

2018 IEEE Frontiers in Education Conference (FIE 2018)

**San Jose, California, USA
3-6 October 2018**

Pages 1-556



**IEEE Catalog Number: CFP18FIE-POD
ISBN: 978-1-5386-1175-3**

**Copyright © 2018 by the Institute of Electrical and Electronics Engineers, Inc.
All Rights Reserved**

Copyright and Reprint Permissions: Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

****** This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number:	CFP18FIE-POD
ISBN (Print-On-Demand):	978-1-5386-1175-3
ISBN (Online):	978-1-5386-1174-6
ISSN:	1539-4565

Additional Copies of This Publication Are Available From:

Curran Associates, Inc
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: (845) 758-0400
Fax: (845) 758-2633
E-mail: curran@proceedings.com
Web: www.proceedings.com

CURRAN ASSOCIATES INC.
proceedings
.com

TABLE OF CONTENTS

PARTNERSHIPS TO CREATE SYNERGISTIC STEM COMMUNITIES	1
<i>Ramakrishnan Sundaram</i>	
DEFINING REQUIREMENTS FOR A REPOSITORY TO MEET THE NEEDS OF K-12	
COMPUTER SCIENCE EDUCATORS, RESEARCHERS, AND EVALUATORS	5
<i>Monica M. McGill ; Adrienne Decker</i>	
QUADCOPTER DRONES — BEYOND THE HOBBY	14
<i>Nagy N. Bengiamin</i>	
AUTOMATIC IDENTIFICATION OF INEFFECTIVE ONLINE STUDENT QUESTIONS IN	
COMPUTING EDUCATION.....	19
<i>Qiang Hao ; April Galyardt ; Bradley Barnes ; Robert Maribe Branch ; Ewan Wright</i>	
AN APPROACH TO ASSESSING LEARNING OUTCOMES OVER CONSECUTIVE COURSES	24
<i>Irene Rothe ; Marco Winzker ; Cathleen Salega</i>	
IMPROVING STUDENT’S LEARNING AND COOPERATION SKILLS USING CODING DOJOS	
(IN THE WILD!)	29
<i>Caio Matheus Campos De Oliveira ; Edna Dias Canedo ; Henrique Faria ; Luis Henrique Vieira Amaral ; Rodrigo Bonifácio</i>	
MEET THE ENGINEERING EDUCATION PIONEERS — PANEL & ROUNDTABLE.....	37
<i>Samantha Brunhaver ; Ken Yasuhara ; Jennifer Case ; Wendy Newstetter ; Jennifer Turns ; Adam Carberry ; Cheryl Allendoerfer ; Cynthia Finelli ; Sheri Sheppard ; Jeremi London ; Cynthia Atman ; Ann McKenna ; Karl Smith ; Karan Watson</i>	
STUDENT EXPERIENCES WITH COLLABORATIVE PROBLEM-BASED LEARNING (CPBL)	
IN A SECOND-YEAR UNDERGRADUATE ENGINEERING COURSE	41
<i>Ning Fang</i>	
DIFFERENCES IN GRADE OUTCOMES BETWEEN ICT ENGINEERING AND COMPUTER	
SCIENCE DEGREES	46
<i>Dale A. Carnegie ; Craig A. Watterson ; Morgan Atkins ; James Eldridge</i>	
SERVICE-ORIENTED BUSINESS DESIGN FOR IT STUDENTS	53
<i>Blagovesta Pirelli ; Alain Wegmann</i>	
WORK-IN-PROGRESS: WHAT RECENT ARTIFICIAL INTELLIGENCE BREAKTHROUGHS	
IN THE GAME OF GO MEAN FOR HUMAN LEARNING AND ENGINEERING EDUCATION	62
<i>Yuetong Lin ; Chris Janke ; A. Mehran Shahhosseini</i>	
EPISTEMOLOGICAL TENSIONS IN ENGINEERING EDUCATION RESEARCH: HOW DO WE	
NEGOTIATE THEM?	67
<i>Jillian Seniuk Cicek ; Marcia Friesen</i>	
ASSESSING THE DEVELOPMENT OF STUDENT OUTCOMES IN PROJECT-BASED	
LEARNING ENGINEERING DESIGN AND ENTREPRENEURSHIP COURSES	72
<i>Prateek Shekhar ; Cassandra Woodcock ; Aileen Huang-Saad</i>	
GAMING PROJECTS FOR COGNITIVE TESTING IN AN UNDERGRADUATE MOBILE	
HEALTHCARE TECHNOLOGY COURSE.....	76
<i>Nikhil Yadav ; Joan E. Debello ; Celeste Gallardo ; Sherice T. Jackson</i>	
STUDENTS’ PERCEPTIONS OF APPLYING REAL-WORLD PROBLEM SOLVING IN	
COMPUTER SCIENCE EDUCATION : CASE STUDY IN INTERACTION DESIGN	84
<i>Deller J. Ferreira ; Ana Paula Ambrósio ; Tiago Nogueira ; Matheus R. D. Ullmann ; Tatiane F. N. Melo</i>	
TEACHING ALGORITHMS FOR VISUALLY IMPAIRED AND BLIND STUDENTS USING	
PHYSICAL FLOWCHARTS AND SCREEN READERS.....	92
<i>Rodolfo M. Pereira ; Felipe Fernandes Da Silva ; Carlos N. Silla</i>	
DEMONSTRATION OF THREE-PHASE ARMATURE WINDING IN CLASSROOM USING A	
PROPOSED PORTABLE HARDWARE TOOL	101
<i>P. Kumkratug</i>	
IMPROVING THE TEACHING OF VECTOR GROUP OF THREE-PHASE TRANSFORMER BY	
INTEGRATING SOFTWARE AND HARDWARE TOOLS INTO CLASSROOM	107
<i>P. Kumkratug</i>	
DOCTOR OF PROFESSIONAL STUDIES IN COMPUTING: A CATEGORIZATION OF	
APPLIED INDUSTRY RESEARCH	113
<i>Lisa R. Ellrodt ; Ion C. Freeman ; Ashley J. Haigler ; Suzanna E. Schmeelk</i>	

INTEGRATING THE ADVANTAGES OF HARDWARE AND SOFTWARE TOOLS INTO AN INDUCTION MACHINE EDUCATION	119
<i>P. Kumkratug</i>	
WHY THERE IS STILL FEW WOMEN IN ENGINEERING? A PERSPECTIVE FROM FEMALE STUDENTS AND PROFESSORS IN AN ENGINEERING CAMPUS	124
<i>Edna Dias Canedo ; Giovanni Almeida Santos ; Fabiana Freitas Mendes ; Elaine Venson ; Rejane Maria Da Costa Figueiredo</i>	
CRUMBLE DAY TO INTRODUCE ROBOTICS	132
<i>Pedro Plaza ; German Carro ; Manuel Blazquez ; Elio Sancristobal ; Manuel Castro ; Félix García-Loro</i>	
MULTIPLATFORM EDUCATIONAL ROBOTICS COURSE TO INTRODUCE CHILDREN IN ROBOTICS	136
<i>Pedro Plaza ; Elio Sancristobal ; German Carro ; Manuel Castro ; Manuel Blazquez ; Félix García-Loro</i>	
DON'T LEAVE ANYONE BEHIND: ACHIEVING TEAM PERFORMANCE THROUGH DIVERSITY	145
<i>Ewa Andrejczuk ; Juan A. Rodríguez-Aguilar ; Carles Sierra ; Carme Roig ; Yolanda Parejo-Romero</i>	
ESTIMATING SERVICE LIFE FOR CORRUGATED STEEL PIPE CULVERTS	154
<i>George Aquino ; David Pucio ; David Boyajian ; Ryan Bratcher ; Jorge Sanchez ; Sami Maalouf ; John Copello ; Francisco Silva ; Tadeh Zirakian</i>	
UN-MUDDLING IMPLEMENTATION FROM DESIGN VIA ALGORITHMIC DESIGN PATTERNS	159
<i>Carolyn Pe Rosiene ; Joel Rosiene</i>	
TRADE-OFFS IN CURRICULUM DESIGN: IMPLEMENTATION OF AN INTEGRATED CURRICULUM IN CHEMICAL ENGINEERING	163
<i>Jennifer M. Case ; Hilton Heydenrych</i>	
APPLYING PHENOMENOGRAPHY TO DEVELOP A COMPREHENSIVE UNDERSTANDING OF ETHICS IN ENGINEERING PRACTICE	172
<i>Andrew O. Brightman ; Nicholas D. Fila ; Justin L. Hess ; Alison J. Kerr ; Dayoung Kim ; Michael C. Loui ; Carla B. Zoltowski</i>	
WORK-IN-PROGRESS: INTEGRATION OF INCLUSIVITY ACTIVITY IN CIVIL ENGINEERING MATERIALS COURSE	177
<i>Tiago Forin ; Parth Bhavsar ; Aaron Nolan ; Harsh Pandya ; Yusuf Mehta</i>	
INTEGRATING ELECTRICAL MACHINES AND ANTENNAS VIA SCALAR AND VECTOR MAGNETIC POTENTIALS; AN APPROACH FOR ENHANCING UNDERGRADUATE EM EDUCATION	180
<i>Seemein Shayesteh ; Maryam Rahmani ; Lauren Christopher ; Maher Rizkalla</i>	
TOWARDS MAKING THE INVISIBLE ENGINEER VISIBLE: A REVIEW OF LOW-SOCIOECONOMIC STUDENTS' BARRIERS EXPERIENCING COLLEGE STEM EDUCATION	184
<i>Justin Major ; Allison Godwin</i>	
MULTI-DIMENSION TRAINING SCHEME TO IMPROVE THE INNOVATION CAPACITY OF POSTGRADUATE AND UNDERGRADUATE STUDENTS COLLABORATIVELY	193
<i>Xiaolong Xu ; Jianhua Shen</i>	
INCORPORATING A MODEL-BASED APPROACH IN AN INTRODUCTORY ELECTRONICS COURSE USING SIMSCAPE	197
<i>Diego A. Aponte-Roa ; Mark A. Lau</i>	
MEETING THE DEMAND: BUILDING A CYBERSECURITY DEGREE PROGRAM WITH LIMITED RESOURCES	203
<i>Scott Bell ; Michael Oudshoorn</i>	
USABILITY TESTING FOR TEACHERS' LESSON PLANNING SERVICES	210
<i>Leandro Marques Queiros ; Nicolau Calado Jofilsan ; Amadeu S. Campos Filho ; Alex Sandro Gomes ; Francisco Kelsen De Oliveira ; Carlos José Pereira Da Silva</i>	
DESIGN OF A TRANSPARENT HYDRAULIC EDUCATIONAL DEMONSTRATOR UTILIZING ELECTRICALLY CONTROLLED VALVES	218
<i>Joseph Marx ; Keith Pate ; Farid El Breidi</i>	
CONNECTING THEORY TO PRACTICE IN AN ONLINE INTRODUCTORY SIGNALS AND SYSTEMS COURSE	225
<i>Chao Wang ; Stephen Phillips</i>	
CLOUD-BASED LABS AND PROGRAMMING ASSIGNMENTS IN NETWORKING AND CYBERSECURITY COURSES	231
<i>Weiying Zhu</i>	
ORCHESTRATING AGILE SPRINT REVIEWS IN UNDERGRADUATE CAPSTONE PROJECTS	240
<i>Xiaocong Fan</i>	

AN ENVIRONMENT FOR TEACHING ENTERPRISE SOFTWARE EVOLUTION: USING PLAYFUL TECHNIQUES WITH ROBOTICS	248
<i>João Ricardo Moreno Camilo ; Alexandre L'erario ; José Augusto Fabri</i>	
“NOT ALL THOSE WHO WANDER ARE LOST.” EXAMINING OUTCOMES FOR MIGRATING ENGINEERING STUDENTS USING ECOSYSTEM METRICS	255
<i>Susan M. Lord ; Matthew W. Ohland ; Richard A. Layton ; Michelle M. Camacho</i>	
ACHIEVING EFFECTIVE COMMUNICATION BETWEEN DIVERSE DISCIPLINES IN SMALL TEAMS	260
<i>Robert Pastel ; Wei Zhang</i>	
RASPBERRY PI BASED LEARNING CENTER USAGE TRACKING SYSTEM FOR OPTIMAL RESOURCE ALLOCATION	269
<i>Aneet Dharmavaram Narendranath</i>	
GENERATIVE MODEL OF KNOWLEDGE GAPS DISCOVERY FROM MULTIPLE CHOICE TESTS.....	274
<i>Dymitr Ruta ; Yousef Abosalem ; Ling Cen</i>	
CRACKING THE CODE: THE EFFECTS OF USING MICROCONTROLLERS TO CODE ON STUDENTS' INTEREST IN COMPUTER AND ELECTRICAL ENGINEERING	282
<i>Ali Bicer ; Yujin Lee ; Robert M. Capraro ; Mary M. Capraro ; Luciana R. Barroso ; Daniella Bevan ; Katherine Vela</i>	
BEHIND THE SCENES: COURSE SYLLABI EXPLAINED	289
<i>Natascha T. Buswell</i>	
PREPARING K-12 TEACHERS TO INSPIRE FUTURE CODERS: IT DOESN'T HAVE TO BE COMPLEX.....	296
<i>Lori Carter ; Catherine Crockett</i>	
A LOW STAKES INTRODUCTION TO COMPUTER PROGRAMMING.....	303
<i>Lori Carter</i>	
BUG HIDE-AND-SEEK: AN EDUCATIONAL GAME FOR INVESTIGATING VERIFICATION ACCURACY IN SOFTWARE TESTS	308
<i>Kevin Buffardi ; Pedro Valdivia</i>	
INCLUSIVE MODEL FOR THE DEVELOPMENT AND EVALUATION OF ACCESSIBLE LEARNING OBJECTS FOR GRADUATION IN COMPUTING: A CASE STUDY	316
<i>Andreza Bastos Mourão ; José Francisco Magalhães Netto</i>	
ASSESSING TEAM DEVELOPMENT IN AN ENGINEERING PROJECT-BASED COURSE	324
<i>Chad E. Davis ; Kim Graves Wolfenbarger</i>	
THE DEVELOPMENT AND EVALUATION OF A SERIES OF NEW FIRST-YEAR ENGINEERING COURSES.....	331
<i>Evelyn H. Laffey ; Catherine A. Riihimaki ; Paul A. Durst ; Mei Chai Zheng</i>	
IMPROVING FRESHMAN RETENTION AND GRADUATION RATES THROUGH A TWO-TIER TENURE TRACK SYSTEM	335
<i>Steven Billis ; Oscar Cubenas ; Ellen Katz</i>	
COMPARING MATHEMATICS AND SCIENCE ACHIEVEMENT OF STUDENTS FROM SCHOOLS WITH PLTW VERSUS SCHOOLS WITHOUT PLTW	338
<i>Yujin Lee ; Ali Bicer ; Robert M. Capraro ; Mary M. Capraro ; Luciana Barroso ; Hyunkyung Kwon ; Michael Rugh</i>	
INVESTIGATING THE WAYS IN WHICH STUDENT AGENCY DEVELOPS THROUGH ENGAGEMENT WITH KNOWLEDGE	343
<i>Nicole Pitterson ; Jennifer Case ; Ashish Agrawal ; Indhira Hasbun</i>	
BEST PRACTICES DEVELOPED BY THE MODEL INSTITUTE FOR EXCELLENCE FROM PUERTO RICO	348
<i>Juan F. Arratia ; Tomislav Jagust ; Carlo Ratti ; Iva Bojic</i>	
THE GAP BETWEEN ENGINEERING SCHOOLS AND INDUSTRY: A STRATEGIC INITIATIVE	353
<i>Kamel Alboaouh</i>	
MAJOR UPGRADE OF THE PRESENTATION EDUCATION ASSISTANCE SYSTEM (PEAS) AND ITS EXTENSIVE APPLICATION TO EDUCATIONAL FIELDS	359
<i>Junko Toyoshima ; Soichiro Fujii ; Yuji Tokiwa</i>	
CO-CREATIVE ENGINEERING CURRICULUM DESIGN — CASE EAST AFRICA	364
<i>Ville Taajamaa ; Antero Järvi ; Samuli Laato ; Johannes Holvitie</i>	
HOW DO ACADEMICS EXPERIENCE USE OF RECORDED AUDIO FEEDBACK IN HIGHER EDUCATION? A THEMATIC ANALYSIS	369
<i>Anneli Heimbürger ; Ville Isomöttönen ; Paavo Nieminen ; Harri Keto</i>	

