# 2014 Frontiers in Education Conference

**OCTOBER 22-25, 2014**

**MADRID - SPAIN**

**Melia Castilla Hotel & Convention Center**

## Table of Contents
- **Welcome Message**
- **Awards**
- **Workshops**
- **Conference Sponsors**
- **Technical Sessions**
- **Plenary Sessions**
- **Author Index**
- **Search**
- **Help**

---

**Technical Support:**
Conference Catalysts, LLC
Phone: +1 352 872 5544
c.dyer@conferencecatalysts.com

**IEEE Catalog Number:** CFP14FIE-USB
**ISBN:** 978-1-4799-3921-3
2014 IEEE Frontiers in Education Conference Proceedings

To obtain copies of the USB version of the proceedings, please contact:

Mail  IEEE Customer Service Department
      445 Hoes Lane
      PO Box 1331
      Piscataway, NJ 08855-1331 USA

Phone  Toll-free 800-678-IEEE (4333) or 732-981-0060

USB Version of Proceedings IEEE Catalog Number and ISBN

IEEE Catalog Number: CFP14FIE-ART
USB version, IEEE Catalog Number: CFP14FIE-USB

©2014 IEEE

Copyright and Reprint Permission:

Unless otherwise noted on the first page of each paper, IEEE copyrights all papers.
©IEEE 2014

Copyright and Reprint Permission: 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 Operations Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved. Copyright ©2014 by IEEE.
# TABLE OF CONTENTS

- CONFERENCE AT A GLANCE .......................................................................................................................... IV
- WELCOME FROM THE GENERAL CO-CHAIRS ............................................................................................. V
- WELCOME FROM THE PROGRAM CO-CHAIRS ............................................................................................ VI
- MESSAGE FROM THE FIE STEERING COMMITTEE ................................................................................... VII
- FIE 2014 PLANNING COMMITTEE ................................................................................................................ VII
- FIE STEERING COMMITTEE ........................................................................................................................ XVII
- FUTURE FIE CONFERENCES ....................................................................................................................... XVII
- SPONSORS ..................................................................................................................................................... IX
- FIE 2014 EXHIBITORS ................................................................................................................................... X
- GROUP MEETINGS .......................................................................................................................................... XI
- WORKSHOPS ................................................................................................................................................ XI
- KEYNOTES ...................................................................................................................................................... XIV
- NEW FACULTY FELLOW PROGRAM ............................................................................................................ XV
- CONFERENCE AMENITIES ............................................................................................................................. XVI
- AWARD SELECTION COMMITTEE CHAIRS ..................................................................................................... XVII
- FREDERICK EMMONS TERMAN AWARD ................................................................................................... XVIII
- IEEE EDUCATION SOCIETY HEWLETT-PACKARD HARRIETT B. RIGAS AWARD .................................. XXI
- BENJAMIN J. DASHER BEST PAPER AWARD .......................................................................................... XXVII
- HELEN PLANTS AWARD BEST NONTRADITIONAL SESSION AT FIE 2013 ........................................... XXIX
- RONALD J. SCHMITZ AWARD .................................................................................................................. XXVIII
- IEEE EDUCATION SOCIETY WILLIAM E. SAYLE II AWARD FOR ACHIEVEMENT IN EDUCATION ...... XXX
- IEEE TRANSACTIONS ON EDUCATION BEST PAPER AWARD ............................................................... XXXXII
- IEEE EDUCATION SOCIETY EDWIN C. JONES, JR. MERITORIOUS SERVICE AWARD ...................... XXXIII
- IEEE EDUCATION SOCIETY MAC VAN VALKENBURG EARLY CAREER TEACHING AWARD ....... XXXV
- STUDENT LEADERSHIP AWARD ................................................................................................................ XXXVI
- REVIEWERS .................................................................................................................................................. XXXVII
- SESSION CHAIRS ....................................................................................................................................... XLVIII
- SESSION GRID – WEDNESDAY, OCTOBER 22ND ...................................................................................... LII
- SESSION GRID – THURSDAY, OCTOBER 23RD ........................................................................................ LIII
- SESSION GRID – FRIDAY, OCTOBER 24TH ............................................................................................... LIV
- SESSION GRID – SATURDAY, OCTOBER 25TH ....................................................................................... LV
- TECHNICAL SESSIONS TABLE OF CONTENTS ....................................................................................... LVI
### CONFERECE AT A GLANCE

**Wednesday, October 22**
- 12:00 PM – 8:00 PM: Registration Open
- 2:00 PM – 5:00 PM: Workshop Session 1
- 6:00 PM – 9:00 PM: Workshop Session 2

**Thursday, October 23**
- 8:00 AM – 6:00 PM: Registration Open
- 8:00 AM – 9:00 AM: Focus on New Attendees Breakfast
- 9:00 AM – 10:30 AM: Plenary Session
- 10:30 AM – 6:00 PM: Exhibit Hall Open
- 10:30 AM – 11:00 AM: Exhibit Hall Break
- 11:00 AM – 12:30 PM: Technical Sessions (T1)
- 12:45 PM – 2:15 PM: HP Terman and Rigas Awards Lunch
- 2:30 PM – 4:00 PM: Technical Sessions (T2)
- 4:30 PM – 6:00 PM: Technical Session (T3)

