University of Alagoas, Brazil)
Esther de Freitas (Federal University of Alagoas, Brazil)
Sergio Amorim (Federal University of Alagoas, Brazil)
Alan Pedro da Silva (Federal University of Alagoas, Brazil)

AN APPROACH TO USING RASP TOOLS IN ANALOG SYSTEMS EDUCATION.....1932
Michelle Collins (Georgia Institute of Technology, USA)
Jennifer Hasler (Georgia Institute of Technology, USA)
Sahil Shah (Georgia Institute of Technology, USA)

S3E: PK-12: Assessment and Evaluation Tools and Strategies
Chair: Nathan M. Hicks (Purdue University, USA)
1:30 PM – 3:00 PM
Room: 140A

NO PATTERNS IN PATTERN RECOGNITION: A SYSTEMATIC LITERATURE REVIEW.....1940
Senay Purzer (Purdue University, USA)
Annwesa Dasgupta (Purdue University, USA)

DEVELOPMENT OF AN ASSESSMENT FOR MEASURING MIDDLE SCHOOL STUDENT ATTITUDES TOWARDS ROBOTICS ACTIVITIES.....1943
Jennifer Cross (Carnegie Mellon University, USA)
Emily Hammer (Carnegie Mellon University, USA)
Lauren Zito (Carnegie Mellon University, USA)
Illah Nourbakhsh (Carnegie Mellon University, USA)
Debra Bernstein (TERC, USA)

A SYSTEMATIC MAPPING STUDY ON ASSESSING COMPUTATIONAL THINKING ABILITIES.....1951
Ana Liz Souto O. de Araujo (Federal University of Campina Grande, Brazil)
Wilkinson L. Andrade (Federal University of Campina Grande, Brazil)
Dalton D. Serey Guerrero (Federal University of Campina Grande, Brazil)

IMPACT FOR FEMALE STUDENTS OF AN INTEGRATED STEM PBL SUMMER CURRICULUM ON CONTENT KNOWLEDGE MASTERY AND POST-SECONDARY MATRICULATION.....N/A
Robert M. Capraro (Texas A&M University, USA)
Mary M. Capraro (Texas A&M University, USA)
Sandra B. Nite (Texas A&M University, USA)
Luciana R. Barroso (Texas A&M University, USA)
'Chon Brooks (Texas A&M University, USA)
INNOVATIVE METHODS FOR EVALUATING THE SCIENCE CAPITAL OF YOUNG CHILDREN.....1960
Annie Padwick (Northumbria University, United Kingdom)
Opeyemi Dele-Ajayi (Northumbria University, United Kingdom)
Carol Davenport (Northumbria University, United Kingdom)
Rebecca Strachan (Northumbria University, United Kingdom)

S3F: Software Engineering Processes
Chair: Yolanda Martinez-Trevino (Tecnologico de Monterrey, Mexico)
1:30 PM – 3:00 PM
Room: 140B

INVESTIGATING HOW FEATURES OF ONLINE LEARNING SUPPORT SOFTWARE PROCESS EDUCATION.....1965
Eduardo Fernandes (Federal University of Minas Gerais (UFMG), Brazil)
Johnatan Oliveira (Federal University of Minas Gerais (UFMG), Brazil)
Eduardo Figueiredo (Federal University of Minas Gerais (UFMG), Brazil)

AN AGILE SOFTWARE ENGINEERING PROCESS IMPROVEMENT GAME.....1973
Bruce R. Maxim (University of Michigan-Dearborn, USA)
Rasinder Kaur (University of Michigan-Dearborn, USA)
Christopher Apzynski (University of Michigan-Dearborn, USA)
David Edwards (University of Michigan-Dearborn, USA)
Ethan Evans (University of Michigan-Dearborn, USA)

UTILIZING OPEN SOURCE SOFTWARE IN TEACHING PRACTICE-BASED SOFTWARE ENGINEERING COURSES.....1977
Mohsen Dorodchi (University of North Carolina, Charlotte, USA)
Nasrin Dehbozorgi (University of North Carolina, Charlotte, USA)

AGILE METRICS FOR A UNIVERSITY SOFTWARE ENGINEERING COURSE.....1982
Christoph Matthies (University of Potsdam, Germany)
Thomas Kowark (University of Potsdam, Germany)
Matthias Uflacker (University of Potsdam, Germany)
Hasso Plattner (University of Potsdam, Germany)