BOOSTING PROFESSIONAL COMPETENCES AND IT COMPANIES' INNOVATION IN A MASTER DEGREE IN INFORMATICS ENGINEERING	374
<i>F. Badia ; F. Giné ; Josep L. Lerida ; M. Moltó ; M. Valls</i>	
THE OPEN NETWORKING LAB: HANDS-ON VOCATIONAL LEARNING IN COMPUTER NETWORKING	379
<i>Alexander Mikroyannidis ; Karen Kear ; Andrew Smith ; Allan Jones ; Jon Rosewell ; Helen Donelan ; Michel Wermelinger ; Chris Sanders ; Allan Third ; Teresa Connolly</i>	
CONTACTLESS SMART CARD EXPERIMENTS IN A CYBERSECURITY COURSE	384
<i>Xiaojun Wu ; Yongqiang Chen ; Shanshan Li</i>	
A CROSS-DISCIPLINARY COURSE ON VIRTUAL REALITY	388
<i>Daniel C. Cliburn</i>	
A FOUR-YEAR AUTOMATION AND INTEGRATION CONCENTRATION FOR MANUFACTURING ENGINEERING	393
<i>Jeffrey L. Newcomer</i>	
SITUATION AWARENESS-ORIENTED CYBERSECURITY EDUCATION	398
<i>Jun Dai</i>	
COMBATTING STEREOTYPES IN COMPUTING USING PERSONALITY TYPE	406
<i>Linda Ott</i>	
TOWARD A NATIONAL AGENDA FOR BROADENING PARTICIPATION OF AFRICAN AMERICANS IN ENGINEERING & COMPUTER SCIENCE: A METHODOLOGICAL OVERVIEW OF PHASE II.....	411
<i>Chanee D. Hawkins Ash ; Walter Lee ; Jeremi London ; Teirra Holloman ; Gilbert Jew ; Atota Halkiyo ; Beville Watford</i>	
BENEFITS OF EXPOSING K-12 STUDENTS TO COMPUTER SCIENCE THROUGH SUMMER CAMP PROGRAMS	416
<i>Jeffrey Miller ; Saty Raghavachary ; Andrew Goodney</i>	
AUTONOMOUS VEHICLE CONTROL: TEACHING TOOL AND SIMULATION.....	421
<i>Marie O'brien ; Kashish Gupta ; Bara Emran ; Homayoun Najjaran</i>	
ABET CRITERION 3 AS A MEASURE OF ENGINEERING SELF-EFFICACY: COMPARING THE NEW CRITERIA (3.1-7) TO THE PREVIOUS CRITERIA (3A-K).....	430
<i>Mark Schar ; Patsy Brackin ; K. J. Chew ; Sheri Sheppard</i>	
MEASURING CURRICULAR IMPACT USING AN ABET-BASED ENGINEERING SELF-EFFICACY SCALE	439
<i>Mark Schar ; Patsy Brackin ; K. J. Chew ; Sheri Sheppard</i>	
EXPLORING THE RELEVANCE AND ENERGY USAGE IMPLICATIONS OF FIXED COMPUTER LABS IN ELECTRICAL ENGINEERING EDUCATION	446
<i>Joseph Callenes-Sloan ; Paul Hummel ; Andrew Danowitz ; Bridget Benson</i>	
PREDICTING STUDENT SUCCESS IN COMPUTER SCIENCE – A REPRODUCIBILITY STUDY	453
<i>Amruth N. Kumar</i>	
EFFECTS OF IMMEDIATE FEEDBACK USING ICT IN A CS1 COURSE THAT IMPLEMENTS MASTERY LEARNING.....	459
<i>Yolanda Martínez Treviño ; María Raquel Landa Cavazos</i>	
MOTIVATION OF ENGINEERING STUDENTS WITH A MIXED-CONTEXTS APPROACH TO INTRODUCTORY PROGRAMMING.....	464
<i>Bianca L. Santana ; Jose Solenir L. Figueredo ; Roberto A. Bittencourt</i>	
INCREASING MOTIVATION OF CS1 NON-MAJORS THROUGH AN APPROACH CONTEXTUALIZED BY GAMES AND MEDIA	473
<i>Bianca L. Santana ; Roberto A. Bittencourt</i>	
A MAPPING STUDY OF COMPUTATIONAL THINKING AND PROGRAMMING IN BRAZILIAN K-12 EDUCATION	482
<i>Priscila S. C. Santos ; Luis Gustavo J. Araujo ; Roberto A. Bittencourt</i>	
A HANDS-ON, SYSTEM-LEVEL ANALOG ELECTRONICS COURSE.....	490
<i>Meghdad Hajimorad ; Tony Pirc</i>	
EVALUATING THE INFLUENCE OF PBL ON THE DEVELOPMENT OF SOFT SKILLS IN A COMPUTER ENGINEERING UNDERGRADUATE PROGRAM.....	495
<i>Felipe L. F. Barros ; Roberto A. Bittencourt</i>	
COMPUTER PROGRAMMING WORKSHOPS WITH PLAYFUL ENVIRONMENTS FOR MIDDLE SCHOOL GIRLS	504
<i>Suenny M. Souza ; Roberto A. Bittencourt</i>	
AUTHENTIC KNOWLEDGE, LEARNING OUTCOMES, AND PROFESSIONAL IDENTITY: A MIXED-METHODS STUDY OF A SUCCESSFUL ENGINEERING COURSE	513
<i>Claudia G. Interiano ; Peter T. Tkacik ; Jerry L. Dahlberg ; Jae Hoon Lim</i>	

SAT DOES NOT SPELL SUCCESS: HOW NON-COGNITIVE FACTORS CAN EXPLAIN VARIANCE IN THE GPA OF UNDERGRADUATE ENGINEERING AND COMPUTER SCIENCE STUDENTS	520
<i>Matthew Scheidt ; Ryan Senkpeil ; John Chen ; Allison Godwin ; Edward Berger</i>	
QUALITATIVE FINDINGS FROM AN ONLINE COURSE ON MACHINE LEARNING	525
<i>Steve Chenoweth ; Panagiotis K. Linos</i>	
UNCOVERING THE HIDDEN FACTORS THAT COULD COMPROMISE EQUITABLE AND EFFECTIVE ENGINEERING EDUCATION	534
<i>Idalis Villanueva ; Joel Alejandro Mejia ; Renata A. Revelo</i>	
UNDERSTANDING HOW FIRST-GENERATION COLLEGE STUDENTS' OUT-OF-SCHOOL EXPERIENCES, PHYSICS AND STEM IDENTITIES RELATE TO ENGINEERING POSSIBLE SELVES AND CERTAINTY OF CAREER PATH	537
<i>Dina Verdín ; Allison Godwin ; Gerhard Sonnert ; Phillip M. Sadler</i>	
DIFFERENCES IN MENTAL HEALTH BETWEEN STUDENTS IN A JOINTLY OFFERED COMPUTER ENGINEERING PROGRAM AND THE TWO HOME DEPARTMENTS	545
<i>Andrew Danowitz ; Bridget Benson ; Joseph Callenes-Sloan ; Paul Hummel</i>	
MOTIVATING FACTORS AND BARRIERS FOR SUSTAINED USE OF AUDIENCE RESPONSE SYSTEMS - "I WOULD LOVE TO, BUT I DON'T HAVE TIME :("	550
<i>Tony Vo ; Nathan Sherburn ; Jiachun Huang ; Veronica Halupka ; Jonathan C. Li</i>	
BREAKING DOWN THE LABORATORY SUPERTYPE CONFLATION	557
<i>Joshua Burridge ; David Lowe</i>	
CHANGING THE EDUCATIONAL EPISTEMOLOGIES OF COMPUTER SCIENCE TEACHERS - A CASE STUDY OF THE KINGDOM OF SAUDI ARABIA	563
<i>Fayiq Alghamdi ; Aletta Nylén ; Arnold Pears</i>	
TEACHING FUNDAMENTAL POWER ENGINEERING CONCEPTS USING THE VISPHASOR APP	572
<i>Sangit Sasidhar</i>	
TEACHING MULTIDISCIPLINARY TEAMS REQUIREMENTS FOR UNDERGRADUATE STUDENTS: AN APPROACH TO AUGMENTED REALITY SOFTWARE IN DESIGN THINKING CONTEXT	577
<i>Eduarda Maganha De Almeida ; Eduardo Filgueiras Damasceno ; Alexandre L'erário</i>	
ON THE IMPACT OF STEM SUSTAINED ACTIONS ON THE FUTURE OF YOUNG STUDENTS	584
<i>F. Fernández De Vega ; M. C. García ; F. Chávez La De O</i>	
DIDACTIC FRAMEWORK FOR TEACHING C PROGRAMMING LANGUAGE: A PROPOSAL BASED ON COOPERATIVE AND COMPETITIVE LEARNING TECHNIQUES	588
<i>Wollace Souza De Picanço ; Juliana M.V. Martinez De Lucena ; Antônio Fonseca De Lira ; Vicente Ferreira De Lucena</i>	
PROMOTING STUDENT COMPLETION IN A MOOC ON INFORMATION THEORY	597
<i>Celia Xiaoxi Lyu ; Rosanna Yuen-Yan Chan ; Raymond W. Yeung</i>	
SUFAT - AN ANALYTICS TOOL FOR GAINING INSIGHTS FROM STUDENT FEEDBACK COMMENTS	601
<i>Siddhant Pyasi ; Swapna Gottipati ; Venky Shankararaman</i>	
MINI-CASE STUDY PEDAGOGY: EXPERIENCE FROM A TECHNICAL COURSE IN AN INFORMATION SYSTEMS PROGRAM	610
<i>Venky Shankararaman ; Swapna Gottipati ; Alan Megargel</i>	
USING GAMIFICATION IN OUTREACH CAMPS: EXPERIENCE FROM AN IS PROGRAM	618
<i>Swapna Gottipati ; Venky Shankararaman</i>	
THE RELATIONSHIP BETWEEN DEMOGRAPHIC CHARACTERISTICS AND ENGAGEMENT IN AN UNDERGRADUATE ENGINEERING ONLINE FORUM	627
<i>Yueqin Duan ; Edward Berger ; Rohit Kandakatla ; Jennifer Deboer ; Nick Stites ; Jeffrey F. Rhoads</i>	
EXAMINATION OF STUDENT SELF-ASSESSED LEARNING IN A PROJECT-BASED FRESHMAN ROBOTICS COURSE	635
<i>Susan Bitetti ; Ethan Danahy ; Jessica Swenson</i>	
IMPROVING STEM'S CALCULUS EDUCATION USING CROSS-COUNTRIES BEST TEACHING PRACTICES	641
<i>Genady Ya. Grabarnik ; Luiza Kim-Tyan ; Serge Yaskolko</i>	
STUDENTS' PERCEPTIONS OF BEST AND WORST ASPECTS OF DESIGN COURSES: A QUALITATIVE ANALYSIS OF 87 COURSES AND 5591 STUDENTS	646
<i>Ahmed Ibrahim ; Michael J. Reese</i>	
METHOD MATTERS: REFLECTIONS FROM STUDENT-MADE MAPPING STUDIES	654
<i>Ville Isomöttönen ; Sari Ryyänen ; Niko Mononen</i>	

EXPERIENCE WITH ACTIVE LEARNING AND FORMATIVE FEEDBACK FOR A SQL UNIT	663
<i>Christine F. Reilly</i>	
EDUCATING CHANGEMAKERS: CROSS DISCIPLINARY COLLABORATION BETWEEN A SCHOOL OF ENGINEERING AND A SCHOOL OF PEACE.....	672
<i>Gordon Hoople ; Austin Choi-Fitzpatrick ; Elizabeth Reddy</i>	
FROM EXPLAINING HOW RANDOM FOREST CLASSIFIER PREDICTS LEARNING OF SOFTWARE ENGINEERING TEAMWORK TO GUIDANCE FOR EDUCATORS.....	677
<i>Dragutin Petkovic ; Sabiha H Barlaskar ; Jizhou Yang ; Rainer Todtenhoefer</i>	
COMPUTER SCIENCE STUDENTS' EXPERIENCE OF REFLECTING ON TEAM LEADERSHIP - A CASE STUDY OF A STUDENT-CENTERED COURSE ON COMMUNICATION	684
<i>David Haselberger ; Renate Motschnig</i>	
TEACHING SPATIAL VISUALIZATION: A CONTROLLED TRIAL OF A TOUCHSCREEN APP IMPLEMENTED AS HOMEWORK	693
<i>Gordon D. Hoople ; Elizabeth Cowan ; Lelli Den Van Einde ; Jon Tara ; Nathan Delson</i>	
HOW ENGINEERING AND COMPUTING STUDENTS DEMONSTRATE CRITICAL THINKING DURING REQUIRED CO-OP WORK EXPERIENCES.....	698
<i>Adrienne Decker ; Jennifer L. Schneider ; Lauren E. Margulieux</i>	
FEASIBILITY AND ACCEPTABILITY OF PEER ASSESSMENT FOR CODING ASSIGNMENTS IN LARGE LECTURE BASED PROGRAMMING ENGINEERING COURSES	707
<i>Christine E. King</i>	
AN ETHNOGRAPHIC INVESTIGATION INTO THE DEVELOPMENT OF ENGINEERS WITHOUT BORDERS USA STUDENTS DURING THE MONITORING AND MAINTENANCE OF A POTABLE WATER SYSTEM IN PERU	716
<i>Sarah Savage ; Daniel Knight</i>	
CONTEXTUALIZED SPIRAL LEARNING OF COMPUTER PROGRAMMING IN BRAZILIAN VOCATIONAL SECONDARY EDUCATION.....	722
<i>Luis Gustavo J. Araujo ; Roberto A. Bittencourt ; David M. B. Santos</i>	
LOCKDOWN COMPUTERIZED TESTING INTERWOVEN WITH RAPID REMEDIATION: A CROSSOVER STUDY WITHIN A MECHANICAL ENGINEERING CORE COURSE	731
<i>Tian Tian ; Ronald F. Demara ; Su Gao</i>	
THE ADOPTION OF OPEN SOURCE PROJECTS IN ENGINEERING EDUCATION: A REAL SOFTWARE DEVELOPMENT EXPERIENCE	740
<i>Debora M. C. Nascimento ; Christina F. G. Chavez ; Roberto A. Bittencourt</i>	
STUDENT REFLECTION TO IMPROVE ACCESS TO STANDARDS-BASED GRADING FEEDBACK.....	749
<i>Heidi A. Diefes-Dux ; Laura M. Cruz Castro</i>	
INSTRUMENT DEVELOPMENT: MEASURING UNDERGRADUATE STUDENTS' PERCEIVED SUPPORT IN STEM.....	758
<i>Walter C. Lee ; Lisa Moyer ; Allison Godwin ; David Knight</i>	
SOLDIER TO STUDENT: EXPLORING THE UNIQUE SKILLS AND CHALLENGES VETERANS WITH DISABILITIES BRING TO COLLEGE	763
<i>Michael S. Sheppard ; Nadia Kellam ; Samantha Brunhaver</i>	
EDUCATION OF ELECTRICAL ENGINEERING STUDENTS ABOUT ETHICS AND SOCIETAL IMPACTS IN COURSES AND CO-CURRICULAR ACTIVITIES.....	768
<i>Angela R. Bielefeldt ; Madeline Polmear ; Daniel Knight ; Christopher Swan ; Nathan Canney</i>	
VISUAL ANALYTIC WORKFLOW TO UNDERSTAND STUDENTS' PERFORMANCE IN COMPUTER SCIENCE COURSES.....	777
<i>Ravali Gampa ; Anna Baynes</i>	
INNOVATIVE COMPUTING CURRICULA AND THE CC2020 PROJECT	782
<i>John Impagliazzo ; Allen Parrish ; Alison Clear</i>	
EFFECTS OF CORNERSTONE DESIGN EXPERIENCE ON INNOVATIVE BEHAVIOR AND PERCEPTIONS IN ENGINEERING FOR FIRST-YEAR ENGINEERING STUDENTS	784
<i>Jac K. L. Leung</i>	
EXPERIENCE-BASED LECTURE OF VIBRATION ENGINEERING USING DUAL SCALE EXPERIMENTS: FEELING THE FREE VIBRATION OF 5,600-TON SEISMIC BUILDING AND CONTROLLING THE VIBRATION OF SCALE-DOWN EXPERIMENTAL MODEL.....	789
<i>Kohei Yamaguchi ; Susumu Hara</i>	
THE RELATIONSHIP BETWEEN BREADTH OF PREVIOUS ACADEMIC STUDY AND ENGINEERING STUDENTS' PERFORMANCE	798
<i>David Lowe ; Archie Johnston ; Tim Wilkinson ; Tania Machet</i>	