**Friday, October 24**
- 8:00 AM – 6:00 PM: Registration Open
- 8:00 AM – 9:00 AM: Breakfast
- 9:00 AM – 10:30 AM: Technical Sessions (F1)
- 10:00 AM – 5:30 PM: Exhibit Hall is open
- 10:30 AM – 11:00 AM: Exhibit Hall Break
- 11:00 AM – 12:30 PM: Technical Sessions (F2)
- 12:45 PM – 2:15 PM: Lunch and Plenary Session
- 2:30 PM – 4:00 PM: Technical Sessions (F3)
- 4:00 PM – 5:00 PM: Focus on Exhibits and New Faculty Fellows
- 5:00 PM – 6:30 PM: Technical Sessions (F4)
- 7:30 PM – 10:00 PM: Reception and Awards Banquet

**Saturday, October 25**
- 8:00 AM – 5:00 PM: Registration
- 8:00 AM – 9:00 AM: Breakfast
- 9:00 AM – 10:30 AM: Technical Sessions (S1)
- 10:30 AM – 11:00 AM: Break
- 11:00 AM – 12:30 PM: Technical Sessions (S2)
- 12:45 PM – 2:15 PM: Lunch
- 2:30 PM – 4:00 PM: Technical Sessions (S3)
- 4:00 PM – 4:30 PM: Break
- 4:30 PM – 6:00 PM: Technical Sessions (S4)
WELCOME FROM THE GENERAL CO-CHAIRS

One of the most rewarding tasks a conference chair has is the pride of becoming, for a few days, an ambassador of his city and having the responsibility and opportunity to repay to his colleagues the many experiences, the knowledge acquired, and the friendships that are the results of his past conference attendance.

The 44th Annual Frontiers in Education (FIE) Conference, as any of the past editions, is special. However, this one stands out for the fact that it is held, for the first time in more than 25 years, outside the United States, thanks to the consideration and trust shown by the sponsoring entities: the IEEE Education Society, the IEEE Computer Society, and the ASEE Educational Research and Methods Division, through the FIE Steering Committee. What can you expect from Madrid during your visit? Testimonies from attendees to other organized events endorse Madrid as a luminous city, just as Velazquez portrayed it, a result of its multicultural composition, its presentation of history through its museums and monuments, and its modern cutting-edge ambiance. You will feel welcomed by its people, who haven’t necessarily been born in Madrid.

In addition, FIE 2014 in Madrid is inspired by this year’s theme “Opening Doors to Innovation and Internationalization in Engineering Education.” Analogous to the city, we engineering educators search for new roles in the face of the world challenges and necessities which transcend boundaries, by using innovation and generously sharing both resources and educational practices.

This has been the guideline that has lead to the participation of more than 500 speakers and that continues a long tradition of disseminating the results of educational innovations and research in engineering and computing. We are thankful for these speakers and the hard and brilliant work performed by the co-chairs of the Program Committee, who have selected and organized the papers submitted: Monica Cardella, ASEE Program Co-Chair; Russ Meier, IEEE Education Society Program Co-Chair; and Arnold Pears, IEEE Computer Society Program Co-Chair. Also to be thanked is the FIE Steering Committee, which by representing the three Societies, has achieved, despite the present situation of global, political and educational crisis, the success of this journey.

Thanks also to the logistic support of Assistant to the General Chairs Kevin Curry, University of Kansas Continuing Education, and to Conference Catalysts, for their work on the computer applications and the web site. We have to thank our sponsors - the academic host institutions: Universidad Politécnica de Madrid (Madrid Technical University) and Universidad Nacional de Educación a Distancia (Spanish University of Distance Education); our other sponsors: The Madrid Convention Bureau, Hewlett-Packard, Edibon, Mathworks; and our exhibitors.

Madrid will play the role of a hub, a meeting point for professionals from different parts of the world to share ideas and learn about developments in computer science, engineering, and technology education and to interact with colleagues in these fields. Enjoy the history of the city, and the passion with which the artistic and sporting events are experienced. We hope that Madrid will forever find a place in your heart.

Conference General Co-Chairs

Manuel Castro, UNED, Madrid, Spain

Edmundo Tovar, UPM, Madrid, Spain
Dear Colleagues,

It gives us great pleasure to welcome you to Madrid, Spain, and the 2014 Frontiers in Education Conference.

As conference programme co-chairs we have had the stimulating challenge of managing the reviewing, selection, and scheduling of submissions for what promises to be a truly outstanding conference. This year we received close to 900 submissions, from which we have selected approximately 500 for presentation in different formats. The result is a research and innovation packed programme that commences with a day of pre-conference workshops on Wednesday, followed by three full days of presentations, special sessions, mini-workshops, keynotes, and last, but not least, many opportunities over breakfast, lunch and dinner events to meet new friends, renew old acquaintanceships and engage in inspiring debate and discussion.

We have spent a most exciting six months preparing the technical programme. We hope that you enjoy the fruits of our labour, and find the conference as stimulating and interesting to attend, as we have found the process of putting it all together.

Welcome to FIE 2014 in Madrid!

Monica Cardella  Russ Meier  Arnold Pears
ASEE ERM  IEEE Education Society  IEEE Computer Society
MESSAGE FROM THE FIE STEERING COMMITTEE

¡Bienvenidos a Madrid!

You are attending the 44th annual Frontiers in Education conference and we are happy to see you here! The Steering Committee is especially excited about this conference, as it has been 14 years since the last time FIE was held in Europe. As FIE is one of the premier conferences in engineering education, we look forward to increasing the frequency that FIE is held outside the United States so that we can all better learn from engineering educators from around the world.

FIE is a space where we can be challenged, invigorated and encouraged to think in new ways to facilitate our engineering students’ learning. I hope you come away from this conference changed in some way - be it how you see your students, how you see yourself or how you see your institution and its role in educating future engineers.