LEVERAGING ROLE PLAY TO EXPLORE SOFTWARE AND GAME DEVELOPMENT PROCESS.....1987
Adrienne Decker (Rochester Institute of Technology, USA)
David Simkins (Rochester Institute of Technology, USA)

S3G: Engineering in Global Context
Chair: Neha Choudhary (Purdue University, USA)
1:30 PM – 3:00 PM
Room: 140C

THE RESILIENT CIVIL ENGINEER WITH THE CHANGING GLOBAL ENVIRONMENT.....1992
Hudson Jackson (U.S. Coast Guard Academy, USA)
Kassim Tarhini (U.S. Coast Guard Academy, USA)
Sharon Zelmanowitz (U.S. Coast Guard Academy, USA)
Alina Zapalska (U.S. Coast Guard Academy, USA)

ENGINEERING THE ENGINEERING PROGRAM: THE YEAR OF DISCOVERY.....2001
Claudio da Rocha Brito (Science and Education Research Council, Brazil)
Melany M. Ciampi (World Council on Systems Engineering and Technology Information, Brazil)
Victor F. A. Barros (Science and Education Research Council, Portugal)
Luis Amaral (Computer Graphics Center, Portugal)
Rosa Vasconcelos (University of Minho, Portugal)
STUDENT PERCEPTIONS OF GLOBAL KNOWLEDGE AND SKILLS ACQUIRED DURING A FIVE-WEEK STUDY ABROAD PROGRAM.....2005
Robert O'Connell (University of Missouri, USA)
Miguel Ayllon (University of Missouri, USA)

MEASURING GLOBAL AWARENESS INTEREST DEVELOPMENT OF ENGINEERING AND INFORMATION TECHNOLOGY STUDENTS.....2009
Sadak Kurturu-Konak (Penn State Berks, USA)
Abdullah Konak (Penn State Berks, USA)
Ivan E. Esparragoza (Penn State Brandywine, USA)
Gül E. Okudan Kremer (Penn State University Park, USA)

S3H: Literature Reviews and Analyses
Chair: Carlos Mugruza-Vassallo (Universidad de Lima, Peru)
1:30 PM – 3:00 PM
Room: 160A

VISUALIZING SYSTEMATIC LITERATURE REVIEWS TO IDENTIFY NEW AREAS OF RESEARCH.....2014
Allison Godwin (Purdue University, USA)

UNDERSTANDING ENGINEERING THROUGH THE ENGINEERING JOURNAL OF THE COLOMBIAN UNIVERSITY OF LOS ANDES.....2022
Mariana Tafur-Arciniegas (University of Los Andes, Colombia)

LEARNING PRINCIPLES IN PROGRAM VISUALIZATIONS: A SYSTEMATIC LITERATURE REVIEW.....2028
Jeisson Hidalgo-Césedes (Universidad de Costa Rica, Costa Rica)
Gabriela Marin-Raventós (Universidad de Costa Rica, Costa Rica)
Vladimir Lara-Villagrán (Universidad de Costa Rica, Costa Rica)

AUTHORSHIP/AUTHORING POSSIBILITIES IN THREE-DIMENSIONAL VIRTUAL WORLDS IN EDUCATION: THE STATE OF ART FROM A SYSTEMATIC REVIEW.....2037
Leander Cordeiro de Oliveira (Universidade Tecnológica Federal do Paraná - UTFPR, Brazil)
Marília Abrahão Amaral (Universidade Tecnológica Federal do Paraná - UTFPR, Brazil)
Danúbia BuenoEspindola (Universidade Federal do Rio Grande - FURG, Brazil)
Regina Barwaldt (Universidade Federal do Rio Grande - FURG, Brazil)
Silvia S. C. Botelho (Universidade Federal do Rio Grande - FURG, Brazil)

S3I: Students as Learners
Chair: Ben Oni (Tuskegee University, USA)
1:30 PM – 3:00 PM
Room: 160B