BFAB FOR FACULTY: USING MAKING TO EMPOWER ENTREPRENEURIAL-MINDED LEARNING.....	804
<i>Margot Vigeant ; Donna Ebenstein ; Eric Kennedy ; Wade Hutchison ; R. Alan Cheville ; Matthew Lamparter ; Michael S. Thompson ; Joe Meiser ; Nate Siegel</i>	
PRELIMINARY EFFORTS TO DEFINE, ASSESS, AND IMPROVE STUDENTS' ABILITY TO MAKE "CONNECTIONS" AS PART OF DEVELOPING AN ENTREPRENEURIAL MINDSET.....	809
<i>Margot Vigeant ; R. Alan Cheville ; Charles Kim ; Michael Prince ; Erin Jablonski ; Joseph Tranquillo</i>	
USING A CHATBOT AS A FAQ ASSISTANT IN A COURSE ABOUT COMPUTERS ARCHITECTURE.....	814
<i>Fernando A. Mikic-Fonte ; Martín Llamas-Nistal ; Manuel Caeiro-Rodríguez</i>	
EXPLORING WOMEN'S MOTIVATIONS TO STUDY COMPUTER SCIENCE.....	818
<i>Sally Smith ; Emilia Sobolewska ; Jyoti Bhardwaj ; Khristin Fabian</i>	
STARTING PROBLEMS IN MECHANICAL ENGINEERING	825
<i>Hao Li ; A. E. Hosoi</i>	
A COMPARATIVE ANALYSIS OF THE AUTOMATIC MODELING OF LEARNING STYLES THROUGH MACHINE LEARNING TECHNIQUES	830
<i>Lucas D Ferreira ; Gabriel Spadon ; André Cplf Carvalho ; Jose F Rodrigues</i>	
AVENUES TOWARD INTERDISCIPLINARITY IN THE CLASSROOM.....	838
<i>Desen Sevi Ozkan ; Lisa Mcnair ; Diana Bairaktarova</i>	
APPLYING PBL IN TEACHING PROGRAMMING: AN EXPERIENCE REPORT	843
<i>Simone C. Dos Santos ; Éden Santana ; Lucas Santana ; Pedro Rossi ; Lucas Cardoso ; Ullayne Fernandes ; Cláudio Carvalho ; Pedro Tôrres</i>	
ESTABLISHING AN AGILE MINDSET AND CULTURE FOR WORKFORCE PREPAREDNESS: A BASELINE STUDY.....	851
<i>Gerald C. Gannod ; Willam F. Eberle ; Douglas A. Talbert ; Robert A. Cooke ; Kathy Hagler ; Kathy Opp ; Jasmin Baniya</i>	
A TOOL FOR THE AUTOMATIC SELECTION OF MECHATRONICS REMOTE LABORATORIES BASED ON THEIR ACTUAL EFFECTIVE COSTS	860
<i>Guido Soprano Machado ; Yuri Motta Lopes Rodrigues Silva ; Vicente Ferreira De Lucena</i>	
"OUR LITTLE WORLD": (UN)ENVISIONING THE SOCIAL AND ETHICAL IMPLICATIONS OF ENGINEERING	865
<i>Jae Hoon Lim ; Nickcoy A. Findlater ; Claudia Interiano ; Peter T. Tkacik ; Jerry L. Dalhberg ; Lauren Faw ; Brittany Hunt ; Nhu V. Nguyen</i>	
BLOOM'S TAXONOMY BASED APPROACH TO LEARN BASIC PROGRAMMING LOOPS.....	871
<i>Anabela Gomes ; Fernanda Brito Correia</i>	
EVALUATION OF ACADEMIC PERFORMANCE BASED ON LEARNING ANALYTICS AND ONTOLOGY: A SYSTEMATIC MAPPING STUDY	876
<i>Laécio A. Costa ; Laís N. Salvador ; Ricardo R. Amorim</i>	
MEASURING SELF-EFFICACY IN DIVERSE FIRST-YEAR ENGINEERING STUDENTS EXPOSED TO ENTREPRENEURIAL MINDED LEARNING	881
<i>James Thomas ; Laura E. Boucheron ; Jessica P. Houston</i>	
DELINEATING FACTORS THAT INFLUENCE STUDENT PERFORMANCE IN A DATA STRUCTURES COURSE.....	890
<i>Halil Bisgin ; Murali Mani ; Suleyman Uludag</i>	
WHO I AM BECOMING, NOW: TOWARD A COMPUTER SCIENCE PROFESSIONAL IDENTITY INSTRUMENT.....	899
<i>Rick Parker</i>	
PHRONESIS, AUTHENTIC LEARNING AND THE SOLUTION OF OPEN-ENDED PROBLEMS IN COMPUTER SCIENCE.....	908
<i>Roger Mcdermott ; Mark Zarb ; William Ballew ; Mats Daniels ; Ville Öttö</i>	
DIGITAL BADGES FOR MOTIVATING INTRODUCTORY PROGRAMMERS: QUALITATIVE FINDINGS FROM FOCUS GROUPS.....	917
<i>Lisa Facey-Shaw ; Marcus Specht ; Jeanette Bartley-Bryan</i>	
APPLYING STAGES OF CHANGE IN AN ACADEMIC CONTEXT TO HELP STUDENTS ADOPT HEALTHY LEARNING DISPOSITIONS AND BEHAVIORS.....	924
<i>Dong San Choi ; Michael C. Loui</i>	
LEARNING OUTCOME OUTCOMES: AN EVALUATION OF QUALITY	928
<i>Daniel Brur Sigurgeirsson ; Marta Larusdottir ; Mohammad Hamdaga ; Mats Daniels ; Björn Þór Jónsson</i>	
JCAB: MAKING JAVA CLASS DESIGN EASIER FOR NOVICE PROGRAMMERS.....	936
<i>Qian Liu</i>	
LOCALIZED SOLUTIONS TO INCORPORATING BROADER IMPACTS INTO FIRST-YEAR ENGINEERING EDUCATION	942
<i>Jessica Deters ; Marie Paretti</i>	

EXAMINING THE EFFECT OF A GAME-LIKE PRACTICE TOOL ON THE QUALITY OF STUDENT PEER EVALUATIONS.....	947
<i>Daniel M. Ferguson ; Elizabeth Shu ; Yuchen Cao ; Matthew Ohland</i>	
DEVELOPING EMERGENT CODES FOR THE CLASSROOM OBSERVATION PROTOCOL FOR UNDERGRADUATE STEM (COPUS).....	951
<i>Sin-Ning Cindy Liu ; Cynthia K. Lang ; Brooke A. Merrill ; Adrian Leos ; Kaitlin N. Harlan ; Carolyn L. Sandoval ; Mindy E. Bergman ; Jeffrey E. Froyd</i>	
A BLENDED LEARNING APPROACH TO ENHANCE STUDENT LEARNING FOR AN INTRODUCTORY POWER SYSTEMS COURSE	955
<i>Sangit Sasidhar ; Sanjib Sahoo</i>	
TURNED FROM KNOWLEDGE-BASED TO INNOVATION-BASED: INTRODUCTION OF EMERGING ENGINEERING EDUCATION IN CHINA	960
<i>Ying Li ; Zhang Jiong ; Tianyi Qi ; Shicheng Yu</i>	
GIRLS, MUSIC AND COMPUTER SCIENCE	964
<i>Carlos N. Silla ; André L. Przybysz ; Andriano Rivolli ; Thayna Gimenez ; Carolina Barroso ; Jessika Machado</i>	
EVALUATION OF CYBER DEFENSE EXERCISES USING VISUAL ANALYTICS PROCESS	970
<i>Radek Ošlejšek ; Jan Vykopal ; Karolína Burská ; Vít Rusnák</i>	
WHAT STAYS IN MIND? - RETENTION RATES IN PROGRAMMING MOOCS.....	979
<i>Ralf Teusner ; Christoph Matthies ; Thomas Staubitz</i>	
FACULTY APPRENTICE AS A MENTORSHIP MODEL FOR ENGINEERING GRADUATE STUDENTS INTERESTED IN TEACHING.....	988
<i>Rohit Kandakatla ; Ruth A. Streveler ; Juan D. Ortega-Alvarez ; Karl Smith</i>	
SYSTEMATIC LITERATURE REVIEW OF STUDENTS' AFFECTIVE RESPONSES TO ACTIVE LEARNING: OVERVIEW OF RESULTS	994
<i>Maura Borrego ; Kevin A. Nguyen ; Caroline Crockett ; Matt Demonbrun ; Prateek Shekhar ; Sneha Tharayil ; Cynthia J. Finelli ; Robyn S. Rosenberg ; Cynthia Waters</i>	
DYSGU: A MOBILE-BASED ADAPTIVE SYSTEM TO REDESIGN OUT-OF-CLASS ACTIVITIES.....	1001
<i>Muztaba Fuad ; Monika Akbar ; Lynn Zubov</i>	
ANALYZING MAIN CHARACTERISTICS IN SOFTWARE ENGINEERING PROJECTS	1006
<i>Jakeline Marcos-Abed</i>	
INVESTIGATION INTO THE USE OF LEARNING AGREEMENTS TO ENHANCE STAKEHOLDER ENGAGEMENT AND PROMOTE SELF-EFFICACY IN COMPUTING EDUCATION.....	1011
<i>William Ballew ; Roger Mcdermott ; Mark Zarb ; Mats Daniels ; Tony Clear</i>	
IMPROVING RETENTION AND CONFIDENCE THROUGH CROSS-COURSE COLLABORATIVE PROJECT-BASED LEARNING.....	1018
<i>Jennifer Winikus ; Lukasz Ziarek ; Carl Alphonse ; Jesse Hartloff</i>	
FEMALE AND FEMALE UNDERREPRESENTED ENGINEERING TECHNOLOGY STUDENTS: BACKGROUND, AND INFLUENCES.....	1023
<i>Anne M. Lucietto ; Lesley Berhan</i>	
COLLABORATIVE LEARNING IN MOOCS APPROACHES AND EXPERIMENTS.....	1030
<i>Thomas Staubitz ; Christoph Meinel</i>	
STUDENT-CENTERED CLASSROOMS IN ENGINEERING EDUCATION: CONCEPT AND EVALUATION OF A LEARNING OFFICE FOR SOFTWARE DEVELOPMENT AND APPLIED MATHEMATICS	1039
<i>Dominik Dolezal ; Alexra Posekany ; Lisa Vittori ; Gottfried Koppensteiner ; Renate Motschnig</i>	
USING BAYESIAN ANALYSIS TO REFINE THE MEASUREMENT OF THE INNOVATIVE CAPACITIES OF ENGINEERS.....	1048
<i>Daniel M. Ferguson ; Diane D. Navin ; Michael L. Thompson ; Amy D. Phillips ; Matthew W. Ohland ; Kathryn W. Jablokow</i>	
ENHANCING STANFORD DESIGN THINKING FOR KIDS WITH DIGITAL TECHNOLOGIES A PARTICIPATORY ACTION RESEARCH APPROACH TO CHALLENGE-BASED LEARNING	1052
<i>Renate Motschnig ; Daniel Pfeiffer ; Anna Gawin ; Peter Gawin ; Michael Steiner ; Lisa Strel</i>	
UNDERGRADUATE ENGINEERING EDUCATION AND THE GAME-BASED LEARNING METHODS TO PROMOTE A CULTURE OF LABORATORY SAFETY	1061
<i>Willie Brown ; Lei Zhang ; Ellis Lawrence ; Yuanwei Jin ; I. Dabipi ; Weiwei Zhu ; Dinesh K. Sharma</i>	
CHANGES IN ENGINEERING TECHNOLOGY STUDENTS PERCEPTION FROM FRESHMAN TO SENIOR YEAR.....	1068
<i>Anne M. Lucietto ; Eddy Efendy ; R. Mark French</i>	
RETHINKING ENGINEERING LEADERSHIP.....	1076
<i>Meagan Kendall ; Debbie Chachra ; Kate Roach ; Emanuela Tilley ; Kyle Gipson</i>	

ENHANCING ELECTRICAL SCIENCE LEARNING WITHIN A NOVEL PRACTICE TESTING LEARNING FRAMEWORK	1079
<i>James Eustace ; Pramod Pathak</i>	
INTEGRATING ENGINEERING LEADERSHIP THROUGHOUT AN UNDERGRADUATE ENGINEERING DEGREE.....	1087
<i>Meagan Kendall ; Caroline Salas ; Evelyn Martinez ; Roger Gonzalez</i>	
THE INTEGRATION OF DATA ANALYTICS TO ASSESS MULTI-COMPLEX ENVIRONMENTS OF RESEARCH TO PRACTICES IN ENGINEERING EDUCATION	1096
<i>Willie Brown ; Lei Zhang ; Dinesh K. Sharma ; Yuanwei Jin ; I. Dabipi ; Weiwei Zhu ; Ellis Lawrence</i>	
THE SELF-FLIPPED CLASSROOM CONCEPT: UNDERLYING IDEAS AND EXPERIENCES.....	1102
<i>Anna Vasilchenko ; Åsa Cajander ; Mats Daniels ; Madeline Balaam</i>	
DO GREAT MINDS THINK ALIKE? : RACIAL/ETHNIC AND GENDER DIFFERENCES IN MINDSET OF UNDERGRADUATE ENGINEERING STUDENTS	1111
<i>Julianna S. Ge ; Edward J. Berger ; John Chen ; Brian Self</i>	
STUDENT AND FACULTY REFLECTIONS AFTER USING MATHWORKS' CODY COURSEWORK IN A CONTROL SYSTEMS COURSE	1116
<i>Rebecca M. Reck</i>	
MAKERSPACES VS ENGINEERING SHOPS: INITIAL UNDERGRADUATE STUDENT IMPRESSIONS.....	1121
<i>Kate Youmans ; Idalis Villanueva ; Louis Nadelson ; Jana Bouwma-Gearheart ; Adam Lenz ; Sarah Lanci</i>	
COMPARING STUDENT PERFORMANCE ON LOW-STAKES AND HIGH-STAKES EVALUATIONS OF CONCEPTUAL UNDERSTANDING.....	1126
<i>Rachel V Vitali ; Noel C Perkins ; Cynthia J Finelli</i>	
A STRUCTURAL EQUATION MODEL ANALYSIS OF COMPUTING IDENTITY SUB-CONSTRUCTS AND STUDENT ACADEMIC PERSISTENCE	1130
<i>Mohsen Taheri ; Monique Ross ; Zahra Hazari ; Mark Weiss ; Michael Georgiopoulos ; Ken Christensen ; Tiana Solis ; Atalie Garcia ; Deepa Chari</i>	
OBTAINING EVIDENCE OF LEARNING IN DIGITAL GAMES THROUGH A DEEP LEARNING NEURAL NETWORK TO CLASSIFY FACIAL EXPRESSIONS OF THE PLAYERS	1137
<i>Heraclito A. Pereira ; Alberto F. De Souza ; Crediné S. De Menezes</i>	
EVALUATING THE EFFECT OF DIFFERENT TEAMWORK TRAINING INTERVENTIONS ON THE QUALITY OF PEER EVALUATIONS	1145
<i>Daniel M. Ferguson ; Matthew W. Ohland ; Chad Lally ; Hilda Ibriga Somnooma ; Yuchen Cao</i>	
PLATFORM FOR TEACHING HANDS-ON END-TO-END ANONYMITY ALGORITHMS.....	1150
<i>Emil H Salib ; Grant Hobar</i>	
SPATIAL ABILITIES IN EARLY CHILDHOOD	1159
<i>Vyshnavi Malathi Ramesh</i>	
MASSIVE OPEN ONLINE COURSES ON WEB DEVELOPMENT EDUCATION: A CASE STUDY.....	1166
<i>Aracele Garcia De Oliveira Fassbinder ; Ellen Francine Barbosa ; Marcelo Fassbinder</i>	
MAKING MIDFIELD MORE ACCESSIBLE: A WORKSHOP FOR R BEGINNERS	1175
<i>Richard A. Layton ; Russell A. Long ; Susan M. Lord ; Matthew W. Ohl ; Marisa K. Orr ; Nichole Ramirez</i>	
PANEL: STUDENT SELF-PERCEPTIONS REGARDING THEIR FIRST POSITION AFTER GRADUATION: WHAT ARE THEY AND HOW DO WE HELP?	1178
<i>Cheryl Carrico ; Holly Matusovic ; Samantha Brunhaver ; Jinny Rhee ; Sheri Shep ; Helen L. Chen</i>	
EFFECTIVENESS OF FLOWCHARTING AS A SCAFFOLDING TOOL TO LEARN PYTHON.....	1181
<i>Candido Cabo</i>	
SPECIAL SESSION: TAKING A DEEP DIVE: QUALITATIVE METHODS AND IDENTITY	1188
<i>Susan M. Lord ; Michelle M. Camacho</i>	
I DON'T FIT THE STEREOTYPE, BUT I SEE MYSELF AS AN ENGINEER: FIRST-YEAR ENGINEERING STUDENTS' ATTITUDES AND BELIEFS ABOUT THEIR ENGINEERING IDENTITIES.....	1191
<i>Brianna Benedict ; Dina Verdín ; Rachel Baker ; Allison Godwin ; Aaron Thielmeyer</i>	
MISSION POSSIBLE: BLENDING THE SOCIAL AND TECHNICAL THROUGH AN INNOVATIVE BIODESIGN CHALLENGE MODULE FOR A MATERIALS SCIENCE CLASS.....	1198
<i>Breanne Przestrzelski ; Elizabeth Reddy ; Susan M. Lord</i>	
SOFTWARE ENGINEERING DEPARTMENT HEADS WORKSHOP	1205
<i>Christopher Taylor ; Stephen Frezza</i>	
TOWARDS EDUCATION ALTERNATIVES TO TEACHING AND LEARNING OF PROGRAMMING: A COURSE EXPERIENCE USING OPEN HARDWARE TOOLS	1207
<i>Jonathan Álvarez Ariza</i>	