One of the wonderful aspects of FIE is the community we continue to create and maintain. Over these next few days, I hope you meet some new colleagues and perhaps make a new friend. For those of you that have been coming to FIE for a while, I encourage you to make the extra effort to reach out to those that are new to the conference and make them feel welcome. FIE is a special time and place that we can welcome others to.

Many volunteers, including the Steering Committee work to continually innovate and improve the conference. This year you will notice it is our first year without a physical program. We look forward to hearing your response to this new change that is easier on the planet and our pocketbooks.

Below is the list of all current members on the FIE Steering Committee. You can find us at the conference as we will be wearing Steering Committee ribbons on our conference badges. We represent you and your needs for this conference. Please let us know how to improve FIE.

ASEE Educational Research and Methods Division Representatives
• Beth Eschenbach (Chair), Humboldt State University, Elizabeth.Eschenbach@humboldt.edu
• Archie Holmes, University of Virginia, ah7sj@virginia.edu
• James Morgan, Texas A&M University, jmorgan@civil.tamu.edu

IEEE Computer Society Representatives
• Stephen Frezza, Gannon University, FREZZA001@gannon.edu
• Arnold Pears, Uppsala University, Arnold.Pears@it.uu.se
• Deborrah Trytten, University of Oklahoma, dtrytten@ou.edu

IEEE Education Society Representatives
• Russ Meier, Milwaukee School of Engineering, meier@msoe.edu
• James Sluss, University of Oklahoma, sluss@ou.edu
• Edmundo Tovar, Universidad Politécnica de Madrid, etovar@fi.upm.es

As the senior ASEE ERM representative, this conference begins my first of a two year rotation as FIE Steering Committee Chair. I want to thank our recent past chairs, Dr. Russ Meir (IEEE Ed. Soc. 2012-2014) and Arnold Pears (IEEE Comp. Soc. 2010-2012) for their vision and leadership. I look forward to working with all of you to continue to keep FIE on the frontier.

¡Amigos y colegas, espero que disfrutéis de la Conferencia!

Beth Eschenbach, Chair
Frontiers In Education Steering Committee
Humboldt State University
Arcata, CA USA

Elizabeth A. Eschenbach, Ph.D
Department Chair & Professor
Environmental Resources Engineering
1 Harpst Street
Humboldt State University
Arcata, CA 95521
FIE 2014 PLANNING COMMITTEE

General Co-Chairs
Manuel Castro
Spanish National Distance University
mcastro@ieec.uned.es

Edmundo Tovar Caro
Universidad Politecnica de Madrid
etovar@fi.upm.es

Assistant to the General Chairs
Kevin Curry
University of Kansas
kgcurry@ku.edu

ASEE/ERM Program Co-Chair
Monica Cardella
Purdue University
mcardell@purdue.edu

IEEE/Computer Society Program Co-Chair
Arnold Pears
University of Uppsala, Sweden
Arnold.Pears@it.uu.se

IEEE/Education Society Program Co-Chair
Russ Meier
Milwaukee School of Engineering
meier@msoe.edu

Local Arrangements Chair
Clara Perez
Spanish University for Distance Education (UNED),
Spain

International Co-Chair, Africa
Hamadou Saliah Hassane
University of Quebec in Montreal (TELUQ/UQAM)
saliah@teluq.uqam.ca

International Co-Chair, Asia
Ming Zhang
Peking University

International Co-Chair, Australasia
Mark Lee
Charles Sturt University

International Co-Chair, Europe
Edmundo Tovar
Universidad Politecnica de Madrid

International Co-Chair, South America
Melany M. Ciampi
VP COPEC- Science and Education Research Council
melany@copec.org.br

Conference Historian
Ed Jones
Iowa State University
n2ecj@iastate.edu

Awards Chair
Ed Jones
Iowa State University
n2ecj@iastate.edu

FIE STEERING COMMITTEE

ASEE Educational Research and Methods Division
Representatives
• James Morgan
  (June 2011 - June 2014)
• Archie Holmes, University of Virginia
  (June 2012 - June 2015)
• Beth Eschenbach, Humboldt State University
  (June 2010 - June 2016)

IEEE Computer Society
• Arnold Pears, Uppsala University
  (June 2009 - June 2015)
• Stephen Frezza, Gannon University
  (June 2011 - June 2014)
• Deborah Trytten
  (June 2013 - June 2016)

IEEE Education Society
• Russ Meier, Milwaukee School of Engineering,
  Steering Committee Chair
  (June 2007 - present)
• Edmundo Tovar, Universidad Politecnica de Madrid
  (June 2008 - June 2014)
• James Sluss, University of Oklahoma
  (June 2012 - June 2015)

FUTURE FIE CONFERENCES

FIE 2015 El Paso, Texas
FIE 2016 Erie, Pennsylvania
FIE 2017 Indianapolis, Indiana

Are you interested in hosting a future FIE conference?
Leave your business card at the registration desk, and
an FIE steering committee member will contact you
SPONSORS

Society Sponsors

The 44th Annual Frontiers in Education Conference is sponsored by the IEEE Education Society, the IEEE Computer Society, and the ASEE Educational Research and Methods Division.

Academic Host Institutions

Universidad Nacional de Educación a Distancia (The National University of Distance Education)

Universidad Nacional de Educación a Distancia (UNED) is a distance learning and research university founded in 1972 and is the only university run by the central government of Spain. UNED is headquartered in Madrid and has centers in all of the Spanish Autonomous Communities as well as in thirteen countries in Europe, the Americas, and Africa. The University awards undergraduate and postgraduate degrees, as well as non-degree qualifications such as diplomas and certificates, or continuing education units. UNED has more than 205,000 students, making it the largest student population in Spain and is one of the largest universities in Europe.