PEDAGOGICAL STANDARD FOR THE ANALYSIS OF VIRTUAL LEARNING ENVIRONMENTS.....2046
Rosana Abutakkka Vasconcelos dos Anjos (The Federal University of Mato Grosso, Brazil)
Kátia Morosov Alonso (The Federal University of Mato Grosso, Brazil)
Cristiano Maciel (The Federal University of Mato Grosso, Brazil)
Alexandre Martins dos Anjos (The Federal University of Mato Grosso, Brazil)
Eunice dos Santos Nunes (The Federal University of Mato Grosso, Brazil)
UNDERSTANDING SIMILARITIES AND DIFFERENCES IN STUDENTS ACROSS FIRST-YEAR COMPUTING MAJORS.....2054
Glen Archer (Michigan Technological University, USA)
Leonard Bohmann (Michigan Technological University)
Allison Carter (Michigan Technological University, USA)
Christopher Cischke (Michigan Technological University, USA)
Linda M. Ott (Michigan Technological University, USA)
Leo Ureel (Michigan Technological University, USA)

COURSE MATERIAL DELIVERY IN ENGINEERING USING BRAIN-BASED LEARNING TECHNIQUES.....2062
John Solomon (Tuskegee University, USA)
Vimal Viswanathan (Tuskegee University, USA)
Vini Unnikrishnan (University of Alabama, USA)
Eric Hamilton (Pepperdine University, USA)

THE VISUAL DIPOLE - A KEY TO UNDERSTANDING ANTENNA THEORY.....2067
Paul Crilly (United States Coast Guard Academy, USA)

S3J: Teaching and Learning Experiences in Engineering Education I
Chair: Jennifer Winskus (Michigan Technological University, USA)
1:30 PM – 3:00 PM
Room: 160C

USING EVERYDAY OBJECTS TO ENGAGE STUDENTS IN STANDARDS EDUCATION.....2070
Margaret Phillips (Purdue University, USA)
Paul McPherson (Purdue University, USA)

OPTIMIZATION AND IMPROVEMENTS OF A MOODLE-BASED ONLINE LEARNING SYSTEM FOR C PROGRAMMING.....2075
Xiaohong Su (Harbin Institute of Technology, P.R. China)
Jing Qiu (Harbin Institute of Technology, P.R. China)
Tiantian Wang (Harbin Institute of Technology, P.R. China)
Lingling Zhao (Harbin Institute of Technology, P.R. China)

MULTI-DIMENSIONAL AND CUSTOMIZABLE OPEN-SOURCE LABWARE FOR PROMOTING BIG DATA ANALYTICAL SKILLS IN STEM EDUCATION.....2083
Ying Xie (Kennesaw State University, USA)
Kai Qian (Kennesaw State University, USA)
Jing (Selena) He (Kennesaw State University, USA)

STUDENTS ENVISIONING THE FUTURE.....2088
Thomas Lind (Uppsala University, Sweden)
Åsa Cajander (Uppsala University, Sweden)
Bengt Sandblad (Uppsala University, Sweden)
Mats Daniels (Uppsala University, Sweden)
Marta Lárusdóttir (Reykjavik University, Iceland)
Roger McDermott (The Robert Gordon University, United Kingdom)
Tony Clear (Auckland University of Technology, New Zealand)

A CONCEPT MAP-BASED COGNITIVE FRAMEWORK FOR ACQUIRING EXPERT KNOWLEDGE IN INDUSTRIAL ENVIRONMENT.....2097
Yuetong Lin (Indiana State University, USA)
A. Mehran Shahhosseini (Indiana State University, USA)
M. Affan Badar (Indiana State University, USA)
Tad Foster (Indiana State University, USA)
Jason Dean (Indiana State University, USA)
S4A: Leadership
Chair: Andrew Danowitz (California Polytechnic State University San Luis Obispo, USA)
3:30 PM – 5:00 PM
Room: 170A

CORRELATION BETWEEN ENGINEERING STUDENT LEADERSHIP PRACTICES, PERSONALITY TYPES, AND DEMOGRAPHIC CHARACTERISTICS.....2102
Benjamin Ahn (Iowa State University, USA)
John G. Brisson (Massachusetts Institute of Technology, USA)

A METHODOLOGICAL EVALUATION OF AN INTEGRATIVE PEDAGOGY FOR ENGINEERING EDUCATION.....2107
Cecilia Moloney (Memorial University of Newfoundland, Canada)
Janna Rosales (Memorial University of Newfoundland, Canada)
Cecile Badenhorst (Memorial University of Newfoundland, Canada)

S4B: Group and Team Work
Chair: Marc Sosnick-Pérez (San Francisco State University, USA)
3:30 PM – 5:00 PM
Room: 170B

CAPSTONE: A CLOUD-BASED PLATFORM FOR MULTI-PARTY COLLABORATION ON CAPSTONE PROJECTS.....2113
Xiaocong Fan (Pennsylvania State University, USA)