EFFECTS OF ERROR MESSAGES ON STUDENTS' ABILITY TO UNDERSTAND AND FIX PROGRAMMING ERRORS	1215
<i>Harsha B. M. Kadekar ; Sohum Sohoni ; Scotty D. Craig</i>	
APPLY DATA ANALYTICS TO SCHEDULE BEST-SUITED CLASSES FOR STUDENTS WITH DIFFERENT ACADEMIC HISTORIES	1223
<i>Yanzhen Qu ; Anthony Kutscher</i>	
SOCIOLOGY A GAME CHANGER IN COMPUTER SCIENCE PROGRAMS	1230
<i>Soraya Cardenas</i>	
VOICES ON THE CORE OF COMPUTING.....	1238
<i>Stephen T. Frezza ; Alison Clear ; Abhijat M. Vichare</i>	
BEYOND SURVEYS: ANALYZING SOFTWARE DEVELOPMENT ARTIFACTS TO ASSESS TEACHING EFFORTS	1247
<i>Christoph Matthies ; Ralf Teusner ; Guenter Hesse</i>	
TEACHING WITH VIDEO ASSISTANCE IN EMBEDDED REAL-TIME OPERATING SYSTEM	1256
<i>Zhaohong Wang ; Kathleen Meehan ; Jing Guo</i>	
ADAPTATION CONTENT IN ROBOTIC SYSTEMS: A SYSTEMATIC MAPPING STUDY	1262
<i>Thais Oliveira Almeida ; José Francisco De M. Netto</i>	
A METHOD FOR BUILDING MASSIVE OPEN ONLINE COURSES FOR ELDERLY PEOPLE MOOCEP: FROM THE USER PERCEPTIONS.....	1271
<i>Priscila Cedillo ; Alexra Bermeo ; Paola Beltran ; Paul Rodriguez-Ch ; Freddy Serrano</i>	
MAKING TESTING LESS TRYING: LESSONS LEARNED FROM OPERATING A COMPUTER-BASED TESTING FACILITY	1278
<i>Craig Zilles ; Matthew West ; David Mussulman ; Tim Brett</i>	
ASEE TELPHE DIVISION AS A COMMUNITY OF TRANSFORMATION	1287
<i>Mani Mina ; John Krupczak</i>	
USING RESEARCH PROJECTS IN THE CLASSROOM TO IMPROVE ENGINEERING EDUCATION.....	1292
<i>Natalia A. Bueno Pizarro</i>	
HELLO ROBOT! A WEBSITE TO RAISE INTEREST IN A STEM FUTURE THROUGH INTERNET SPEECH CONTROLLED ROBOTS.....	1299
<i>Torben E. Svane</i>	
ASSESSING LEARNING BEHAVIOR AND COGNITIVE BIAS FROM WEB LOGS	1303
<i>Rashmi Jayathirtha Rao ; Christopher Stewart ; Arnulfo Perez ; Siva Meenakshi Renganathan</i>	
USING MAGIC IN COMPUTING EDUCATION AND OUTREACH	1308
<i>Ronald I. Greenberg ; Dale F. Reed</i>	
DEVELOPMENT OF LEADERSHIP SELF-EFFICACY: COMPARING ENGINEERS, OTHER STEM, AND NON-STEM MAJORS	1312
<i>Bryce E. Hughes ; William J. Schell ; Brett Tallman</i>	
TOWARD INCREASING COLLABORATION AWARENESS IN SOFTWARE ENGINEERING TEAMS.....	1317
<i>Shuddha Chowdhury ; Charles Walter ; Rose Gamble</i>	
ANALYSING STUDENTS' SCRATCH PROGRAMS AND ADDRESSING ISSUES USING ELEMENTARY PATTERNS	1326
<i>Kashif Amanullah ; Tim Bell</i>	
THE DEVOPS LAB PLATFORM FOR MANAGING DIVERSIFIED PROJECTS IN EDUCATING AGILE SOFTWARE ENGINEERING	1331
<i>Xiaoying Bai ; Dan Pei ; Mingjie Li ; Shanshan Li</i>	
MOTIVATORS OVER MODES DIVERSE STUDENT TEAM DRIVES LEADING AUTOMOTIVE COMPANY'S EVOLUTION TO MOBILITY PLATFORM.....	1336
<i>Grace Greenwald ; Anand Upender ; Daniel Chan ; Cole Patterson ; Barbara Karanian</i>	
ACHIEVEMENT GAP IN ONLINE AND HYBRID COURSES VERSUS FACE-TO-FACE COURSES AMONG ENGINEERING AND COMPUTER SCIENCE STUDENTS	1341
<i>Farshid Zabihian</i>	
SUPERVISING MULTIDISCIPLINARY FINAL-YEAR ENGINEERING STUDENTS TO DEVELOP CUBESATS WITH AN INNOVATIVE PROJECT MANAGEMENT METHOD	1346
<i>Sha Luo ; Eng Keng Soh ; Ai Po Loh</i>	
INTERNATIONALIZATION PROJECT TO FACE THE UNCERTAINTIES OF WORK MARKET.....	1350
<i>Claudio R. Brito ; Henrique D. Santos ; Luis A. Amaral ; Melany M. Ciampi ; Rosa M. Vasconcelos ; Victor A. Barros</i>	
IMPROVING STUDENT MOTIVATION THROUGH COMPETITIVE ACTIVE LEARNING.....	1355
<i>Manika Kapoor ; Shuai Hua ; David C. Anastasiu</i>	

RESEARCH ON ENGINEERING PRACTICE: CATALYZING A SCHOLARLY COMMUNITY	1360
<i>Samantha R. Brunhaver ; Brent K. Jesiek ; Alexandra Coso Strong ; Russell Korte ; Reed Stevens</i>	
UBIQUITOUS ENVIRONMENTS FOR PROBLEM-BASED LEARNING: A BIBLIOGRAPHIC REVIEW	1364
<i>Sam Devincenzi ; Fernando Pereira De Toledo ; Viviani Kwecko ; Fernanda Pinto Mota ; Silvia Silva Da Costa Botelho</i>	
A HACKATHON METHODOLOGY FOR UNDERGRADUATE COURSE PROJECTS	1370
<i>Kiev Gama ; Breno Alencar ; Filipe Calegario ; André Neves ; Pedro Alessio</i>	
STUDY ON DISTRIBUTED COGNITION PROCESSES AND PARTICIPATION IN COLLABORATIVE CONSTRUCTION ACTIVITIES IN DIGITAL MEDIA	1379
<i>Viviani Rios Kwecko ; Fernanda Pinto Mota ; Sam Devincenzi ; Fernando Pereira De Toledo ; Mauren Porcincula ; Silvia Silva Da Costa Botelho</i>	
AN INNOVATIVE TEACHING APPROACH IN ENGINEERING EDUCATION TO IMPART REFLECTIVE DIGITALIZATION COMPETENCES	1385
<i>Brit-Maren Block</i>	
STUDENT MOTIVATION TOWARDS LEARNING TO PROGRAM	1390
<i>Anabela Gomes ; Wei Ke ; Chan-Tong Lam ; Maria José Marcelino ; António Mendes</i>	
MOTIVATION CENTERED LEARNING	1398
<i>Thomas Fuhrmann</i>	
GRADUATE STUDENT PROGRAM OF ELECTRICAL ENGINEERING BASED ON INDUSTRY-UNIVERSITY COOPERATION	1403
<i>Guangwei Xue ; Shaoping Wang ; Xinjian Wang ; Segio Amedeo Pignari ; Mileta Tomovic</i>	
EXPLORING DIFFERENT UNPLUGGED GAME-LIKE ACTIVITIES FOR TEACHING COMPUTATIONAL THINKING	1409
<i>Tomislav Jagušć ; Ana Sović Krzić ; Gordan Gledec ; Mislav Grgić ; Iva Bojic</i>	
GATHERING INSIGHTS FROM TEENAGERS' HACKING EXPERIENCE WITH AUTHENTIC CYBERSECURITY TOOLS	1414
<i>Valdemar Švábenský ; Jan Vykopal</i>	
MENTORING FEMALE HIGH SCHOOL STUDENTS FOR A STEM CAREER	1418
<i>Noelia Olmedo-Torre ; Marta Peña Carrera ; Mireia López-Beltrán ; Maica Sanz Gómez ; David López</i>	
ACCESSIBILITY IN MOBILE APPLICATIONS FOR ELDERLY USERS: A SYSTEMATIC MAPPING	1423
<i>Camila Dias De Oliveira ; Maria Lydia Fioravanti ; Renata Pontin De Mattos Fortes ; Ellen Francine Barbosa</i>	
A CATALOG OF PEDAGOGICAL PATTERNS FOR LEARNING APPLICATIONS	1432
<i>Maria Lydia Fioravanti ; Ellen Francine Barbosa</i>	
A PHYSICALLY EMBODIED ROBOT TEACHER (PERT) AS A FACILITATOR FOR PEER LEARNING.....	1441
<i>Bosede I. Edwards ; Idris O. Muniru ; Nosiba Khougali ; Adrian D. Cheok ; Rui Prada</i>	
AN EMPIRICAL INVESTIGATION ON A PEDAGOGICAL PATTERN LANGUAGE FOR MOBILE LEARNING APPLICATIONS.....	1450
<i>Maria Lydia Fioravanti ; Camila Dias De Oliveira ; Lilian Passos Scatolon ; Ellen Francine Barbosa</i>	
DCLAB: A WEB-BASED SYSTEM FOR DIGITAL LOGIC EXPERIMENT TEACHING	1459
<i>Yuhui Ding ; Shanshan Li ; Jinghan Liu ; Xiaojun Wu</i>	
MEET-UP: AN ORIENTATION PROGRAM FOR STUDENTS WITH AUTISM SPECTRUM DISORDER.....	1464
<i>David Lopez ; Lidia Montero ; Montserrat Vilalta</i>	
FEATURE EXTRACTION AND CLASSIFICATION OF LEARNERS USING NEURAL NETWORKS.....	1468
<i>Tomohiro Hayashida ; Toru Yamamoto ; Shin Wakitani ; Ichiro Nishizaki ; Shinya Sekizaki ; Yusuke Tanimoto</i>	
EXPLORATION OF FIRST-YEAR STUDENTS' RESOURCE NETWORKS TO COMPLETE ENGINEERING HOMEWORK.....	1472
<i>Emily Diehl ; Courtney Faber</i>	
LEARNING TO THINK LIKE A TRAINER: BRINGING SCRATCH FOR EDUCATIONAL SCIENCES PROFESSIONAL'S FORMATION.....	1477
<i>Ricardo Almeida ; Teresa Pessoa ; Anabela Gomes</i>	
LEARNING TO LEARN ENGINEERING - A LEARNING SCIENCES APPROACH TO ENGINEERING CURRICULUM DESIGN AND IMPLEMENTATION	1484
<i>Tris Utschig ; William L. Scheller II ; Jim Morgan ; Daniel M Litynski ; David Leasure ; Mohamed El-Sayed ; Virgil Cox ; S. Raj Chaudhury ; Steven Beyerlein ; Daniel Apple</i>	
A SYSTEMATIC REVIEW ON THE USE OF LEGO® ROBOTICS IN EDUCATION	1492
<i>Isabelle M. L. Souza ; Wilkerson L. Andrade ; Livia M. R. Sampaio ; Ana Liz Souto O. Araujo</i>	

INTELLIGENT EDUCATIONAL DUAL ARCHITECTURE FOR UNIVERSITY DIGITAL TRANSFORMATION	1501
<i>Jesús Alfonso Pérez Gama</i>	
EXAMINING SOFTWARE DESIGN PROJECTS IN A FIRST-YEAR ENGINEERING COURSE: : THE IMPACT OF THE PROJECT TYPE ON PROGRAMMING COMPLEXITY AND PROGRAMMING.....	1510
<i>Krista M. Kcskemety ; Zachary Dix ; Benjamin Kott</i>	
FLIPPING UNPLUGGED: AN EXPERIENCE REPORT	1515
<i>James K. Huggins</i>	
EVOLVING A DATA STRUCTURES CLASS TOWARD INCLUSIVE SUCCESS	1519
<i>Celine Latulipe ; Stephen Macneil ; Brian Thompson</i>	
WHAT BELONGS IN A COMPUTER SCIENCE SYLLABUS?.....	1528
<i>Mitchell Duncan ; James K. Huggins</i>	
TEACHING ASSISTANTS' EXPERIENCES OF LAB SESSIONS IN INTRODUCTORY COMPUTER SCIENCE COURSES.....	1533
<i>Emma Riese</i>	
AUTHENTIC LEARNING SECURE SOFTWARE DEVELOPMENT (SSD) IN COMPUTING EDUCATION.....	1538
<i>Kai Qian ; Dan Lo ; Reza Parizi ; Fan Wu ; Emmanuel Agu ; Bei-Tseng Chu</i>	
EXTENDED ADDIE MODEL FOR IMPROVED DISTANCE LEARNING COURSES.....	1547
<i>Fernando G. Constancio ; Couras Maria F. K. B. ; Nogueira Danielle X. P. ; Da Costa João Paulo C. L. ; Mateus Da R. Zanatta ; Rafael. T. De Sousa ; Stela Gomes F ; Natalia T. Da Mota</i>	
MEASURING PROGRAMMING KNOWLEDGE IN A RESEARCH CONTEXT	1552
<i>Kristina Von Hausswolff ; Anna Eckerdal</i>	
WHAT DOES IT MEAN TO BE SMART? A NARRATIVE APPROACH TO EXPLORING COMPLEX CONSTRUCTS.....	1561
<i>Emily Dringenberg ; Rachel Kajfez</i>	
INTEGRATING HARDWARE PROTOTYPING PLATFORMS INTO THE CLASSROOM	1566
<i>Eyhab Al-Masri</i>	
TOKEN-BASED APPROACH FOR REAL-TIME PLAGIARISM DETECTION IN DIGITAL DESIGNS	1570
<i>Han Wan ; Kangxu Liu ; Xiaopeng Gao</i>	
DESIGNING FOR ALL: EXPLORING GENDER DIVERSITY AND ENGAGEMENT WITH DIGITAL EDUCATIONAL GAMES BY YOUNG PEOPLE.....	1575
<i>Opeyemi Dele-Ajayi ; Rebecca Strachan ; Alison Pickard ; Jonathan Sanderson</i>	
GOING BEYOND GENDER BALANCE: UNDERSTANDING THE INTERSECTION OF GENDER AND THE ENGINEERING EXPERIENCES OF ALUMNI	1584
<i>Matt Brucker ; Emma Price ; David Freeman ; Jeremy M. Goodman ; Yevgeniya V. Zastavker</i>	
ENGINEERING EMOTION : STUDENTS TELL STORIES ABOUT THE COSTS OF BEING INNOVATIVE	1592
<i>Barbara A. Karanian ; Andrew Parlier ; Ville Taajamaa ; Gloria Monaghan</i>	
INVESTIGATING THE INTERSECTION OF CAREER ASPIRATIONS AND ENGINEERING BELIEFS IN FIRST YEAR ENGINEERING STUDENTS.....	1601
<i>Jacqueline A. Rohde ; Dina Verdín ; Jacqueline Doyle ; Allison Godwin ; Adam Kirn ; Lisa Benson ; Geoff Potvin</i>	
SPECIAL SESSION: SEE SOMETHING, SAY SOMETHING:REDIRECTING STORIES FOR ORGANIZATIONAL CHANGE	1609
<i>Jennifer Karlin ; Cheryl Allendoerfer ; Rebecca Bates ; Dan Ewert ; Ron Ulseth</i>	
A REFLECTION ON DIVERSITY AND INCLUSIVITY EFFORTS IN A SOFTWARE ENGINEERING PROGRAM	1611
<i>David S. Janzen ; Sara Bahrami ; Bruno C. Da Silva ; Davide Falessi</i>	
SPECIAL SESSION: LEARNING AND PRACTICE OF ENGINEERING FUNDAMENTAL PRINCIPLES FOR LONG-TERM RETENTION	1620
<i>Eleanor Leung ; Elizabeth Pluskwik</i>	
CAN STUDENTS HELP THEMSELVES? AN INVESTIGATION OF STUDENTS' FEEDBACK ON THE QUALITY OF THE SOURCE CODE	1624
<i>Raul Andrade ; João Brunet</i>	
INSTRUMENT DEVELOPMENT TO ASSESS DESIGN PROJECT APPROPRIATENESS FOR DOMAIN RELATEDNESS, AMBIGUITY TOLERANCE, AND GENDEREDNESS.....	1632
<i>Kathy L. Jackson ; Jordan C. E. Blair ; Gül E. Kremer ; Xinli Wu</i>	
HOW TO PREPARE COMPETITIVE NSF ENGINEERING EDUCATION PROPOSALS	1640
<i>Abiodun Ilumoka ; Julie Martin ; Alexandra Medina-Borja ; Paige Smith ; Heather Watson</i>	

EVALUATION OF AN INSTRUMENT TO IDENTIFY FACTORS THAT IMPACT THE MOTIVATION AND ENGAGEMENT OF UNDERGRADUATE STUDENTS IN COMPUTING	1644
<i>Pablo Schoeffel ; Raul Sidnei Wazlawick ; Vinicius Faria Culmant Ramos ; Adilson Vahldick ; Marcelo De Souza</i>	
FACILITATING INTERCULTURAL DEVELOPMENT: PREPARING FUTURE ENGINEERS FOR MULTIDISCIPLINARY TEAMS AND MULTICULTURAL ENVIRONMENTS	1653
<i>Darshini N. Render ; Horane A. Holgate ; Charles A. Calahan</i>	
INVESTIGATING THE BENEFITS OF INTRODUCING PROCESS-ORIENTED LIFE CYCLE DEVELOPMENT MODELS TO IMPROVE STUDENTS APPRECIATION FOR AGILE METHODS.....	1662
<i>Omar Ochoa ; Miralda Rodney ; Massood Towhidnejad ; Salamah Salamah</i>	
PLAYING THE ROLE OF TEAMWORK FACILITATOR: USING ROLE PLAY TO DEMONSTRATE STRATEGIES TO FACILITATE TEAMWORK.....	1670
<i>Alexa Kottmeyer ; Stephanie Cutler ; James J. Pembbridge</i>	
CONTEXTUAL ANALYSIS OF ENGINEERING STUDENT ACADEMIC SUCCESS AT A HISPANIC SERVING INSTITUTION (HSI).....	1672
<i>Farshid Marbouti ; Julia Thompson ; Jale Ulas</i>	
DEVELOPING AND APPLYING AN UNDERGRADUATE CROSS-COURSE TEAM ASSIGNMENT	1678
<i>Luciana Debs ; Mark Zimpfer</i>	
AN INNOVATIVE PROFESSIONAL DEVELOPMENT MODEL FOR TEACHING ROBOTICS TO NOVICE EDUCATORS.....	1683
<i>Bryan Choate ; Mia Dubosarsky ; Katherine Chen</i>	
SECOND CHANCES: DOES ALLOWING HOMEWORK RESUBMISSIONS AFFECT STUDENT LEARNING?.....	1688
<i>R. Pito Salas</i>	
ASSESSING THE DEMAND OF PROBLEMS IN AN UNDERGRADUATE ELECTRICAL ENGINEERING COURSE	1693
<i>Presentacion Rivera-Reyes ; Lance C. Pérez ; Thomas Delahunty</i>	
INTEGRATING SYSTEMS APPROACHES INTO EDUCATION USING ACTIVE CASE STUDIES	1701
<i>Reid Bailey ; William H. Guilford ; Shawn Russell</i>	
ENGINEERING STUDENT INTEREST IN FUTURE WORK ABROAD	1703
<i>Angela R. Bielefeldt</i>	
A FRAMEWORK FOR ABDUCTIVE COMPUTATIONAL MODELING	1708
<i>Oswaldo Luiz De Oliveira ; Ricardo Jose Martins ; Marcio Yuji Matsumoto</i>	
JUSTIFICATIONS ON THE BEHAVIOR IN RELATION TO THE CONSUMPTION OF ELECTRIC POWER AT HOME AND AT WORK: A QUALITATIVE ANALYSIS	1716
<i>Fernanda Pinto Mota ; Viviani Rios Kwecko ; Fernando Pereira De Toledo ; Sam Devincenzi ; Silvia Silva Da Costa Botelho</i>	
TOWARDS A CATALOG OF GESTURES FOR M-LEARNING APPLICATIONS FOR THE TEACHING OF PROGRAMMING	1720
<i>Anderson S. Marcolino ; Alef Santos ; Marco Schaefer ; Ellen F. Barbosa</i>	
“SO FAR BACK, I’M ANONYMOUS”: EXPLORING STUDENT IDENTITY USING PHOTOVOICE.....	1729
<i>Debbie Meharg ; Sandra Cairncross ; Alison Varey</i>	
OPPORTUNITIES FOR NATURAL LANGUAGE PROCESSING IN QUALITATIVE ENGINEERING EDUCATION RESEARCH: TWO EXAMPLES	1738
<i>Catherine G.P. Berdanier ; Eric Baker ; Weiqin Wang ; Christopher Mccomb</i>	
CORRELATIONS BETWEEN GRADUATE STUDENT WRITING CONCEPTS AND PROCESSES AND CERTAINTY OF CAREER TRAJECTORIES.....	1744
<i>Catherine G.P. Berdanier ; Ellen Zerbe</i>	
INDUSTRY AND ACADEMIA PARTNERSHIP FOR SHORT-TIME HIGH-LEVEL QUALIFICATION	1752
<i>José Reginaldo H. Carvalho ; Auri Vnicenzi ; José Carlos Maldonado ; Marcel Gonçalves</i>	
INVESTIGATING THE IMPACT OF AN IMMERSIVE COMPUTER-BASED MATH GAME ON THE LEARNING PROCESS OF UNDERGRADUATE STUDENTS	1760
<i>Cristina Hava Muntean ; Nour El Mawas ; Michael Bradford ; Pramod Pathak</i>	
PROMOTING INNOVATION AND ENTREPRENEURSHIP AS PART OF AN ENGINEERING CURRICULUM.....	1768
<i>Asad Azemi</i>	
APPLIED LEARNING WITHIN THERMODYNAMICS: A PERSPECTIVE ON ENERGY CONCEPTS	1773
<i>Cole Maynard ; Brittany Newell ; Anne Lucietto ; William Hutzet ; Jose Garcia-Bravo</i>	