La Universidad Politécnica de Madrid (The Technical University of Madrid)

La Universidad Politécnica de Madrid (UPM) was founded in 1971 by the merging of the higher technical schools of engineering and architecture, most of which originated in the 18th and 19th centuries. According to the annual university ranking conducted by El Mundo Newspaper, UPM ranks as the number two university in Spain and as the top technical university. The majority of its engineering schools are consistently ranked as the leaders in their fields in Spain, and among the very best in Europe. UPM is attended by over 44,000 students pursuing undergraduate and postgraduate degrees, as well as those in permanent training.
KEYNOTES

Thursday, October 23, 9:00 AM
Tapices
Reinventing Education in the Internet Age

Speaker: Carlos Delgado Kloos, Universidad Carlos III de Madrid

We find ourselves at a crossroads. In Higher Education, we have to teach young people to work in jobs that don’t exist to solve problems we don’t know of, with technology that has not yet been developed. There are even problems today that are complex and wicked enough. And this in a context, where the professor cannot be any more the source of all knowledge. On the other side, we are witnessing a commoditization of educational content. Content abounds and becomes richer and more interactive. The Internet and ICT have reinvented the photography, music and news industries. How to reinvent the education industry?

Carlos Delgado Kloos received the Ph.D. degree in Computer Science from the Technische Universität München and in Telecommunications Engineering from the Universidad Politécnica de Madrid. He is Full Professor of Telematics Engineering at the Universidad Carlos III de Madrid, where he is the Director of the GAST research group, Director of the UNESCO Chair on “Scalable Digital Education for All”, Director of an online Master program on e-learning, and Vice-Rector of Infrastructures and Environment. He is also the Coordinator of the eMadrid research network on Educational Technology in the Region of Madrid.

His main research interests are in the area of Technology-enhanced Learning. He has been involved in more than 30 projects with European (Esprit, IST, @LIS, eContentPlus), national (Spanish Ministry, Region of Madrid) and bilateral (Spanish-German, Spanish-French) funding. He has published over 200 articles in national and international conferences and journals. He has further written a book and co-edited over a dozen. He is the Spanish representative at IFIP TC3 on Education and Senior Member of IEEE.

Friday, October 24, 12:45 PM
Tapices
Who am I? Who are you? Where are we going?

Speaker: John Heywood, Life member and Fellow ASEE, Life Senior Member IEEE

Dr John Heywood is best known for his IEEE/Wiley publication Engineering Education: Research and Development in Curriculum and Instruction. He has been engaged in R and D in Engineering and Higher Education since 1960 and during that period studied change, been a change agent and an innovator. He is author of Learning, Adaptability and Change: The Challenge for Education and Industry. He has made other contributions to management including a study of engineers at work, and has a particular interest in policy making. He has made a special study of assessment both in high schools and higher education and three editions of his book on Assessment in Higher Education have been published. In engineering he had the privilege to direct the British Astronomical Association’s and Radio Society of Great Britain’s observations of Sputniks I and II. He is currently interested in the development of philosophy as applied to engineering education and the development of engineering and technological literacy. He has made many contributions to Frontiers in Education Conferences. John Heywood is a Professorial Fellow Emeritus of Trinity College Dublin in the School of Education of the University of Dublin.
CONFERENCE AMENITIES

Breakfast ● Tapices Room
Breakfast is included with hotel registration at the conference hotel. It is separate from your conference registration. However, our conference attendees who are staying at the Meliá Castilla will eat in a separate breakfast room from the other hotel guests so we have more freedom to network. Breaks will take place in the Tapices Room. On Thursday and Friday, breakfasts will include plenary presentations.
If you registered for the conference, but do not stay at the Meliá Castilla, you will be responsible for your own breakfast. Nonetheless, you will be able to come to the plenary sessions following the breakfasts on Thursday and Friday.

8:00 a.m. – 10:30 a.m. Thursday Includes Plenary Session
8:00 a.m. – 9:00 a.m. Friday
8:00 a.m. – 9:00 a.m. Saturday

Refreshment Breaks
Morning and afternoon breaks Thursday and Friday Exhibit Hall – Patio 2
Morning and afternoon breaks Saturday – Outside Patio Rooms by Conference Registration

Lunches ● Tapices Room

Frederick Emmons Terman and Harriett B. Rigas Awards Luncheon
Sponsored by the Hewlett-Packard Company
12:45 a.m. – 2:15 p.m. Thursday
The Frederick Emmons Terman Award is presented annually to an outstanding young electrical engineering educator by the Electrical and Computer Engineering Division of the American Society for Engineering Education. The Harriett B. Rigas Award is presented annually to an outstanding woman engineering educator in recognition of her contributions to the profession.

Luncheon
12:45 a.m. – 2:15 p.m. Friday
Includes Plenary Session

Luncheon
12:45 a.m. – 2:15 p.m. Saturday

New Faculty Fellows ● Exhibit Hall ● Patio 2
4:00 p.m. – 5:00 p.m. Friday
A special session focusing on the New Faculty Fellows will be held on Friday. This session will provide an opportunity to meet this year’s New Faculty Fellows, a group of new CSET educators who were selected based on an application and a full paper being presented at this year’s conference. There will also be an opportunity to view their poster presentations at this time.