USING FRAME-OF-REFERENCE TRAINING TO IMPROVE THE DISPERSION OF PEER RATINGS IN TEAMS.....2122
Daniel M. Ferguson (Purdue University, USA)
Chad Lally (Purdue University, USA)
Hilda Ibriga Somnooma (Purdue University, USA)
Olivia Murch (Purdue University, USA)
Matthew W. Ohland (Purdue University, USA)

CONFIGURING AN APPROPRIATE TEAM ENVIRONMENT TO SATISFY RELEVANT CRITERIA.....2128
Charles Walter (University of Tulsa, USA)
Ian Riley (University of Tulsa, USA)
Rose Gamble (University of Tulsa, USA)

A TOOL FOR STUDENTS’ GROUPING IN CLASSROOM.....2137
Sergio A. A. Freitas (University of Brasilia, Brazil)
Rita C. Silva (University of Brasilia, Brazil)
Edna D. Canedo (University of Brasilia, Brazil)
Tiago Franklin R. Lucena (Centro Universitário de Maringa, Brazil)
**S4C: Identity, Learning and Persistence**

**Chair:** Henriette Burns (Washington State University, USA)

**3:30 PM – 5:00 PM**

**Room:** 130B

**HOW SALIENT IS THE IDENTITY OF ENGINEERING STUDENTS?**
**ON THE USE OF THE ENGINEERING STUDENT IDENTITY SURVEY.....2142**
Olga Pierrakos (James Madison University, USA)
Nicholas A. Curtis (James Madison University, USA)
Robin D. Anderson (James Madison University, USA)

**UNDERSTANDING INTERSECTING SOCIAL IDENTITIES IN ENGINEERING EDUCATION AND PRACTICE.....2148**
Javier A. Kypuros (University of Texas, USA)
Michelle Bothwell (Oregon State University, USA)
Charles S. Sasaki (Windward Community College, USA)
Jessica Lavariega Monforti (Pace University, USA)
Kelli Y. Nakamura (Kapi‘olani Community College, USA)
Dwaine Plaza (Oregon State University, USA)

**A DEGREE IS NOT ENOUGH: PROMOTING ENGINEERING IDENTITY DEVELOPMENT AND PROFESSIONAL PLANNING THROUGH THE TEACHING OF ENGINEERING RÉSUMÉ WRITING.....2152**
Catherine G.P. Berdaniel (The Pennsylvania State University, USA)
Mary McCall (Purdue University, USA)
Gracemarie Mike (Rowan University, USA)

**MOTIVATION AND IDENTITY IN C++: THE EFFECTS OF MUSIC IN AN ENGINEERING CLASSROOM.....2157**
Courtney S. Smith-Orr (UNC Charlotte, USA)
Andrew Garnett (UNC Charlotte, USA)

**HIGH IMPACT PRACTICES TOWARD PERSONAL AND PROFESSIONAL IDENTITY IN INTRODUCTORY AND ADVANCED ENGINEERING SEMINAR COURSES.....2162**
Kurt A. Thoroughman (Washington University in St. Louis, USA)
Joseph A. O’Sullivan (Washington University in St. Louis, USA)

---

**S4D: Student-Centered Education**

**Chair:** Renata A. Revelo (University of Illinois at Chicago, USA)

**3:30 PM – 5:00 PM**

**Room:** 130C

**ACTUALIZING STUDENTS’ PRIOR KNOWLEDGE IN ENGINEERING EDUCATION.....2166**
Qaiser Malik (National University of Sciences and Technology, Pakistan)
Naveed Zafar (National University of Sciences and Technology, Pakistan)
Mohammad Javed Khan (Tuskegee University, USA)

**A CRITICAL ANALYSIS OF TRENDS IN STUDENT-CENTRIC ENGINEERING EDUCATION AND THEIR IMPLICATIONS FOR LEARNING.....2173**
Arnold Pears (Uppsala University, Sweden)
Aletta Nylén (Uppsala University, Sweden)
Mats Daniels (Uppsala University, Sweden)
THE FIRST STEP TOWARDS A PRE-REQUISITE KNOWLEDGE TRACKING ARCHITECTURE FOR ENGINEERING PROGRAMS.....2180
Chitra R. Nayak (Tuskegee University, USA)
Vimal Viswanathan (Tuskegee University, USA)
John Solomon (Tuskegee University, USA)