MIDOAA: INCLUSIVE MODEL OF DEVELOPMENT OF ACCESSIBLE LEARNING OBJECTS.....	1781
<i>Andreza Bastos Mourão ; José Francisco Magalhães Netto</i>	
INFLUENCE OF INTERNSHIPS ON ENGINEERING STUDENTS' ATTITUDES ABOUT SOCIALLY RESPONSIBLE ENGINEERING	1789
<i>Greg Rulifson ; Angela Bielefeldt</i>	
EXAMINING SELF-EFFICACY AND GROWTH MINDSET IN AN INTRODUCTORY COMPUTING COURSE	1795
<i>James J Pembridge ; Kelsey J Rodgers</i>	
CONCEPT INVENTORIES IN CYBERSECURITY EDUCATION: AN EXAMPLE FROM SECURE PROGRAMMING	1800
<i>Ida Ngambeki ; Phillip Nico ; Jun Dai ; Matthew Bishop</i>	
DESIGNING A COMPETENCY-BASED EVALUATION MODEL IN EXTERNAL ACADEMIC PRACTICES (INTERNSHIP).....	1805
<i>Margarita Moltó-Aribau ; Anna Tena Tarruella ; Ana Vendrell-Vilanova</i>	
MIDDLE SCHOOL STUDENTS' CONCEPTIONS OF FAILURE IN RURAL COMMUNITIES	1809
<i>Tawni Paradise ; Jake Grohs</i>	
"WE'VE ALWAYS DONE IT THAT WAY," AN EXPLORATION OF ELECTRICAL AND COMPUTER ENGINEERING FACULTY CURRICULAR DECISIONS.....	1814
<i>D. Reeping ; L.D. Mcnair ; L Baum ; M Wisnioski ; A.Y. Patrick ; T.L. Martin ; L. Lester ; B. Knapp ; S. Harrison</i>	
VISUO-HAPTIC SIMULATIONS TO IMPROVE STUDENTS' UNDERSTANDING OF FRICTION CONCEPTS	1819
<i>Luis Neri ; Alejandra J. Magana ; Julieta Noguez ; Yoselyn Walsh ; Andres Gonzalez-Nucamendi ; Victor Robledo-Rella ; Bedrich Benes</i>	
REAL-TIME METACOGNITION FEEDBACK FOR INTRODUCTORY PROGRAMMING USING MACHINE LEARNING	1825
<i>Phyllis J. Beck ; M. Jean Mohammadi-Aragh ; Christopher Archibald ; Bryan A. Jones ; Amy Barton</i>	
GETTING THINGS DONE IN ACADEMIA: THE CHALLENGES WITH INSTITUTIONAL BUREAUCRACY AND THE NEED FOR PROJECT MANAGEMENT.....	1830
<i>A. Goldenstein ; E. Wirtz ; E. Berger</i>	
LEARNING AND ACADEMIC SUCCESS IN ENGINEERING COURSES: COMPARING 1ST YEAR STUDENTS ACCORDING TO GENDER	1836
<i>Rosa M. Vasconcelos ; Leandro S. Almeida</i>	
BUTTING HEADS: COMPETITION AND POSTURING IN A PAIRED PROGRAMMING TEAM.....	1840
<i>J. Ross Uhlar ; Stephen Secules</i>	
DEVELOPING POSTDOCTORAL SCHOLAR AND GRADUATE STUDENT MENTORSHIP ABILITY	1847
<i>Zhen Zhao ; Adam R. Carberry</i>	
EXPLORING THE RANGE OF METHODS USED TO ASSESS ENGINEERING STUDENTS' EDUCATION ON ETHICAL AND SOCIETAL IMPACT ISSUES	1854
<i>Daniel W Knight ; Angela R. Bielefeldt ; Chris Swan ; Nathan E. Canney ; Madeline Polmear</i>	
COMBINING CHALLENGE-BASED LEARNING AND DESIGN THINKING TO TEACH MOBILE APP DEVELOPMENT	1861
<i>Kiev Gama ; Fernando Castor ; Pedro Alessio ; Andre Neves ; Cristiano Araújo ; Rafael Formiga ; Francisco Soares-Neto ; Higor Oliveira</i>	
WHY ARE WE HERE? THE EDUCATIONAL VALUE MODEL (EVM) AS A FRAMEWORK TO INVESTIGATE THE ROLE OF STUDENTS' PROFESSIONAL IDENTITY DEVELOPMENT	1866
<i>Aletta Nylén ; Mats Daniels ; Arnold Pears ; Åsa Cajander ; Roger Mcdermott ; Ville Isomöttönen</i>	
THE EFFECT OF DIVERSITY ON FEELINGS OF BELONGINGNESS FOR NEW ENGINEERING STUDENTS	1874
<i>Nelon Pearson ; Allison Godwin ; Adam Kirn</i>	
APPLYING HOL/PBL TO PREPARE UNDERGRADUATE STUDENTS INTO GRADUATE LEVEL STUDIES IN THE FIELD OF AEROSPACE ENGINEERING USING THE PUERTO RICO CUBESAT PROJECT INITIATIVE	1881
<i>Rachid Darbali-Zamora ; Nicolas Cobo-Yepes ; Eduardo I. Ortiz-Rivera ; Erick E. Aponte-Bezares ; Amilcar A. Rincón-Charris</i>	
STUDENT LEARNING IN COMPUTING-BASED SERVICE-LEARNING	1889
<i>Nusaybah Abu-Mulaweh ; William Oakes</i>	
CONSUMER ELECTRONICS DESIGN AS PREPARATION FOR CAPSTONE DESIGN	1896
<i>John Lund</i>	

USING MULTIPLE ACTIVE TEACHING-LEARNING APPROACHES IN SOFTWARE PROJECT MANAGEMENT: A LONGITUDINAL ANALYSIS OF STUDENTS' MOTIVATION AND LEARNING	1903
<i>Pablo Schoeffel ; Raul Sidnei Wazlawick ; Vinicius Faria Culmant Ramos</i>	
MOTIVATION AND ENGAGEMENT FACTORS OF UNDERGRADUATE STUDENTS IN COMPUTING: A SYSTEMATIC MAPPING STUDY	1912
<i>Pablo Schoeffel ; Raul Sidnei Wazlawick ; Vinicius Faria Culmant Ramos</i>	
THE WREASN TYPOLOGY OF STUDENT INVOLVEMENT ACTIVITIES	1917
<i>R. M. Mwenesi ; E. Brennan-Wydra ; C. Sanchez ; M. Ellis ; D. Koch ; C. S. Davis ; J. M. Millunchick</i>	
UNPLUGGED ROBOTICS TO INCREASE K-12 STUDENTS' ENGINEERING INTEREST AND ATTITUDES	1920
<i>Blanca Miller ; Adam Kirn ; Mercedes Anderson ; Justin C. Major ; David Feil-Seifer ; Melissa Jurkiewicz</i>	
THE STRUCTURE OF CHANGE: A CONTENT ANALYSIS OF ENGINEERING DIVERSITY PLANS AND MISSION STATEMENTS	1925
<i>Kelly J. Cross ; Walter C. Lee ; Whitney B. Gaskins ; Brandi P. Jones</i>	
A FRAMEWORK FOR MODELING PERSUASIVE TECHNOLOGIES BASED ON THE FOGG BEHAVIOR MODEL	1929
<i>Fernando Pereira De Toledo ; Sam Devincenzi ; Viviani Kwecko ; Fernanda Pinto Mota ; Silvia Silva Da Costa Botelho</i>	
COMPARISON OF LIVE, LATE AND ARCHIVED MODE LEARNER BEHAVIOR IN AN ADVANCED ENGINEERING MOOC	1934
<i>Kerrie Douglas ; Harsh Aggarwal ; Taylor V. Williams ; Yichen Fan ; Peter Bermel</i>	
CAN VIRTUAL REALITY ENHANCE LEARNING: A CASE STUDY IN MATERIALS SCIENCE	1941
<i>Veronica Caro ; Brandon Carter ; Sahil Dagli ; Mark Schissler ; Joanna Millunchick</i>	
THE DISSERTATION INSTITUTE : EVALUATION OF A DOCTORAL STUDENT WRITING WORKSHOP	1945
<i>Juan M. Cruz ; Mayra S. Artiles ; Gwen Lee-Tomas ; Holly M. Matusovich ; Stephanie G. Adams</i>	
WHAT SOFTWARE ENGINEERING "BEST PRACTICES" ARE WE TEACHING STUDENTS - A SYSTEMATIC LITERATURE REVIEW	1952
<i>Maira Marques ; Javier Robledo</i>	
K-12 CYBERSECURITY EDUCATION, RESEARCH, AND OUTREACH	1960
<i>Giti Javidi ; Ehsan Sheybani</i>	
PROMOTING STUDENTS' SOCIAL INTERACTIONS RESULTS IN AN IMPROVEMENT IN PERFORMANCE, CLASS ATTENDANCE AND RETENTION IN FIRST YEAR COMPUTING COURSES	1965
<i>Candido Cabo ; Ashwin Satyanarayana</i>	
SECURE MODULES FOR UNDERGRADUATE SOFTWARE ENGINEERING COURSES	1973
<i>Jeong Yang ; Akhtar Lodgher ; Young Lee</i>	
TEENAGERS NEED TO AWARE THEIR PERSONAL RESPONSIBILITY IN INTERNET SOCIETY: OUR APPROACH IN INFORMATION ENTRANCE COURSE	1978
<i>Yuanxin Ouyang ; Shanbo Cui ; Yue Qu ; Shiyuan Xiao ; Wenge Rong ; Zhang Xiong</i>	
WIP: TESTING AN INTEGRATED FRAMEWORK OF MOTIVATION AND IDENTITY IN A DOCTORAL ENGINEERING CONTEXT	1983
<i>Marissa A. Tsugawa-Nieves ; Heather Perkins ; Cheryl Cass ; Adam Kirn</i>	
ONLINE MACHINE LEARNING EXPERIMENTS IN HTML5	1988
<i>Abhinav Dixit ; Uday Shankar Shanthamallu ; Andreas Spanias ; Visar Berisha ; Mahesh Banavar</i>	
THE CONSTANTLY EVOLVING FRESHMAN ENGINEERING COURSE: THE CASE OF THE DUALSHOCK4 GAME CONTROLLER TO INCREASE ENGAGEMENT WITH LABORATORY EXERCISES FOR AN INTRODUCTORY PROBLEM SOLVING COURSE	1993
<i>Julie. A. Rursch ; Paul Pfister ; Andy Luse ; Tyler Tran</i>	
A CLOSER LOOK AT CAMPUS-COMMUNITY PARTNERSHIPS IN ENGINEERING EDUCATION.....	2000
<i>Eric Reynolds Brubaker ; Marsie Trego ; Kofi Taha ; Sheri D. Sheppard</i>	
REDESIGNING A COMPUTER SCIENCE CAPSTONE COURSE WITH MICRO-CREDENTIALS	2005
<i>Yang Song</i>	
PERSONALIZING COMPUTER SCIENCE EDUCATION BY LEVERAGING MULTIMODAL LEARNING ANALYTICS	2010
<i>David Azcona ; I-Han Hsiao ; Alan F. Smeaton</i>	
INTEGRATION OF AN ELECTRICAL ENGINEERING CAPSTONE COURSE WITH SOCIAL JUSTICE AND GLOBAL STUDIES	2019
<i>David Wahlgren Parent ; Patricia Backer</i>	

DOCTORAL DEGREE COMPLETION: BLACK WOMEN AND THE ROLE OF FACULTY	2026
<i>Cathy D. Howell</i>	
CHALLENGES IN DESIGNING A MENTORSHIP PROGRAM FOR ELECTRICAL ENGINEERING FRESHMEN	2034
<i>Branimir Pejcinovic ; Melinda Holtzman</i>	
THE THINKING LINE	2039
<i>Reiner Martens</i>	
GRASSROOTS TEAMS FOR ACADEMIC DEPARTMENTS: A NEW WAY TO UNDERSTAND CULTURE AND CHANGE.....	2048
<i>Edward Berger ; Elizabeth Wirtz ; Angela Goldenstein ; Edward Morrison ; Elizabeth Briody</i>	
COLLABORATIVE SURVEY CONSTRUCTION FOR NATIONAL DATA COLLECTION: COORDINATION, NEGOTIATION, AND DELIVERY	2056
<i>Edward Berger ; Allison Godwin ; Matthew Scheidt ; John Chen ; Ryan Senkpeil ; Julianna Ge ; Jim Widmann ; Brian Self ; Ann Gates</i>	
CAN ADDING DISCUSSION-ONLY ACTIVE LEARNING INCREASE STUDENT LEARNING IN MATERIALS SCIENCE CLASS?.....	2063
<i>Amir Saeidi ; Adrienne Williams ; Natascha Buswell ; Daniel Mumm ; Kameryn Denaro</i>	
DEVELOPMENT OF A PLACEMENT EXAM TO INCREASE STUDENT SUCCESS IN A JUNIOR LEVEL CIRCUITS AND SYSTEMS CLASS	2067
<i>David W. Parent</i>	
A CURRICULUM DESIGN ON ELECTRONIC DEVICES DESIGN LABORATORY.....	2073
<i>Shabnam Ghotbi ; Seyedali Ghahari</i>	
MOOCS ON THE CONTEXT OF SOFTWARE ENGINEERING TEACHING AND TRAINING: TRENDS AND CHALLENGES	2078
<i>Jorge Marques Prates ; Rogério Eduardo Garcia ; José Carlos Maldonado</i>	
WITHIN-GROUP DIFFERENCES OF ENGINEERING IDENTITY FOR LATINX ENGINEERING STUDENTS.....	2087
<i>Renata A. Revelo ; Nikolay Stepin</i>	
WIP: IMPLEMENTING PROJECT BASED LEARNING: SOME CHALLENGES FROM A REQUIREMENTS ENGINEERING PERSPECTIVE	2092
<i>Joshua C. Nwokeji ; Faisal Aqlan ; Ayodele Olagunju ; Terry Holmes ; Nkeiruka C. Okolie</i>	
APPLYING PRODUCT MANUFACTURING TECHNIQUES TO TEACH DATA ANALYTICS IN INDUSTRIAL ENGINEERING: A PROJECT BASED LEARNING EXPERIENCE.....	2097
<i>Faisal Aqlan ; Joshua C. Nwokeji</i>	
STUDENT ACHIEVEMENT GOALS IN THE SIGNALS AND SYSTEMS COURSE.....	2104
<i>Daria Gerasimova ; Jill K. Nelson ; Margret Hjalmanson</i>	
REIMAGINING AND EMPOWERING THE DESIGN OF PROJECTS: A PROJECT-BASED LEARNING GOALS FRAMEWORK	2109
<i>Jonathan D. Stolk ; Robert Martello</i>	
WIP: FACTORS AFFECTING GRADUATE STEM STUDENT ATTRITION RATES	2118
<i>Derrick J. Satterfield ; Marissa Tsugawa-Nieves ; Adam N. Kirn</i>	
INTEGRATING A DIGITAL TEXTBOOK INTO A STATICS COURSE.....	2122
<i>Thalia Anagnos ; Sheri D. Sheppard ; Sarah L. Billington</i>	
A PBL-BASED, INTEGRATED LEARNING EXPERIENCE OF OBJECT-ORIENTED PROGRAMMING, DATA STRUCTURES AND SOFTWARE DESIGN	2127
<i>Ayala L. Ribeiro ; Roberto A. Bittencourt</i>	
APPLYING INNOVATIVE FRAMEWORKS TO FOSTER INCLUSIVE LEARNING IN ENGINEERING STUDENTS	2136
<i>Wendy Newstetter ; Mahauganee D. Bonds ; Julie R. Ancis ; Joseph M. Le Doux ; Chris C. Martin</i>	
THE INFLUENCE PARENT SOCIALIZATION AND SCHOOL ENVIRONMENT HAS ON AFRICAN-AMERICAN ADOLESCENT MALES' MATHEMATICS SELF-EFFICACY AND ENGINEERING CAREER TRAJECTORY	2140
<i>David L. Barnes ; Odis Johnson</i>	
PERSONALIZING PERSUASIVE EDUCATIONAL TECHNOLOGIES TO LEARNERS' COGNITIVE ABILITY	2147
<i>Aisha Muhammad Abdullahi ; Rita Orji ; Joshua C. Nwokeji</i>	
TOWARDS INNOVATIVE TEACHING WITH EDUCATIONAL PERSUASIVE INTERFACES	2156
<i>Raquel Machado Leite ; Regina Barwaldt ; Danúbia Bueno Espíndola ; Marcelo Pias</i>	
EFFECTS OF PROFESSIONAL DEVELOPMENT ON PROGRAMMING KNOWLEDGE AND SELF-EFFICACY	2164
<i>Yolanda J. Reimer ; Michael Coe ; Lisa M. Blank ; Jeffrey Braun</i>	