Focus on Exhibits ● Exhibit Hall ● Patio 2
4:00 p.m. – 5:00 p.m. Friday
Visit the FIE exhibits and check out the latest textbooks, computer software, lab equipment, and other innovations while enjoying refreshments.

Awards Banquet ● Tapices Room
7:30 p.m. – 9:00 p.m. Friday
This year’s awards banquet features fine food, drink, and camaraderie along with presentation of special awards from FIE, the IEEE Education Society, and the IEEE Computer Society. There is a separate charge for the banquet.

FIE Registration Conference Desk ● Lobby Level by Patios 1, 2 & 3
Registration will be open during these times:
Wednesday 12:00 p.m. – 8:00 p.m.
Thursday 8:00 a.m. – 6:00 p.m.
Friday 8:00 a.m. – 6:00 p.m.
Saturday 8:00 a.m. – 5:00 p.m.
TECHNICAL SESSIONS TABLE OF CONTENTS

Wednesday, October 22nd

1A: Your Data Deserve Better than Pies and Bars: An R Graphics Workshop for the Timid
2:00 PM - 5:00 PM
Room: El Jardin

Your Data Deserve Better than Pies and Bars: An R Graphics Workshop for the Timid
Richard Layton (Rose-Hulman Institute of Technology, USA)

1B: Evaluability Assessment for Engineering Educators
2:00 PM - 5:00 PM
Room: Alcalá

Evaluability Assessment for Engineering Educators
Michael S. Trevisan (Washington State University, USA)
Tamara Walser (University of North Carolina-Wilmington, USA)

1C: Training Student in Responsibility for Their Own Learning: True Student Centered Learning
2:00 PM - 5:00 PM
Room: Patio 1

Training Student in Responsibility for Their Own Learning: True Student Centered Learning
Peter Shull (Penn State University, USA)

1D: Using Community Engagement to Teach Engineering and Computing
2:00 - 5:00 PM
Room: Comendador

Using Community Engagement to Teach Engineering and Computing
William Oakes (Purdue University, USA)
Carla Zoltowski (Purdue University, USA)

2A: Developing and Evaluating Active Learning Classroom Experiences with Tablet PCs and Slate Devices
6:00 PM - 9:00 PM
Room: El Jardin

Developing and Evaluating Active Learning Classroom Experiences with Tablet PCs and Slate Devices
Joseph G Tront (Virginia Tech, USA)
Flora McMartin (Broad-based Knowledge, USA)

2B: Qualifying Qualitative Research Quality (The Q3 Project): An interactive discourse around research quality in interpretive approaches to engineering education research
6:00 PM - 9:00 PM
Room: Alcalá

Qualifying Qualitative Research Quality (The Q3 Project): An interactive discourse around research quality in interpretive approaches to engineering education research
Joachim Walthier (University of Georgia, USA)
Nicola Sochacka (University of Georgia, USA)
2C: Using and Disseminating a Taxonomy for Engineering Education Research
6:00 PM - 9:00 PM
Room: Patio 1

Using and Disseminating a Taxonomy for Engineering Education Research................................................................. 17
Cynthia Finelli (University of Michigan, USA)
Golnoosh Rasoulifar (University of Michigan, USA)

2D: Simulink for Project-Based Learning using LEGO MINDSTORMS NXT and MATLAB & Simulink with Raspberry Pi - A hands-on workshop on hardware support
6:00 PM - 9:00 PM
Room: Comendador

Simulink for Project-Based Learning using LEGO MINDSTORMS NXT................................................................. xvii
Mathworks

MATLAB & Simulink with Raspberry Pi - A hands-on workshop on hardware support................................. xviii
Mathworks
Thursday, October 23

CBL1: Developing professionals
11:00 AM - 12:30 PM
Room: Patio 3

Merlin-Know, An Interactive Virtual Teacher for Improving Learning in Moodle ....................................................... 19
Raquel Hijon-Neira (Universidad Rey Juan Carlos, Spain)
J. Ángel Velázquez-Iturbide (Universidad Rey Juan Carlos, Spain)
Celeste Pizarro-Romero (Universidad Rey Juan Carlos, Spain)
Luís Carriço (University of Lisbon, Portugal)

Managing and Assessing Group Work from a Distance .................................................................................................. 27
Alvaro Figueira (University of Porto, Portugal)
Rui Pereira (University of Porto, Portugal)

A Methodological Approach to Use Technological Support on Teaching and Learning Data Structures .......... 35
Ronaldo Correia (Universidade Estadual Paulista, Brazil)
Rogério Garcia (Universidade Estadual Paulista, Brazil)
Celso Olivete Junior (Universidade Estadual Paulista, Brazil)
Anaílce C. Brandi (Universidade Estadual Paulista, Brazil)
Guilherme Cardim (Universidade Estadual Paulista, Brazil)

Building SCORM embedded WebLabs with LMS interaction ......................................................................................... 43
Ildefonso Ruano Ruano (University of Jaen, Spain)
Javier Gámez García (University of Jaen, Spain)
Juan Gómez Ortega (University of Jaen, Spain)

A SCORM Based Package Model for WebLabs ............................................................................................................... 47
Ildefonso Ruano Ruano (University of Jaen, Spain)
Javier Gámez García (University of Jaen, Spain)
Sebastián Dormido (UNED, Spain)
Juan Gómez Ortega (University of Jaen, Spain)