USING PROCESS MAPPING TO UNDERSTAND ENGINEERING STUDENTS' CONCEPTIONS OF INNOVATION PROCESSES.....2185
Todd Fernandez (Purdue University, USA)
Senay Purzer (Purdue University, USA)
Nicholas D. Fila (Purdue University, USA)

A FRAMEWORK FOR WRITING LEARNING AGREEMENTS.....2190
Tony Clear (Auckland University of Technology, New Zealand)
Roger McDermott (Robert Gordon University, United Kingdom)
Elin Parsjö (Uppsala University, Sweden)
Åsa Cajander (Uppsala University, Sweden)
Mats Daniels (Uppsala University, Sweden)
Nanna Lagerqvist (Uppsala University, Sweden)

INFORMAL STEM CAMP INFLUENCES ON ENGINEERING CONFIDENCE.....N/A
Ali Bicer (Texas A&M University, USA)
Sandra B. Nite (Texas A&M University, USA)
Robert M. Capraro (Texas A&M University, USA)
Luciana R. Barroso (Texas A&M University, USA)
Mary M. Capraro (Texas A&M University, USA)
Jeffrey E. Froyd (Texas A&M University, USA)

ENGINEERING AND COMPUTATIONAL THINKING TALENT IN MIDDLE SCHOOL STUDENTS:
A FRAMEWORK FOR DEFINING AND RECOGNIZING STUDENT AFFINITIES.....2198
Jennifer Cross (Carnegie Mellon University, USA)
Emily Hamner (Carnegie Mellon University, USA)
Lauren Zito (Carnegie Mellon University, USA)
Ililah Nourbakhsh (Carnegie Mellon University, USA)

ENHANCING CONTINUITY BETWEEN GENDER DIVERSITY INTERVENTIONS USING HYBRID SOCIAL NETWORKS.....2207
Henry Griffith (Michigan State University, USA)
Faizeh Hajiaghaqani (Michigan State University, USA)
Angela Griffith (Wright State University, USA)

THE ROLES OF SOCIALIZERS IN CAREER CHOICE DECISIONS FOR HIGH SCHOOL STUDENTS IN RURAL CENTRAL APPALACHIA: "WHO'S DOING WHAT?".....2212
Cheryl Carrico (Virginia Polytechnic Institute and State University, USA)
Homero Murzi (Virginia Polytechnic Institute and State University, USA)
Holly Matusovich (Virginia Polytechnic Institute and State University, USA)

A SYNCHRONOUS DISTANCE EDUCATION HYBRID MODEL OF COLLEGE-LEVEL CREDITS FOR HIGH-SCHOOL STUDENTS.....2218
Manuel Jimenez (Univ. of Puerto Rico at Mayaguez, Puerto Rico)
Sonia Bartolomei (Univ. of Puerto Rico at Mayaguez, Puerto Rico)
Ysela Ochoa (Univ. of Puerto Rico at Mayaguez, Puerto Rico)
Wilma Santiago (Univ. of Puerto Rico at Mayaguez, Puerto Rico)
**S4F: Evaluating Computer Programming**

Chair: Nannan He (Minnesota State University at Mankato, USA)

3:30 PM – 5:00 PM

Room: 140B

**SIMPLE FEEDBACK CAN DO THE JOB: ANALYZING THE EFFECTS OF SIMPLE COMPUTER BASED FEEDBACK FOR FUNDAMENTAL PROGRAMMING TASKS.**

Matthias Laengrich (University of Applied Sciences Zittau / Goerlitz, Germany)

**QUALITATIVE ASPECTS OF STUDENTS' PROGRAMS: CAN WE MAKE THEM MEASURABLE?**

Eliane Araujo (Federal University of Campina Grande, Brazil)
Dalton Serey (Federal University of Campina Grande, Brazil)
Jorge Figueiredo (Federal University of Campina Grande, Brazil)

**TYPES OF ASSESSING STUDENT-PROGRAMMING KNOWLEDGE**

Anabela Gomes (University of Coimbra, Portugal)
Fernanda Brito Correia (University of Aveiro, Portugal)
Pedro Henriques Abreu (University of Coimbra, Portugal)

**APPLYING SPECTRUM-BASED FAULT LOCALIZATION ON NOVICE’S PROGRAMS**

Eliane Araujo (Federal University of Campina Grande, Brazil)
Matheus Gaudencio (Federal University of Campina Grande, Brazil)
Dalton Serey (Federal University of Campina Grande, Brazil)
Jorge Figueiredo (Federal University of Campina Grande, Brazil)