A SURVEY ON GRADUATES' CURRICULUM-BASED KNOWLEDGE GAPS IN SOFTWARE TESTING	2172
<i>Lilian P. Scatalon ; Maria Lydia Fioravanti ; Jorge M. Prates ; Rogério E. Garcia ; Ellen F. Barbosa</i>	
NON-TRADITIONAL NOVICES' PERCEPTIONS OF LEARNING TO PROGRAM: A FRAMEWORK OF DEVELOPING MENTAL MODELS	2180
<i>Thomas Hvid Spangsberg ; Sally Fincher ; Sebastian Dziallas</i>	
COMPARING ENGINEERING LEADERSHIP CURRICULA IN CANADA AND THE UNITED STATES: THE ROLE OF EXTERNAL AND INTERNAL INFLUENCES	2187
<i>John Donald ; Mike Klassen</i>	
STEM LANGUAGE CAN BE THE STEM OF THE PROBLEM	2196
<i>Michael. S. Rugh ; Julia E. Calabrese ; Mykala A. Madson ; Robert M. Capraro ; Luciana R. Barroso ; Mary M. Capraro ; Ali Bicer</i>	
IMPROVING STUDENT LEARNING PERFORMANCE IN A VIRTUAL HANDS-ON LAB SYSTEM IN CYBERSECURITY EDUCATION	2203
<i>Zhen Zeng ; Yuli Deng ; Ihan Hsiao ; Dijiang Huang ; Chun-Jen Chung</i>	
RELIABILITY OF A CONCEPT INVENTORY TO DETERMINE THE LEVEL OF STUDENTS IN STATICS	2208
<i>Carlos Andrés Restrepo García ; Jaime Leonardo Barbosa Pérez ; Jorge Luis Restrepo Ochoa</i>	
SILICON VALLEY WOMEN IN ENGINEERING CONFERENCE — CREATING COMMUNITY AND NURTURING ENGINEERING IDENTITY	2213
<i>Belle Wei ; Amy Strage ; Jinny Rhee</i>	
EXPLORING PEDAGOGICAL RISK-TAKING OF ENGINEERING FACULTY	2217
<i>Michael S Sheppard ; Nadia Kellam ; Adam R Carberry</i>	
DESIGNING A VISUOHAPTIC SIMULATION TO PROMOTE GRAPHICAL REPRESENTATIONS AND CONCEPTUAL UNDERSTANDING OF STRUCTURAL ANALYSIS	2222
<i>Yoselyn Walsh ; Alejandra J. Magana ; Jenny Quintana ; Vojtech Krs ; Genisson Coutinho ; Edward Berger ; Ida B. Ngambeki ; Eddy Efendy ; Bedrich Benes</i>	
THE IMPACT OF INTEGRATED TUTORIALS IN SUPPORTING FIRST YEAR STUDENT PROGRESSION IN ENGINEERING	2229
<i>Howard Lukefahr ; Dale A. Carnegie ; Craig A. Watterson</i>	
ENGINEERING EDUCATION IN SPAIN: HAS IT IMPROVED WITH THE BOLOGNA PROCESS?	2237
<i>Martín Llamas ; Fernando A. Mikic ; Manuel Caeiro ; Inmaculada Plaza ; Edmundo Tovar ; Manuel Castro</i>	
CORRELATION BETWEEN PROCEDURAL AND CONCEPTUAL TEST IN A STATICS COURSE	2245
<i>Carlos Andrés Restrepo García ; Jaime Leonardo Barbosa Pérez ; Jorge Luis Restrepo Ochoa</i>	
THE IMPACT OF ADDING AN INTERACTIVE TEXTBOOK ON STUDENT PERFORMANCE AND SATISFACTION IN A FRESHMAN INTRODUCTION TO PROGRAMMING COURSE	2250
<i>Susan C. Schneider ; Chandana Tamma ; Chris Perez</i>	
EFFECTIVENESS OF PEER INSTRUCTION IN A LINEAR ALGEBRA CLASS WITHIN AN ENGINEERING CURRICULUM	2255
<i>Katiuscia C. B. Teixeira ; Eduardo V. O. Teixeira ; Thomaz E. V. Silva ; João C. M. Mota ; Natália C. Barroso</i>	
PROACTIVE BEHAVIORS IN ENGINEERING: THE ROLE OF PRE-COLLEGE CHARACTERISTICS, RESOURCES, AND EXPERIENCES	2262
<i>Trevion S. Henderson ; Emma Brennan-Wydra ; Cynthia J. Finelli ; Joanna M. Millunchick</i>	
ANALYZING THE IMPACT OF LEADERBOARDS IN INTRODUCTORY PROGRAMMING COURSES' SHORT-LENGTH ACTIVITIES	2270
<i>Rafael G. De Pontes ; Kláudio H. M. Medeiros ; Dalton D. S. Guerrero ; Jorge C. A. De Figueiredo</i>	
MEASURING TEAM MEMBERS' CONTRIBUTIONS IN SOFTWARE ENGINEERING PROJECTS USING GIT-DRIVEN TECHNOLOGY	2279
<i>Reza M. Parizi ; Paola Spoletini ; Amritraj Singh</i>	
BIAS-AWARE GUIDELINES AND FAIRNESS-PRESERVING TAXONOMY IN SOFTWARE ENGINEERING EDUCATION	2284
<i>Paola Spoletini ; Reza M. Parizi</i>	
“PARTICIPATING UNDER THE INFLUENCE”: HOW ROLE MODELS AFFECT THE COMPUTING DISCIPLINE, PROFESSION, AND STUDENT POPULATION	2288
<i>Virginia Grande ; Anne-Kathrin Peters ; Mats Daniels ; Matti Tedre</i>	
MOBILE APPS FOR INCORPORATING SCIENCE AND ENGINEERING PRACTICES IN K-12 STEM LABS	2297
<i>Seema Rivera ; Mahesh K. Banavar ; Dana Barry</i>	
COLLABORATIVE LEARNING IN CLOUD-BASED VIRTUAL COMPUTER LABS	2302
<i>Xiaolin Hu ; Hai Le ; Anu G. Bourgeois ; Yi Pan</i>	

A REVIEW OF LITERATURE ON CONNECTIONS BETWEEN ENGINEERING EDUCATION AND COGNITIVE DEVELOPMENT IN K-12 STUDENTS	2307
<i>Joshua García Sheridan</i>	
USING AWARENESS INFORMATION TO ENHANCE ONLINE DISCUSSION FORUMS: A SYSTEMATIC MAPPING STUDY	2316
<i>Dhanielly Paulina R. De Lima ; Marco A. Gerosa ; José Francisco De Magalhães Netto</i>	
INTRODUCING MACHINE LEARNING TO FIRST-YEAR UNDERGRADUATE ENGINEERING STUDENTS THROUGH AN AUTHENTIC AND ACTIVE LEARNING LABWARE	2325
<i>Lei Huang ; Kuo-Sheng Ma</i>	
ENGAGING CS1 STUDENTS WITH PROJECT BASED LEARNING	2329
<i>Michael Cassens ; Yolanda Reimer</i>	
HELPING STUDENTS GET MORE THAN THEIR MONEY FROM AN ENGINEERING SCHOLARSHIP PROGRAM	2334
<i>Thalia Anagnos ; Eva Schiorring</i>	
AN INNOVATIVE MODULAR APPROACH OF TEACHING CYBER SECURITY ACROSS COMPUTING CURRICULA.....	2339
<i>Akhtar Lodgher ; Jeong Yang ; Ummugul Bulut</i>	
LEARNERS' NEEDS SATISFACTION, CLASSROOM CLIMATE, AND SITUATIONAL MOTIVATIONS: EVALUATING SELF-DETERMINATION THEORY IN AN ENGINEERING CONTEXT	2344
<i>Jonathan D Stolk ; Jonathan Jacobs ; Camille Girard ; Lauren Pudvan</i>	
SOFTWARE DEFINED RADIO FOR COMMUNICATIONS	2349
<i>Ladimer S. Nagurney</i>	
DESIGN OF A TECHNOLOGY-ENHANCED PEDAGOGICAL FRAMEWORK FOR A SYSTEMS AND NETWORKING ADMINISTRATION COURSE INCORPORATING A VIRTUAL LABORATORY.....	2357
<i>Rukshan Athauda ; Tareq Alkhalidi ; Ilung Pranata ; Daniel Conway ; Charles Frank ; William Thorne ; Ryan Dean</i>	
A CONTEXTUALIZED, EXPERIENTIAL LEARNING APPROACH TO QUANTITATIVE ENGINEERING ANALYSIS	2362
<i>Siddhantan Govindasamy ; Rebecca Christianson ; John Geddes ; Christopher Lee ; Samantha Michalka ; Paul Ruvolo ; Mark Somerville ; Alexandra Coso Strong</i>	
AN EXPERIENCE REPORT ON THE USE OF EXPERIENCE MAPS AND SKETCHES IN A DATABASE COURSE PROJECT	2367
<i>Alexandra Martínez</i>	
WHAT MATTERS TO MY FUTURE: STEM INT-HER-EST AND EXPECTATIONS.....	2376
<i>Katherine N Vela ; Ali Bicer ; Robert M Capraro ; Luciana R. Barroso ; Cassidy Caldwell</i>	
AN EXPLORATION OF UNLEARNING OF PRACTICING CIVIL ENGINEERS.....	2383
<i>Oai Ha ; Shane Brown</i>	
FOSTERING HOLISTIC COMPETENCIES, GLOBAL CITIZENSHIP, AND INNOVATION IN ENGINEERING STUDENTS THROUGH COMMUNITY OUTREACH TO DISADVANTAGED USER GROUPS.....	2387
<i>Rosanna Yuen-Yan Chan ; Vincent Yu Hang Choy ; Cecilia Ka Yuk Chan</i>	
EXPLORING GAME ELEMENTS IN LEARNING PROGRAMMING: AN EMPIRICAL EVALUATION	2392
<i>Adriano Lages Dos Santos ; Maurício R. De A. Souza ; Marcella Dayrell ; Eduardo Figueiredo</i>	
EXAMINING THE VALUE OF MENTORING IN YOUTH ENGINEERING PROGRAMS: WHAT MOTIVATES A MENTOR TO MENTOR?.....	2401
<i>Racheida S. Lewis ; Cherie Edwards ; Walter C. Lee ; David Knight ; Kayla Maxey ; Jessica Rush Leeker ; Monica E. Cardella ; Morgan M. Hynes</i>	
GAMES AND GAMIFICATION IN SOFTWARE ENGINEERING EDUCATION: A SURVEY WITH EDUCATORS.....	2407
<i>Pedro Rodrigues ; Mauricio Souza ; Eduardo Figueiredo</i>	
LOST FOR WORDS! DEFINING THE LANGUAGE AROUND ROLE MODELS IN ENGINEERING EDUCATION	2416
<i>Virginia Grande</i>	
MULTIPLE REPRESENTATIONS IN PHYSICS: DELIBERATE PRACTICE DOES NOT IMPROVE EXAM SCORES.....	2425
<i>Campbell R. Bego ; Ramond J. Chastain ; Lacey M. Pyles ; Marci S. Decaro</i>	
ADDRESSING TECHNICAL AND ORGANIZATIONAL PITFALLS OF USING REMOTE LABORATORIES IN A COMMERCIAL ENVIRONMENT.....	2432
<i>Pablo Orduña ; Luis Rodriguez-Gil ; Ignacio Angulo ; Gabriel Martinez ; Aitor Villar ; Unai Hernandez ; Paola Buitrago ; Raúl Camacho ; Paola Marmolejo ; Javier Garcia-Zubia</i>	

A MULTIDIMENSIONAL ELO MODEL FOR MATCHING LEARNING OBJECTS.....	2439
<i>André Prisco ; Rafael Penna ; Evandro Junior ; Silvia Botelho ; Neilor Tonin ; Jean Bez</i>	
ASSESSING STUDENTS' MATHEMATICAL CHALLENGES IN AN INTRODUCTION TO SIGNAL PROCESSING COURSE AND THE EFFECTS OF COOPERATIVE LEARNING	2448
<i>Marisel Villafañe-Delgado ; Ramakrishna Mukkamala</i>	
A COMPARISON OF LECTURE-BASED AND ACTIVE LEARNING DESIGN PATTERNS IN CS EDUCATION.....	2455
<i>Nasrin Dehbozorgi ; Stephen Macneil ; Mary Lou Maher ; Mohsen Dorodchi</i>	
ALTERNATE-UNIVERSE FIE: AN ENGINEERING EDUCATION CONFERENCE SESSION FROM A WORLD WHERE THE MAJORITY OF ENGINEERS ARE DEAF	2463
<i>Mel Chua ; Ian Smith ; Samir Jain</i>	
EFFECTIVELY TRANSFORMING STUDENTS THROUGH FIRST YEAR ENGINEERING STUDENT EXPERIENCES	2465
<i>Noe Vargas Hernandez ; Arturo Fuentes ; Stephen Crown</i>	
APPLYING MACHINE LEARNING TECHNIQUES TO IDENTIFY THE INFLUENTIAL FACTORS OF STUDENTS' ABILITIES TO APPLY STATISTICS MATHEMATICS AND ENGINEERING KNOWLEDGE.....	2470
<i>Wen Cheng ; Gurdiljot Gill</i>	
SUBJECT CORRELATION ANALYSIS IN THE FUNDAMENTALS OF ENGINEERING EXAMS	2475
<i>Wen Cheng ; Gurdiljot Gill</i>	
A COMPARISON OF FLIPPED PROGRAMMING CLASSROOM MODELS – RESULTS BY GENDER AND MAJOR.....	2480
<i>Benjamin Tyler ; Aigerim Yessenbayeva</i>	
THE USE OF A MECHATRONIC SYSTEMS SIMULATOR IN ENGINEERING COURSES	2485
<i>Rafael Da Silva Mendonça ; André Luiz Duarte Cavalcante ; Nasser Jazdi ; Vicente Ferreira De Lucena</i>	
ASSISTING EDUCATION THROUGH REAL-TIME LEARNER ANALYTICS.....	2490
<i>Matthew Montebello</i>	
SURVEY ON PEDAGOGICAL RESOURCES RECOMMENDATION USING COGNITIVE COMPUTING SYSTEMS	2497
<i>Gabriel De Souza Leitão ; Eduardo Bezerra Valentin ; Elaine Harada Teixeira De Oliveira ; Raimundo Da Silva Barreto</i>	
SYSTEMATIC COURSE ANALYSIS – HOW INFRASTRUCTURE AND RESEARCH FINDINGS COLLABORATE TO SUPPORT COURSE DEVELOPMENT.....	2504
<i>Ida Naimi-Akbar ; Hans Havtun ; Sara Nyberg</i>	
PLANNING PBL IN COMPUTING EDUCATION AN APPROACH BASED ON A COLLABORATIVE TOOLKIT	2509
<i>Alexandre Gustavo H. S. ; Simone C. Santos</i>	
DESIGN AND IMPLEMENTATION OF AN ACTIVITY-BASED INTRODUCTORY COMPUTER SCIENCE COURSE (CS1) WITH PERIODIC REFLECTIONS VALIDATED BY LEARNING ANALYTICS.....	2518
<i>Mohsen Dorodchi ; Aileen Benedict ; Devansh Desai ; Mohammad Javad Mahzoon ; Stephen Macneil ; Nasrin Dehbozorgi</i>	
ENGINEERS' IMAGINARIES OF “THE PUBLIC”: CONTENT ANALYSIS OF READER REACTIONS TO AN ENVIRONMENTAL INJUSTICE CONTROVERSY	2526
<i>Nathan Canney ; Yanna Lambrinidou</i>	
ENGINEERING AND INFORMATICS STUDENT MULTIDISCIPLINARY LEARNING USING 3D VISUALIZATION AND 3D DISPLAY OF RADIO FREQUENCY (RF) CONCEPTS	2533
<i>Lauren Christopher ; Albert William ; Anusha S. Rao ; Ashley Dale ; Anthony Chase ; Mihir Piyush Joshi ; Wendy Krogg ; Bree Abernathy</i>	
GLOSSARY OF COMPUTATIONAL TERMS AS A STIMULUS TO PROGRAMMING LOGIC: A CASE STUDY WITH DEAF STUDENTS	2538
<i>Rafael Pinto Granada ; Regina Barwaldt ; Danbia Bueno Espíndola</i>	
INVESTIGATING MORAL DISENGAGEMENT AMONG FIRST-YEAR ENGINEERING STUDENTS.....	2545
<i>Dayoung Kim ; Peter W. Odom ; Carla B. Zoltowski ; Brent K. Jesiek</i>	
PROJECT-BASED LEARNING IN DIGITAL FUNDAMENTALS COURSE USING FPGAS	2552
<i>Dingjuan Chua ; Jieyi Gao ; Massimo Alioto ; Yong-Ping Xu ; Sangit Sasidhar</i>	
STUDENT AND FACULTY PERSPECTIVES ON EFFECTIVENESS OF AN INTERDISCIPLINARY GRADUATE ENGINEERING PROGRAM	2557
<i>Courtney Lavadia ; Chi-Ning Chang ; Debra Fowler</i>	