Authentic Learning in Network and Security with Portable Labs ................................................................................... 51
Dan Lo (Southern Polytechnic State University, USA)
Kǎi Qian (Southern Polytechnic State University, USA)
Wei Chen (Tennessee State University, USA)
Hossain Shahriar (Kennesaw State University, USA)
Victor Clincy (Kennesaw State University, USA)

CUR: Setting the stage for CE2016: A Revised Body of Knowledge
Chair: Eti de Vries
11:00 AM - 12:30 PM
Room: El Escorial

Setting the stage for CE2016 A Revised Body of Knowledge ........................................................................................... 56
Eric Durant (Milwaukee School of Engineering, USA)
John Impagliazzo (Hofstra University, USA)
Susan Conry (Clarkson University, USA)
Robert Reese (Mississippi State University, USA)
Mitchell A Thornton (Southern Methodist University, USA)
Herman Lam (University of Florida, USA)
Victor Nelson (Auburn University, USA)
EER: How do we talk about impact?: Engineering education change language beyond "dissemination"
11:00 AM - 12:30
Room: El Jardín

How do we talk about impact? Engineering education change language beyond "dissemination".............................. 60
Mel Chua (Purdue University, USA)
Robin Adams (Purdue University, USA)
Sally Fincher (University of Kent, United Kingdom)
Lynn Andrea Stein (Franklin W. Olin College of Engineering, USA)

EER1: Research on Blended Learning Environments
Chair: Azim Abdool
11:00 AM - 12:30
Room: Aranjuez

E-participation in higher education The importance of non-technical factors as identified in the EU-project MyUniversity......................................................................................................................................................... 63
Pooyeh Mobini (Stockholm University, Sweden)
Henrik Hansson (Stockholm University, Sweden)

Using textual analysis with Concept Inventories to identify root causes of misconceptions................................. 71
Andrea Goncher (Queensland University of Technology, Australia)
Wageeh Boles (Queensland University of Technology, Australia)
Dhammika Jayalath (Queensland University of Technology, Australia)

"Tap it again, Sam": harmonizing the frontiers between digital and real worlds in education................................. 75
Bernardo Tabuenca (Open University of The Netherlands, The Netherlands)
Marco Kalz (Open University of The Netherlands, The Netherlands)
Marcus Specht (Open University of the Netherlands, The Netherlands)

Classroom Discourse Development for "Flipping Classrooms": Theoretical Concepts, Practices, and Joint Efforts From Engineering Students and Instructors......................................................... 84
Jia-Ling Lin (University of Minnesota Twin-Cities, USA)
Paul Imbertson (University of Minnesota Twin-Cities, USA)
Tamara J. Moore (Purdue University, USA)

What Students Use: Results of a Survey on Media Use among Engineering Students............................................. 92
Dominik May (TU Dortmund University, Germany)
Karsten Lensing (TU Dortmund University, Germany)
A. Erman Tekkaya (TU Dortmund University, Germany)
Michael Grosch (Karlsruhe Institute of Technology, Germany)
Ute Berbuir (Ruhr University Bochum, Germany)
Marcus Petermann (Ruhr Universität Bochum, Germany)

Blended Instruction in a Programming Course: Lessons Learned ............................................................................. 98
K.-Y. Daisy Fan (Cornell University, USA)
Influence of Teaching Assistants' Motivation on Student Learning
Kelsey J Rodgers (Purdue University, USA)
Farshid Marbouti (Purdue University, USA)
Ali Shafaat (Purdue University, USA)
Hyunyi Jung (Purdue University, USA)
Heidi Diefes-Dux (Purdue University, USA)

Spatial Skills as Predictors of Success in First-year Engineering
Sheryl Sorby (Dublin Institute of Technology, USA)
Edmund Nevin (Dublin Institute of Technology, Ireland)
Avril Behan (Dublin Institute of Technology, Ireland)
Eileen Mageean (Dublin Institute of Technology, Ireland)
Sarah Sheridan (Dublin Institute of Technology, Ireland)

Assessment of Student Preparedness for Freshman Engineering Courses Through Assessment of Math Background
Branimir Pejcinovic (Portland State University, USA)
Donald Duncan (Portland State University, USA)
Phillip K Wong (Portland State University, USA)
Mark G Faust (Portland State University, USA)
Gerald Recktenwald (Portland State University, USA)

Self-efficacy and task orientation in first-year engineering design courses
Debbie Chachra (Franklin W. Olin College of Engineering, USA)
Alex Dillon (Franklin W. Olin College of Engineering, USA)
Elizabeth Spingola (Ohio Northern University, USA)
Briana Saul (Louisiana State University, USA)

Relevance-Based Learning in Students' Early Engineering Education Experience
Diana Bairaktarova (University of Oklahoma, USA)
Mary K. Pilotte (Purdue University, USA)
Isaac J. Tetzloff (Purdue University, USA)

Stories 'Told' About Engineering in the Media: Implications for attracting diverse groups to the profession
Nicola Sochacka (University of Georgia, USA)
Joachim Walther (University of Georgia, USA)
Jennifer Wilson (University of Georgia, USA)
Michael Brewer (University of Georgia, USA)

Fear of the Mouse - And other ICT4D Change projects in developing countries
Henrik Hansson (Stockholm University, Sweden)
Proven Practices that can Reduce Stereotype Threat in Engineering Education: A Literature Review ...................... 140
Elizabeth A. Eschenbach (Humboldt State University, USA)
Mary Virnoche (Humboldt State University, USA)
Eileen Cashman (Humboldt State University, USA)
Susan M. Lord (University of San Diego, USA)
Michelle Madsen Camacho (University of San Diego, USA)