**AUTOMATED STYLE FEEDBACK FOR ADVANCED BEGINNER JAVA PROGRAMMERS**

Hannah Blau (University of Massachusetts, USA)
Samantha Kolovson (University of Massachusetts, USA)
W. Richards Adrion (University of Massachusetts, USA)
Robert Moll (University of Massachusetts, USA)

**S4G: Cultural Competence**

Chair: Katherine Ehlert (Clemson University, USA)

3:30 PM – 5:00 PM

Room: 140C

**INCREASING DIVERSE STUDENTS' PERSISTENCE IN ENGINEERING: A SOCIAL COGNITIVE PERSPECTIVE**

Heather K. Hunt (University of Missouri, USA)
Lisa Y. Flores (University of Missouri, USA)
Rachel L. Navarro (University of North Dakota, USA)
Hang-Shim Lee (Oklahoma State University, USA)

**ENRICHING AN INFORMAL ENGINEERING EDUCATION PROGRAM WITH SOCIAL RELEVANCE AND HISTORY FOR MIDDLE SCHOOL GIRLS**

Ann Reimers (University of Virginia, USA)
John F. Smith (University of Pennsylvania, USA)

**PROMOTING LGBTQ EQUALITY IN ENGINEERING VIA ONLINE SAFE ZONE WORKSHOPS**

Rocío C. Chavela Guerra (American Society for Engineering Education, USA)
Stephanie Farrell (Rowan University, USA)
Alexandra Longo (American Society for Engineering Education, USA)
THE PROMISE OF FACULTY CARE IN UNDERGRADUATE STEM COURSES.....2276
Robert Siegel (Franklin W. Olin College of Engineering, USA)
March Saper (Franklin W. Olin College of Engineering, USA)
Emilia Tanu (Franklin W. Olin College of Engineering, USA)
Yevgeniya V. Zastavker (Franklin W. Olin College of Engineering, USA)
Jonathan D. Stolk (Franklin W. Olin College of Engineering, USA)
Alex Dillon (Franklin W. Olin College of Engineering, USA)
Michael D. Gross (Wake Forest University, USA)

S4H: Learning and Teaching Analytics
Chair: Mohsen Dorodchi (University of North Carolina, Charlotte, USA)
3:30 PM – 5:00 PM
Room: 160A

MEASURING COGNITIVE ENGAGEMENT THROUGH INTERACTIVE, CONSTRUCTIVE,
ACTIVE AND PASSIVE LEARNING ACTIVITIES.....2281
Nicole P. Pitterson (Oregon State University, USA)
Shane Brown (Oregon State University, USA)
Jason Pascoe (Oregon State University, USA)
Kathleen Guardokus Fisher (Oregon State University, USA)

VISUALIZING THE LESSON PROCESS IN ACTIVE LEARNING CLASSES.....2287
Masahiro Toyoura (University of Yamanashi, Japan)
Mayato Sakaguchi (University of Yamanashi, Japan)
Xiaoyang Mao (University of Yamanashi, Japan)
Masanori Hanawa (University of Yamanashi, Japan)
Masayuki Murakami (Kyoto University of Foreign Studies, Japan)

INTEGRATING ANALYTICS AND SURVEYS TO UNDERSTAND FULLY ENGAGED LEARNERS
IN A HIGHLY-TECHNICAL STEM MOOC.....2295
Nathan M. Hicks (Purdue University, USA)
Doipayan Roy (Purdue University, USA)
Siddharth Shah (Purdue University, USA)
Kerrie A. Douglas (Purdue University, USA)
Peter Bermel (Purdue University, USA)
Heidi A. Diefes-Dux (Purdue University, USA)
Krishna Madhavan (Purdue University, USA)

TEACHER INTERVENTIONS TO ENHANCE THE QUALITY OF STUDENT COMMENTS
AND THEIR EFFECT ON PREDICTION PERFORMANCE.....2304
Shaymaa E. Sorour (Kyushu University, Japan)
Shaimaa Abd El Rahman (Kafrelsheikh University, Egypt)
Tsunenori Mine (Kyushu University, Japan)

IMPROVED METHOD FOR CREATING CRITERION MAPS
FOR AUTOMATIC MIND MAP ANALYSIS.....2313
Amber Franklin (Miami University, USA)
Ryan Sunderhaus (Miami University, USA)
Chris Bell (Miami University, USA)
Peter Jamieson (Miami University, USA)
### S4I: Curriculum Design in Computer Science/Engineering