A PILOT STUDY INTEGRATING AN AI-DRIVEN CHATBOT IN AN INTRODUCTORY PROGRAMMING COURSE	2564
<i>Matthew Verleger ; James Pembridge</i>	
PEER-FORMULATED ASSIGNMENT METHOD FOR EXPERIMENTAL PROJECTS IN CS COURSES	2568
<i>Xin Zhang ; Libo Huang ; Zhiying Wang ; Qi Yu</i>	
SPECIAL SESSION: DEVELOPING AN EFFECTIVE PROPAGATION PLAN FOR EDUCATIONAL INNOVATIONS	2576
<i>Jeffrey E. Froyd</i>	
TURTLEMCU: A PLATFORM FOR TEACHING A HOLISTIC VIEW INTO EMBEDDED COMPUTER ARCHITECTURE AND SECURITY	2580
<i>Nathaniel Graff</i>	
EEG MARKERS OF STEM LEARNING	2585
<i>Xiaodong Qu ; Yixin Sun ; Robert Sekuler ; Timothy Hickey</i>	
AUGMENTING THE TEACHER'S PERSPECTIVE ON PROGRAMMING STUDENT'S PERFORMANCE VIA PERMANENT MONITORING	2594
<i>Nuno Gil Fonseca ; Luís Macedo ; Maria José Marcelino ; António José Mendes</i>	
TOOLS FOR THE 3CS OF ENTREPRENEURIAL MINDED LEARNING (EML).....	2603
<i>Heath J. Leblanc ; Kundan Nepal ; Greg S. Mowry ; Alan Cheville</i>	
SUPPLEMENTAL INSTRUCTION IN A FIRST-YEAR ENGINEERING COURSE: A STUDY FROM THE LEARNING WITH ACADEMIC PARTNERS (LEAP) PROGRAM.....	2606
<i>Amber Kempainen ; Amy Hamlin ; Nathan Manser</i>	
INTRODUCING GLOBAL COMPETENCE IN SWEDISH ENGINEERING EDUCATION	2612
<i>Björn Kjellgren ; Elizabeth Keller</i>	
DEEPENING E-LEARNING THROUGH SOCIAL-COLLABORATIVE INTELLIGENCE.....	2617
<i>Matthew Montebello ; Bill Cope ; Mary Kalantzis ; Tabassum Amina ; Duane Sears Smith ; Anastasia Tzirides ; Samaa Haniya</i>	
CAN BUILDING AN ELECTRIC BICYCLE BUILD AN ENGINEERING IDENTITY?	2621
<i>Aamir Fidai ; Luciana R. Barroso ; Mary M. Capraro ; Robert M. Capraro</i>	
EVALUATING THE USE OF GAMIFICATION IN MATHEMATICS LEARNING IN PRIMARY SCHOOL CHILDREN.....	2626
<i>Geovania Cezana Araujo Cunha ; Luciana Pelissari Barraqui ; Sergio Antonio Andrade De Freitas</i>	
EXPLORING ALIGNMENT BETWEEN ENGINEERING STUDENTS' JOB PLANS AND POST-GRADUATION OUTCOMES	2630
<i>Lenard Rüde ; Angela Harris ; Shannon Gilmartin ; Sheri Sheppard</i>	
MACHINE LEARNING BASED DIRECTED SELF STUDY IN CALCULUS WITH CALCTUTOR	2639
<i>Kristian Kime ; Timothy Hickey ; Rebecca Torrey</i>	
UNDERSTANDING STUDENTS' ONLINE REVIEWS TO IMPROVE COLLEGE EXPERIENCE AND GRADUATION RATES OF STEM PROGRAMS AT THE LARGEST POST-SECONDARY INSTITUTION: A LEARNER-CENTERED STUDY	2644
<i>Killian Muollo ; Prateek Basavaraj ; Ivan Garibay</i>	
PANEL ON SERVICE-LEARNING PRACTITIONERS NAVIGATING PARTNERSHIPS, RESEARCH, AND FUNDING	2651
<i>Julia Thompson ; James Huff ; Andrew Peirce</i>	
ENGINEERING IDENTITIES OF CHEMICAL AND INDUSTRIAL MAJORS AFTER STUDENTS' FIRST YEAR	2653
<i>Jacqueline C. Mcneil ; Erin L. Gerber ; Gerold Willing ; Mary Mills</i>	
PANEL: INTEGRATING REQUIREMENTS ENGINEERING EDUCATION INTO CORE ENGINEERING DISCIPLINES	2658
<i>Joshua Nwokeji ; Faisal Aqlan ; Jorge Martinez ; Terry Holmes ; Stephen Frezza ; Rita Orji</i>	
USING NEUROEDUCATION METHODS TO COMPARE ENGINEERING STUDENT PERFORMANCE ON LINEAR AND SYSTEMS TASKS.....	2661
<i>Elise Barrella ; Charles Cowan ; Justyn Girdner ; Robin Anderson ; Mary Katherine Watson</i>	
CLASSROOM ORCHESTRATION WITH PROBLEM SOLVING MARKOV MODELS.....	2665
<i>Fatima Abu Deeb ; Timothy Hickey</i>	
WRITING AN ENGINEERING EDUCATION PROPOSAL FOR THE NATIONAL SCIENCE FOUNDATION: AN INTERACTIVE WORKSHOP	2673
<i>Julie P. Martin ; Paige Smith ; Abby Ilumoka ; Heather Watson ; Alexandra Medina-Borja</i>	
INNOVATIVE THINKING: ENCOURAGING CREATIVE DIVERSITY WITH VIDEO SCENARIOS.....	2675
<i>Madalene Spezialetti</i>	

USING THE EXPERIENTIAL LEARNING MODEL TO INTRODUCE K-12 TEACHERS TO CONTROL SYSTEMS ENGINEERING	2679
<i>Mounir Ben Ghalia ; Miguel Ramirez ; Gordon Moore</i>	
PERSONALIZED LEARNING IN A VIRTUAL HANDS-ON LAB PLATFORM FOR COMPUTER SCIENCE EDUCATION	2686
<i>Yuli Deng ; Duo Lu ; Chun-Jen Chung ; Dijiang Huang ; Zhen Zeng</i>	
BUILDING A MUSIC PLAYER: TEACHING OPERATING SYSTEMS CONCEPTS VIA AN ARDUINO-POWERED MUSIC PLAYER	2694
<i>John Seng</i>	
CREATIVITY AND JOB TENSION IN EXPERIENTIAL LEARNING	2699
<i>Juan Pablo Román-Calderón ; Manuel Esteban Acevedo-Jaramillo ; Juan Esteban Escalante ; Alejandro Arias ; Sara Aguilar-Barrientos ; Jaime Barbosa</i>	
CAPSTONE SEMINAR: A ONE-CREDIT HOUR COURSE COVERING THE DESIGN PROCESS IMPLEMENTATION	2704
<i>Khalid S. Al-Olimat ; Firas Hassan</i>	
MAKERSPACE INVOLVEMENT AND ACADEMIC SUCCESS IN MECHANICAL ENGINEERING	2708
<i>Ethan C. Hilton ; Robert L. Nagel ; Julie S. Linsey</i>	
SMART BLOCKCHAIN BADGES FOR DATA SCIENCE EDUCATION	2713
<i>Alexander Mikroyannidis ; John Domingue ; Michelle Bachler ; Kevin Quick</i>	
A FRAMEWORK TO FOSTER DIVERSITY IN COLLABORATIVE ACTIVITIES	2718
<i>Leandro Luque ; Leônidas De Oliveira Brandão ; Anarosa Alves Franco Brandão</i>	
ANALYZING THE EFFECTS OF A FLIPPED CLASSROOM PEDAGOGY ON FRESHMEN AND SOPHOMORE STEM COURSES	2727
<i>Laura Sullivan-Green ; Patricia Ryaby Backer ; Andrew Hale Feinstein</i>	
THE STUDENT EXPERIENCE IN AN INTEGRATIVE, PROJECT-BASED COURSE ON QUANTITATIVE ENGINEERING ANALYSIS	2732
<i>Siddhantan Govindasamy ; Rebecca Christianson ; John Geddes</i>	
IDENTIFICATION OF PRE-UNIVERSITY FACTORS THAT AFFECT THE INITIAL MOTIVATION OF STUDENTS IN COMPUTING PROGRAMS: A MULTI-INSTITUTIONAL CASE STUDY	2735
<i>Pablo Schoeffel ; Raul Sidnei Wazlawick ; Vinicius Faria Culmant Ramos ; Adilson Vahldick ; Marcelo De Souza</i>	
XAPI-BASED MODEL FOR TRACKING ON-LINE LABORATORY APPLICATIONS	2743
<i>Luis Felipe Zapata-Rivera ; Maria M. Larrondo Petrie</i>	
WIP: INFLUENCE OF LABORATORY GROUP MAKEUP ON RECOGNITION AND IDENTITY DEVELOPMENT IN THE ENGINEERING GRADUATE STUDENT POPULATION	2752
<i>Heather Perkins ; Matthew Bahnson ; Marissa Tsugawa-Nieves ; Adam Kirn ; Cheryl Cass</i>	
STUDENT-MENTOR VIEWS ON INQUIRY-BASED LEARNING: A CHALLENGE FOR DESIGNING EFFECTIVE INQUIRY-BASED CLASSES WITH MENTORS	2756
<i>Neelam Prabhu Gaunkar ; Mani Mina</i>	
INFLUENCE OF RESEARCH EXPERIENCE ON RECOGNITION AND IDENTITY DEVELOPMENT IN THE ENGINEERING GRADUATE STUDENT POPULATION	2761
<i>Matthew Bahnson ; Heather Perkins ; Marissa Tsugawa ; Adam Kirn ; Cheryl Cass</i>	
LEGO MINDSTORMS EV3 FOR TEACHING THE BASICS OF TRAJECTORY CONTROL PROBLEMS	2765
<i>Aleksandr Kapitonov ; Evgeniy Antonov ; Kirill Artemov ; Dmitrii Dobriborsci ; Egor Zamotaev ; Aleksandr Karavaev ; Rami Al-Naim ; Oleg Souzdalev</i>	
MAKING IT FOR REAL: REDESIGN OF A FIRST-YEAR ENGINEERING PROJECT	2769
<i>Charlotte De Vries ; Qi Dunsworth</i>	
MULTIDISCIPLINARY TEACHING: THE EMERGENCE OF AN HOLISTIC STEM TEACHER	2774
<i>Niall Seery ; Lena Gumaelius ; Arnold Pears</i>	
INNOVATIVE APPROACH TO ONLINE ARGUMENTATION AND MODELS FOR STRUCTURING THE ARGUMENTS	2780
<i>Neelam Soundarajan ; Swaroop Joshi</i>	
EXTENDING ACADEMIC ANALYTICS TO ENGINEERING EDUCATION	2789
<i>Anthony M. Derocchis ; Ashley Michalenko ; Laura E. Boucheron ; Steven J. Stochaj</i>	
COURSEWARE AS CODE SETTING A NEW BAR FOR TRANSPARENCY AND COLLABORATION	2794
<i>Juliana Rodriguez ; Christopher Apsey ; Sarah Rees ; Todd Boudreau ; George Raileanu</i>	
RECLAIMING THE LARGE FOUNDATIONAL ENGINEERING CLASSROOM: INSTRUCTORS' NEEDS AND ASPIRATIONS	2798
<i>Michelle Soledad ; Homero Murzi ; Jacob R. Grohs ; David Knight ; Scott W. Case ; Natasha Smith</i>	

FACTORS MEDIATING LEARNING AND APPLICATION OF COMPUTATIONAL MODELING BY LIFE SCIENTISTS.....	2803
<i>Aasakiran Madamanchi ; Monica E. Cardella ; James A. Glazier ; David M. Umulis</i>	
INTRODUCTION TO COMPUTING: INTERDISCIPLINARY COURSE DESIGN	2808
<i>Vinitha Hannah Subburaj ; Anitha Sarah Subburaj ; Joseph E. Urban</i>	
SHIFT IN MID-YEAR ENGINEERING STUDENTS' PERCEPTIONS OF THEIR FUTURE CAREERS OVER TIME	2813
<i>Catherine D. Mcgough ; Marisa K. Orr ; Adam N. Kirn ; Lisa C. Benson</i>	
AN INITIAL ANALYSIS OF THE RESEARCH ON INTEREST AND INTRODUCTORY PROGRAMMING : A SYSTEMATIC REVIEW OF THIS LITERATURE	2820
<i>Pasqueline Dantas Scaico ; Alexandre Scaico ; Ruy José Barretto De Queiroz</i>	
FIE 2018: BUILDING ON THE PAST, CREATING THE FUTURE WHERE ARE THE NEW FRONTIERS?	2829
<i>Larry G. Richards ; Larry J. Shuman ; Karl A. Smith</i>	
A SMALL NETWORK SIMULATOR FOR LEARNING ROUTING FUNDAMENTALS	2831
<i>Miguel Bazdresch</i>	
A POSITIVE PERSPECTIVE TO IMPLEMENTATION OF A GENDER EQUALITY PLAN: A QUESTION OF DESIGN, TIME AND PARTICIPATION	2838
<i>Barros Victor F. A. ; Rosa M. Vasconcelos ; Emilia Araújo ; Luis Amaral ; Isabel Ramos</i>	
COMPUTING FOR THE CRITTERS: EXPLORING COMPUTATIONAL THINKING OF CHILDREN IN AN INFORMAL LEARNING SETTING.....	2843
<i>Hoda Ehsan ; Carson Ohland ; Tikyna Dandridge ; Monica Cardella</i>	
INSTRUCTOR VS PEER WRITING FEEDBACK IN A LARGE FIRST-YEAR ENGINEERING COURSE	2848
<i>Mike Ekoniak ; Marie C. Paretti</i>	
WORK EXPERIENCES OF ENGINEERING MANAGERS: CHALLENGES, STRATEGIES, COMPETENCIES.....	2856
<i>Swetha Nittala ; Brent K. Jesiek</i>	
AUGMENTING EXPERIENTIAL LEARNING WITH A GAME-BASED STUDENT RESPONSE SYSTEM.....	2860
<i>Sangit Sasidhar ; Arrchana Muruganantham ; Wee-Seng Soh ; Yuen Jien Soo ; Colin Tan ; Ravi Suppiah</i>	
EDUCATIONAL NANOTECHNOLOGY VIDEO GAME TO INSPIRE MIDDLE AND HIGH SCHOOL STUDENTS TO PURSUE STEM RELATED PROFESSIONAL CAREERS.....	2866
<i>Sujeily Fonseca ; Samuel González ; Brian Rodríguez ; Melody Seda ; Jorge Bobonis ; Alberto Canela ; Chaliana Rolón ; Josean Bosque ; Lexdyel Méndez ; Annamary Cartagena ; Tahiri Fuentes ; Nayda G. Santiago ; Ana Nieves</i>	
CONTENT ANALYSIS OF STUDENT ASSESSMENT EXAMS	2871
<i>Priscila Da Silva Neves Lima ; Ana Paula Laboissière Ambrósio ; Igor Moreira Félix ; Jacques Duílio Brancher ; Deller James Ferreira</i>	
BASIC PSYCHOLOGICAL NEED FULFILLMENT BY GENDER IN TEAM ENVIRONMENTS.....	2880
<i>Emily Miller ; Reid Bailey</i>	
ENGINEERING TEACHERS' APPROACHES TO DESIGN AND DELIVER INCLUSIVE TEACHING IN FLEXIBLE LEARNING SPACES.....	2885
<i>Linda Barman ; Ida Naimi-Akbar ; Cormac Mcgrath ; Maria Weurlander</i>	
TEXT CLASSIFICATION OF STUDENT PREDICATE USE FOR AUTOMATIC MISCONCEPTION CATEGORIZATION.....	2890
<i>Brian A. Landrón-Rivera ; Nayda G. Santiago ; Aidsa Santiago ; J. Fernando Vega-Riveros</i>	
GENDERED INFLUENCES ON PEER ASSESSMENTS OF TEAM BEHAVIOR.....	2898
<i>Emily Miller ; Reid Bailey</i>	
ENGINEERING GENDER IDENTITIES OF WOMEN IN A SERVICE-LEARNING CONTEXT	2907
<i>Danielle Corple ; Megan Kenny Feister ; Carla B. Zoltowski ; Patrice M. Buzzanell</i>	
IMPROVING SOFTWARE TESTING EDUCATION VIA INDUSTRY SPONSORED CONTESTS.....	2912
<i>W. Eric Wong ; Linghuan Hu ; Haoliang Wang ; Zhenyu Chen</i>	
EXPLORING DIVERSITY AND INCLUSION IN THE PROFESSIONAL FORMATION OF ENGINEERS THROUGH DESIGN SESSIONS	2917
<i>Carla B. Zoltowski ; Sean M. Eddington ; Andrew O. Brightman ; Patrice M. Buzzanell ; Rucha Joshi</i>	
LECTURE VIDEO ANALYTICS AS AN INSTRUCTIONAL RESOURCE.....	2922
<i>Ryan Long ; Tayfun Tuna ; Jaspal Subhlok</i>	
A PRINCIPLED APPROACH TO USING MACHINE LEARNING IN QUALITATIVE EDUCATION RESEARCH.....	2929
<i>Alejandra J. Magana ; Mireille Boutin</i>	