Relationships among Student Work/Family Attitudes, Computing Further Education and Career Intentions ........ 149
Leslie Cintron (University of Virginia, USA)
Joanne Cohoon (University of Virginia, USA)

Same course, different goals: Examining the Personal Goals of Men and Women in a Project-Based Engineering Environment ................................................................. 154
Janie Harari (Olin College of Engineering, USA)
Julianne Jorgensen (Olin College of Engineering, USA)
Jonathan Stolk (Olin College of Engineering, USA)

PHII: Philosophy of Engineering Education
Chair: Paul B. Crilly
11:00 AM - 12:30 PM
Room: La Granja

A Knowledge Basis for Engineering Design ................................................................. 158
Stephen Frezza (Gannon University, USA)

An analysis of consistency in, and between, ontology, epistemology and philosophical perspective as contained studies of the first year experience ................................................................. 166
Gavin Duffy (Dublin Institute of Technology, Ireland)
Brian Bowe (Dublin Institute of Technology, Ireland)

Scenario Planning to Envision Potential Futures for Engineering Education ................................................................. 173
Jeffrey E Froyd (Texas A&M University, USA)
Susan M. Lord (University of San Diego, USA)
Matthew W Ohland (Purdue University, USA)
Kishore Prahallad (International Institute of Information Technology, India)
Euan Lindsay (Charles Sturt University, Australia)
Burton Dicht (IEEE, USA)

Exploring Conceptual Understanding and Personal Epistemologies through Metaphor ........................................... 179
Kacey Beddoes (Oregon State University, USA)
Devlin Montfort (Oregon State University, USA)
Shane Brown (Oregon State University, USA)
PRO1: Developing Technical Communication as a Professional Skill
Chair: Ronald Harichandran
11:00 AM - 12:30
Room: Comendador

A Comprehensive Engineering College-Wide Program for Developing Technical Communication Skills in Students .......................................................... 182
Ronald Harichandran (University of New Haven, USA)
Jean Nocito-Gobel (University of New Haven, USA)
Eric Brisart (University of New Haven, USA)
Nadiye Erdil (University of New Haven, USA)
Michael Collura (University of New Haven, USA)
Samuel Daniels (University of New Haven, USA)
David Harding (University of New Haven, USA)
David Adams (Consultant, USA)

Technical Writing Knowledge Transfer from First Year Composition to Major Courses ......................................................... 190
Robert Weissbach (Penn State Erie, The Behrend College, USA)
Ruth C Pflueger (Penn State Erie, The Behrend College, USA)

Enabling higher order thinking and technical communication - An Indian context for OBE ........................................ 195
Naresh Kumar Mallenahalli (National Remote Sensing Centre, India)
Uma Garimella (Nalla Malla Reddy Engineering College, India)
Divya Nalla (Nalla Malla Reddy Engineering College, India)

Throwing Out the First Pitch .......................................................................................................................................... 202
Adrienne Decker (Rochester Institute of Technology, USA)
Christopher Egert (Rochester Institute of Technology, USA)
Stephen Jacobs (Rochester Institute of Technology, USA)

Project-Based Learning of Scientific Writing and Communication Skills for Postgraduate Students .......................... 210
Anthony Mandow (Universidad de Malaga, Spain)
Martínez Jorge (Universidad de Malaga, Spain)
Alfonso García-Cerezo (Universidad de Malaga, Spain)

REM1: Remote Laboratories, implementation and evaluation
Chair: Diana Urbano
11:00 - 12:30
Room: Escudo

Educational Biogas Installation Monitoring using Virtual Instrumentation Concepts......................................................... 214
Adrian Cioabla (University “Politehnică” Timișoara, Romania)
Mihaela Lascu (University “Politehnică” Timișoara, Romania)
Raul Ionel (University “Politehnică” Timișoara, Romania)

A Liquid-Level Control Training Lab Including a Model-Based Design for Electronics Technologists and Instrumentation Technicians .................................................. 223
Daniel Cheverez-Gonzalez (University of Puerto Rico-Bayamón, Puerto Rico)
Wesley Feliciano de Jesús (University of Puerto Rico-Bayamón, Puerto Rico)
Yamil Huertas Morales (University of Puerto Rico-Bayamón, Puerto Rico)
Luis Meléndez Lorenzana (University of Puerto Rico-Bayamón, Puerto Rico)
Generic integration of remote laboratories in public learning tools: organizational and technical challenges .......... 230
Pablo Orduña (DeustoTech - Deusto Institute of Technology, Spain)
Agustín Caminero (Spanish University for Distance Education (UNED), Spain)
Irene Lequerica (Spanish University for Distance Education (UNED), Spain)
Danilo G. Zutin (Carinthia University of Applied Sciences, Austria)
Philip Bailey (Massachusetts Institute of Technology, USA)
Elio Sancristóbal (Spanish University for Distance Education (UNED), Spain)
Luis Rodríguez-Gil (DeustoTech - Deusto Institute of Technology, Spain)
Antonio Robles-Gómez (Spanish University for Distance Education (UNED), Spain)
Miguel Latorre (Spanish University for Distance Education (UNED), Spain)
Kimberley DeLong (Massachusetts Institute of Technology, USA)
Llanos Tobarra (Spanish University for Distance Education (UNED), Spain)
Salvador Ros (Spanish University for Distance Education (UNED), Spain)
Manuel Castro (Spanish University for Distance Education (UNED), Spain)
Diego López-de-Ipiña (DeustoTech - Deusto Institute of Technology, Spain)
Javier García-Zubía (DeustoTech - Deusto Institute of Technology, Spain)