**Chair:** Sami Khorbotly (Valparaiso University, USA)

**3:30 PM – 5:00 PM**

**Room:** 160B

#### TEACHING PROGRAMMING AS APPLICATION DEVELOPMENT FROM THE GROUND UP.....2319

David R. Mudgee (The Pennsylvania State University, USA)
Steven R. Haynes (The Pennsylvania State University, USA)

#### FLIPPING THE CS1 AND CS2 CLASSROOMS IN CENTRAL ASIA.....2328

Benjamin Tyler (Nazarbayev University, Kazakhstan)
Madina Abdrakhmanova (Nazarbayev University, Kazakhstan)

#### COLLABORATIVE PROBLEM SOLVING AND ACHIEVEMENT IN A DISCRETE-TIME SIGNALS AND SYSTEMS COURSE.....2333

Daria Gerasimova (George Mason University, USA)
Jill K. Nelson (George Mason University, USA)

#### EXPLORING ELECTRICAL ENGINEERING THROUGH MOVEMENT: GOING WITH THE FLOW AND PROGRAMMING PUZZLES.....2338

Emily Marasco (University of Calgary, Canada)
Stephanie Hladik (University of Calgary, Canada)
Laleh Behjat (University of Calgary, Canada)
William Rosehart (University of Calgary, Canada)

### S4J: Teaching and Learning Experiences in Engineering Education II

**Chair:** Joan Banks-Hunt (Virginia Tech, USA)

**3:30 PM – 5:00 PM**

**Room:** 160C

#### A MULTIDIMENSIONAL DATA MODEL FOR THE ANALYSIS OF LEARNING MANAGEMENT SYSTEMS UNDER DIFFERENT PERSPECTIVES.....2341

Vanessa Araujo Borges (University of Sao Paulo, Brazil)
Bruno Nogueira (Federal University of Mato Grosso do Sul, Brazil)
Ellen Francine Barbosa (University of Sao Paulo, Brazil)

#### MODELING REAL-WORLD OBJECTS: CONNECTING SOLIDWORKS TO TOY ADAPTATION.....2349

Olga M. Stavridis (The Ohio State University, USA)
Rachel L. Kajfez (The Ohio State University, USA)
Elizabeth A. Riter (The Ohio State University, USA)
Molly Y. Mollica (The Ohio State University, USA)

#### INTEGRATING COMPLEX AVIATION SCIENCE PROJECTS INTO UNDERGRADUATE ENGINEERING EDUCATION WITH DIALECTIC DESIGN APPROACH AND COMPARATIVE PERFORMANCE ANALYSIS FOR INNOVATIVE PRACTICES.....2356

I. Dabip (University of Maryland Eastern Shore, USA)
Willie L. Brown, Jr (University of Maryland Eastern Shore, USA)
Lei Zhang (University of Maryland Eastern Shore, USA)
Christopher Hartman (University of Maryland Eastern Shore, USA)

#### FULLY INTEGRATING REMOTE STUDENTS INTO A TRADITIONAL CLASSROOM USING LIVE-STREAMING AND TEACHBACK.....2364

William T. Tarimo (Brandeis University, USA)
Timothy J. Hickey (Brandeis University, USA)
THE UNIVERSITY OF MICHIGAN'S M-STEM ACADEMIES PROGRAM: EXAMINING THE SOCIAL COMMUNITY OF FUTURE ENGINEERS.....2372
Joi-Lynn Mondisa (University of Michigan, USA)
Joanna Millunchick (University of Michigan, USA)
Cinda Davis (University of Michigan, USA)
Darryl Koch (University of Michigan, USA)

Additional Papers

LANGUAGE AS AN INSTRUCTIONAL BARRIER: TOWARDS SUPPORT FOR INTERNATIONAL FACULTY.....2376
Joshua Nwokeji (Gannon University, USA)
Tinukwa Boulder (Gannon University, USA)
Ikechukwu Ohu (Gannon University, USA)
Nkeiruka Okolie (Lagos State, Nigeria)

WORKING ON HOW TO SOLVE THE NEVER ENDING PROBLEM OF DIVERSITY.....2378
Jennifer Winikus (University at Buffalo, USA)
Glen Archer (Michigan Technological University, USA)
Linda Ott (Michigan Technological University, USA)