EXPLORATION OF RELATIONSHIPS BETWEEN CONFORMITY TO MASCULINE SOCIAL NORMS AND DEMOGRAPHIC CHARACTERISTICS	2936
<i>Usenime M. Akpanudo ; James L. Huff ; Allison Godwin</i>	
ENCOURAGING WOMEN TO PURSUE A COMPUTER SCIENCE CAREER IN THE CONTEXT OF A THIRD WORLD COUNTRY	2942
<i>Ludymila Lobo De Aguiar Gomes ; José Reginaldo Hughes Carvalho ; Tanara Lauschner ; Fabilo G. Nakamura ; Rosiane De Freitas</i>	
QUALITATIVE FINDINGS FROM STUDY OF INTERDISCIPLINARY EDUCATION IN COMPUTATIONAL MODELING FOR LIFE SCIENCES STUDENT RESEARCHERS FROM EMERGING RESEARCH INSTITUTIONS	2947
<i>Aasakiran Madamanchi ; Shenika V. Poindexter ; Monica E. Cardella ; James A. Glazier ; David M. Umulis</i>	
LIBERATORY METHODOLOGIES: PARTICIPATORY ACTION RESEARCH STRATEGIES FOR DISCOVERING INCLUSIVE MAKER SPACE PRACTICES	2952
<i>Adam S. Masters ; Lisa D. McNair ; Donna M. Riley</i>	
VIRTUAL REALITY ACTIVITIES FOR TEACHING ENGINEERING STUDENTS PROFESSIONAL DEVELOPMENT SKILLS	2957
<i>Matthew E. Nelson ; Benjamin Ahn</i>	
VISUALIZATION SKILLS AND STUDENT SUCCESS IN ENGINEERING DISCIPLINES	2962
<i>Gareth Figgess ; Julie Fogarty</i>	
A NIFTY INTER-CLASS PEER LEARNING MODEL FOR ENHANCING STUDENT-CENTERED COMPUTING EDUCATION, AND FOR GENERATING STUDENT INTERESTS IN CO-CURRICULAR PROFESSIONAL DEVELOPMENT	2966
<i>Ankur Chattopadhyay ; Bobby Chindaphone</i>	
A FRAMEWORK FOR TEACHING EVALUATION	2971
<i>Divya Nalla</i>	
INTEGRATING SOCIAL SKILLS PRACTICE WITH COMPUTER PROGRAMMING FOR STUDENTS ON THE AUTISM SPECTRUM	2980
<i>Kurt Eiselt ; Paul Carter</i>	
EVALUATION OF INSTRUCTIONAL MODULE DEVELOPMENT SYSTEM	2985
<i>Vaishnavi Raj ; Preston Goulet ; Srividya Bansal</i>	
A CASE FOR THE STUDENT RESEARCHER: EXPANDING THE ROLE OF UNDERGRADUATE RESEARCH IN THE PROFESSIONAL FORMATION OF ENGINEERS	2994
<i>Kathryn M. Youngblood ; Julie R. Roseberry ; Aubree L. Van Winkle ; Nicola W. Sochacka ; Linda Vanusupa ; Carol J. Thurman ; Patrice A. Torcivia Prusko</i>	
ACTIVELY ENGAGE STUDENTS WITH DIVERSE BACKGROUND USING A MORE PERSONALIZED APPROACH	3003
<i>Jiaofei Zhong</i>	
WHY MAKE IT? UNDERSTANDING UNDERGRADUATE ENGINEERING STUDENTS' CONCEPTIONS FOR THE PURPOSE OF PROTOTYPING IN ENGINEERING DESIGN ACTIVITIES	3008
<i>Hadi Ali ; Micah Lande</i>	
ACADEMIC SYNERGY THROUGH INTEGRATED MECHATRONIC PROJECTS	3013
<i>Alejandro Velásquez-López ; Alberto Rodríguez-García</i>	
MEASURING COMMUTER STUDENT SUPPORT AND SUCCESS THROUGH ACADEMIC	3018
<i>Cory Brozina</i>	
LAUNCHPAD: THE DESIGN AND EVALUATION OF A STEM RECRUITMENT PROGRAM FOR WOMEN	3022
<i>Cheryl K. Dematteis ; Emily L. Allen ; Zilong Ye</i>	
EFFECTIVENESS OF REFLECTION ON PROGRAMMING PROBLEM SOLVING SELF-ASSESSMENTS	3030
<i>Mohammed Alzaid ; I-Han Hsiao</i>	
DEVELOPING A FRAMEWORK FOR COLLABORATIVE EDUCATIONAL CHANGE: A STUDY OF PEOPLE, PROCESSES, AND CULTURES	3035
<i>Tess Edmonds ; Jonathan Stolk</i>	
EDUCATIONAL CHANGE INITIATIVES: MISALIGNMENTS BETWEEN CHANGEMAKERS AND THEIR INSTITUTIONS	3040
<i>Jonathan D. Stolk ; Tess Edmonds</i>	
QUANTITATIVE EVALUATION OF STUDENT ENGAGEMENT IN A LARGE-SCALE INTRODUCTION TO PROGRAMMING COURSE USING A CLOUD-BASED AUTOMATIC GRADING SYSTEM	3045
<i>Narges Norouzi ; Ryan Hausen</i>	

AN ANALYTICAL APPROACH TO UNDERSTANDING UNDERREPRESENTED JUSTICE-INVOLVED YOUTH POTENTIAL IN STEM	3050
<i>Jamie Kennedy ; Jennica Janssen</i>	
REMOTE LABORATORY EXERCISES AND TUTORIALS FOR SPECTRUM-AGILE RADIO FREQUENCY SYSTEMS	3055
<i>Carl Dietrich ; Richard Goff ; Dimitri Dessources ; Xavier Gomez ; Joshua Garcia-Sheridan ; Nicholas Polys ; R. Michael Buehrer ; Seungmo Kim ; Vuk Marojevic ; Christian Hearn</i>	
TOPICAL CONCERNS AND CRITICAL QUESTIONS ENGINEERING STUDENTS WANT/NEED ANSWERS TO: DEPENDENCE ON KEY GROUPS	3057
<i>Armando A. Rodriguez ; Pragyan A. Pradhan ; Karan Puttannaiah ; Nirangkush Das ; Kaustav Mondal ; Aratrik Sarkar</i>	
EXAMINATION THE IMPACT OF VARIOUS FACTORS ON STUDENT SUCCESS IN AN INTRODUCTION TO CIRCUIT ANALYSIS COURSE	3066
<i>David W. Parent</i>	
A COMPREHENSIVE ACADEMIC SUCCESS AND PROFESSIONAL DEVELOPMENT (ASAP) FRAMEWORK THAT USES CAREER-STEERING/SHAPING PROJECTS TO TRAIN ENGINEERING STUDENTS AND DEVELOP CRITICAL LIFE/PROFESSIONAL SKILLS: PART I - IMPACT ON KEY GROUPS	3071
<i>Armando A. Rodriguez ; Pragyan A. Pradhan ; Karan Puttannaiah ; Nirangkush Das ; Kaustav Mondal ; Aratrik Sarkar</i>	
SOL Y AGUA: A GAME-BASED LEARNING PLATFORM TO ENGAGE MIDDLE-SCHOOL STUDENTS IN STEM	3080
<i>Monika Akbar ; Lucia Dura ; Ann Q. Gates ; Angel Ortega ; Mary K Roy ; Claudia Santiago ; Jesus G Tellez ; Elsa Villa</i>	
REFLECTIVE DESIGN PRACTICE: A NOVEL ASSESSMENT OF THE IMPACT OF DESIGN-BASED COURSES ON STUDENTS	3089
<i>Adam Royalty ; Helen Chen ; Sheri Sheppard</i>	
A COMPREHENSIVE ASAP FRAMEWORK THAT USES CAREER-STEERING/SHAPING PROJECTS TO TRAIN ENGINEERING STUDENTS & DEVELOP CRITICAL LIFE/PROFESSIONAL SKILLS : PART II – CASE STUDIES FROM STUDENTS WORKING ON FUNDED PROJECTS	3093
<i>Armando A. Rodriguez ; Pragyan A. Pradhan ; Karan Puttannaiah ; Nirangkush Das ; Kaustav Mondal ; Aratrik Sarkar ; Shubham Sonawani ; Shi Lu ; Kimberly Bui ; Charles Cederstrom ; Carolyn Christie ; Zakk Giacometti ; Corey Kurowski ; Nikki Lopez ; Bryce Pedroza ; Tanner Rosenthal ; Mohamed Sabet ; Bhavica Soni ; Trae Waggoner</i>	
VISUAL PROGRAMMING AND INTERACTIVE LEARNING BASED DYNAMIC INSTRUCTIONAL APPROACHES TO TEACH AN INTRODUCTORY PROGRAMMING COURSE	3102
<i>Md Mahmudur Rahman ; Roshan Paudel</i>	
EXAMINATION OF THE EFFECTIVENESS OF A CRITERIA-BASED TEAM FORMATION TOOL	3108
<i>Albatool A. Alamri ; Brian P. Bailey</i>	
SUSTAINABLE EDUCATIONAL INNOVATION THROUGH ENGAGED PEDAGOGY AND ORGANIZATIONAL CHANGE	3113
<i>Tonya Frevert ; Audrey Rorrer ; Daniel J. Davis ; Celine Latulipe ; Mary Lou Maher ; Bojan Cukic ; Lawrence Mays ; Steven Rogelberg</i>	
LESSONS LEARNED FROM INTERNATIONAL SERVICE LEARNING PROJECTS : STUDENTS’S PERSPECTIVE	3118
<i>Neha Choudhary ; William Oakes</i>	
IMPROVING FIRST-YEAR ENGINEERING STUDENTS’ DESIGN AND TEAMWORK SKILLS	3122
<i>Jale Ulas ; Farshid Marbouti</i>	
SEPARATION OF SYNTAX AND PROBLEM SOLVING IN INTRODUCTORY COMPUTER PROGRAMMING	3127
<i>John M. Edwards ; Erika K. Fulton ; Jonathan D. Holmes ; Joseph L. Valentin ; David V. Beard ; Kevin R. Parker</i>	
USING REFLECTION AND DIGITAL STORYTELLING VIA EPORTFOLIOS TO SUPPORT THE PROFESSIONAL DEVELOPMENT OF ENGINEERING GRADUATE STUDENTS.....	3132
<i>Helen L. Chen ; Sheetal J. Patel</i>	
EXPLORING I-POEMS TO EXPLORE THE IDENTITY OF UNDERREPRESENTED ENGINEERING STUDENT MAKERS	3137
<i>Nadia Kellam ; Anna Cirell ; Audrey Boklage ; Brooke Coley</i>	

A MIXED METHODS APPROACH TO UNDERSTANDING HOW COLLEGES, UNIVERSITIES, AND EMPLOYERS PREPARE AND SUPPORT UNDERGRADUATES IN ENGINEERING INTERNSHIPS	3142
<i>Helen L. Chen ; Kayla Powers ; K. Venkatesh Prasad ; Mary Anderson ; Adam Royalty ; Shannon K. Gilmartin ; Sheri D. Sheppard</i>	
REFLECTING ON THE IMPACT OF A COURSE ON INCLUSIVE STRATEGIES FOR TEACHING COMPUTER SCIENCE	3147
<i>Alark Joshi ; Amit Jain</i>	
DESIGNING VISUALLY INTERACTIVE LEARNING MODULES TO PROMOTE STUDENTS' CRITICAL THINKING IN MATHEMATICS	3156
<i>Vu Linda ; Ying Xie ; Meng Han</i>	
LAB-AS-A-SERVICE (LAAS): A MIDDLEWARE APPROACH FOR INTERNET-ACCESSIBLE LABORATORIES	3161
<i>Eyhab Al-Masri</i>	
MODIFICATION OF VALUE RUBRICS FOR ENGINEERING	3166
<i>Milica Markovic</i>	
MEASURING HARDWARE IMPAIRMENTS WITH SOFTWARE-DEFINED RADIOS	3171
<i>Vuk Marojevic ; Aditya V. Padaki ; Raghunandan M. Rao ; Jeffrey H. Reed</i>	
USING AN INSTRUMENTED LEARNING ENVIRONMENT TO UNDERSTAND PROCRASTINATION	3177
<i>Negin Entezari ; Amirali Darvishzadeh ; Thomas Stahovich</i>	
A MIDDLE-SCHOOL CASE STUDY: PILOTING A NOVEL VISUAL PRIVACY THEMED MODULE FOR TEACHING SOCIETAL AND HUMAN SECURITY TOPICS USING SOCIAL MEDIA APPS	3185
<i>Ankur Chattopadhyay ; David Christian ; Adam Ulman ; Caleb Sawyer</i>	
A SOFTWARE RADIO CHALLENGE ACCELERATING EDUCATION AND INNOVATION IN WIRELESS COMMUNICATIONS.....	3193
<i>Marta González-Rodríguez ; Antoni Gelonch-Bosch ; Vuk Marojevic</i>	
CLOSING THE SKILLS GAP: CONSTRUCTION AND ENGINEERING EDUCATION USING MIXED REALITY – A CASE STUDY.....	3202
<i>Wei Wu ; Aaron Tesei ; Steven Ayer ; Jeremi London ; Yupeng Luo ; Venkata Gunji</i>	
SUSTAINABLE CHANGE IN A FIRST-YEAR ENGINEERING PROGRAM.....	3207
<i>Jon Sticklen ; A.J. Hamlin ; Amber Kemppainen ; Brett Hamlin ; Doug Oppliger</i>	
SPECIAL SESSION: PUT ME IN COACH! DEVELOPING A DESIGN PLAYBOOK FOR INSTRUCTORS TO HELP ENGINEERING STUDENTS DO DESIGN.....	3212
<i>Alexandra Coso Strong ; Micah Lande ; Robin Adams</i>	
HIERARCHIES OF UNDERSTANDING FOR HUMAN LEARNING.....	3214
<i>Scott Carpenter ; Weixun Cao ; Catherine Liu ; Allen Yao</i>	
DEVELOPMENT OF A DISTRIBUTED PAIR EXERCISE SYSTEM FOR NETWORK CONSTRUCTION WITH A DIALOGUE SUPPORT FUNCTION.....	3223
<i>Yuichiro Tateiwa ; Yoshiaki Ooka ; Yonghwan Kim ; Yoshiaki Katayama</i>	
EMBEDDED AFFECTIVE ASSESSMENT	3231
<i>Anastasia M Rynearson ; Lee Rynearson</i>	
EMBEDDED CONTENT ASSESSMENT	3235
<i>Jacqueline Burgher ; Anastasia M Rynearson</i>	
THE DEVELOPMENT OF A FRAMEWORK FOR CURRICULUM INTEGRATION	3239
<i>Michele Miller ; Anastasia M Rynearson</i>	
EQUALITY VS. EQUITY: USING ASSETS AND CULTIVATING STUDENTS	3243
<i>Melissa L. Salazar ; Eileen M. Cashman ; Elizabeth A. Eschenbach</i>	
ELECTRICKS: PRE-COLLEGE ACTIVITIES IN ELECTRO-MECHANICS	3246
<i>Anna J. Buckthorpe ; Dr. Theresa Odun-Ayo ; Mariesa Crow</i>	
AN INSTRUCTIONAL FRAMEWORK, MODEL LESSONS, AND PROFESSIONAL LEARNING PROGRAM FOR SCIENCE STANDARDS-ALIGNED COMPUTING IN 4TH-12TH GRADE CLASSROOMS	3252
<i>K. Virginia Lehmkuhl-Dakhwe</i>	
CREATING A METACOGNITION COMMUNITY OF PRACTICE: TRANSFORMING THE ENGINEERING LEARNING COMMUNITY	3257
<i>Rachel E. Mccord ; Patrick J. Cunningham ; Holly M. Matusovich ; Cheryl A. Carrico</i>	
PERSONALIZED LEARNING TOOL FOR THERMODYNAMICS	3262
<i>Quintana M. Clark ; Jason V. Clark</i>	
STEMULATE-K12: AUTOMATING STEM ATTRACTION	3267
<i>Quintana M. Clark ; Jason V. Clark</i>	

COLLABORATIVE NEED IDENTIFICATION AND DEFINITION OF MACHINE DESIGN	
CLASS PROJECTS	3270
<i>Fisseha M. Alemayehu ; Kenneth R. Leitch</i>	
PRACTICAL EDUCATION IN IOT THROUGH COLLABORATIVE WORK ON OPEN-SOURCE	
PROJECTS WITH INDUSTRY AND ENTREPRENEURIAL ORGANIZATIONS	3275
<i>Vladimir Podolskiy ; Yesika Ramirez ; Atakan Yenel ; Shumail Mohyuddin ; Hakan Uyumaz ; Ali Naci Uysal ;</i>	
<i>Moawiah Assali ; Sergei Drugalev ; Michael Gerndt ; Matthias Friessnig ; Anastasia Myasnichenko</i>	
WHAT LANGUAGE? - THE CHOICE OF AN INTRODUCTORY PROGRAMMING LANGUAGE	3284
<i>Onyeka Ezenwoye</i>	
EXPLORING EXPERIENTIAL LEARNING MODEL AND RISK MANAGEMENT PROCESS	
FOR AN UNDERGRADUATE SOFTWARE ARCHITECTURE COURSE	3292
<i>Ouh Eng Lieh ; Yunghans Irawan</i>	
TEACHING ADULT LEARNERS ON SOFTWARE ARCHITECTURE DESIGN SKILLS	3301
<i>Ouh Eng Lieh ; Yunghans Irawan</i>	
Author Index	