Critical Factors in the Architectural Design of Modern Educational Remote Laboratories ........................................ 237
Mohamed Tawfik (Spanish University for Distance Education (UNED), Spain)
David Lowe (University of Sydney, Australia)
Christophe Salzmann (Swiss Federal Institute of Technology in Lausanne (EPFL), Switzerland)
Denis Gillet (EPFL, Switzerland)
Elio Sancristóbal (Spanish University for Distance Education (UNED), Spain)
Manuel Castro (Spanish University for Distance Education (UNED), Spain)

Arduino and LabVIEW in Educational Remote Monitoring Applications ................................................................... 245
Delia Calinoiu (University “Politehnica” Timișoara, Romania)
Raul Ionel (University “Politehnica” Timișoara, Romania)
Mihaela Lascu (University “Politehnica” Timișoara, Romania)
Adrian Ciocâlba (University “Politehnica” Timișoara, Romania)

Using the similarities between biological and computer virus behavior to connect and teach introductory concepts in cybersecurity in a biology classroom ............................................................................................................................... 250
Camilla Nix (Drexel University, USA)
Jessica Ward (Drexel University, USA)
Adam Fontecchio (Drexel University, USA)
Jared Ruddick (Girard Academic Music Program, USA)

Helping Students to Find Biological Inspiration: Impact of Valuableness and Presentation Format ........................ 257
Jin Woo Kim (Georgia Institute of Technology, USA)
Daniel McAdams (Texas A&M University, USA)
Julie Linsey (Georgia Institute of Technology, USA)

A Mobile Learning System to Enhance Field Trips in Geology .................................................................................... 263
Edgar Marçal (Federal University of Ceará, Brazil)
Rossana Maria de Castro Andrade (Federal University of Ceará, Brazil)
Windson Viana (Federal University of Ceará, France)
Daniel Nascimento Jr. (Federal University of Ceará, Brazil)
Smart physics with smartphone sensors
Enrique Ballester Sarrias (Universitat Politecnica de Valencia, Spain)
Juan Carlos Castro Palacio (Universität Basel, Switzerland)
Luisberis Velázquez Abad (Universidad Católica del Norte, Chile)
Marcos Giménez (Universitat Politècnica de Valencia, Spain)
Juan Antonio Monsoriu Serra (Universitat Politècnica de València, Spain)
Luis M. Sanchez Ruiz (Universitat Politècnica de València, Spain)

Martha Madison: Marvelous Machines - Exploring Simple Machines in an Open-Ended, Collaborative Sandbox
David Simkins (Rochester Institute of Technology, USA)
Adrienne Decker (Rochester Institute of Technology, USA)
Christopher Egert (Rochester Institute of Technology, USA)
Anne Snyder (Second Avenue Learning, USA)
Victoria Van Voorhis (Second Avenue Learning, USA)

Enhancing Collaborative Project-based Learning Using Participatory Design Approach
Jianyu Dong (California State University Los Angeles, USA)
Xuan Qin (California State University Los Angeles, USA)
Pearl Chen (California State University Los Angeles, USA)

TLE1: Increasing the Relevance in Teaching and Learning
Chair: John Mativo
11:00 AM - 12:30 PM
Room: La Galeria

Design Based Wilderness Education: A Cross-Cultural Experience in Engineering Education
Christopher R. Saulnier (Massachusetts Institute of Technology, USA)
Aikaterini Bagiati (Massachusetts Institute of Technology, USA)
John Brisson (Massachusetts Institute of Technology, USA)

Exploiting Research Results in ICT to Extend the Scope of Educational Activities
Maurizio Molinaro (ISMB, Italy)

Internationalizing Engineering Education With Phased Study Programs: India-European Experience
Krishnashree Achuthan (Amrita Vishwa Vidyapeetham, India)
Maneesha Ramesh (Amrita Vishwa Vidyapeetham, India)
Sasikumar Punnekkat (Mälardalen University, Sweden)
Raghu Raman (Amrita Vishwa Vidyapeetham, India)

Students' research on lean and green
Itziar Lujan (Universitat Politecnica de Catalunya-BarcelonaTech, Spain)
Jordi Fortuny-Santos (Universitat Politècnica de Catalunya-BarcelonaTech, Spain)

Environmental Technological Projects in the Computer Engineering Program
Ricardo Santos (Federal University of Mato Grosso do Sul, Brazil)
A Learning Environment for Augmented Reality Mobile Learning
Joaquín Cubillo Arribas (National University for Distance Education of Spain, Spain)
Sergio Martín (National University for Distance Education of Spain, Spain)
Manuel Castro (National University for Distance Education of Spain, Spain)
Gabriel Díaz (National University for Distance Education of Spain, Spain)
Antonio Colmenar (National University for Distance Education of Spain, Spain)
Ivica Botički (University of Zagreb, Croatia)

A Crowdsourcing Caption Editor for Educational Videos
Rucha Deshpande (University of Houston, USA)
Tayfun Tuna (University of Houston, USA)
Jaspal Subhlok (University of Houston, USA)
Lecia Barker (University of Texas & School of Information, USA)

On Using the Cloud to Support Online Courses
Germán Moltó (Universitat Politècnica de València, Spain)
Miguel Caballer (Universitat Politècnica de València, Spain)

Improving Learning Outcomes by Designing Engaging Educational Tools
John Allan Casey (Unitec Institute of Technology, New Zealand)
Nilufar Baghaei (Unitec Institute of Technology, New Zealand)
Kalpana Nand (Mission Heights Primary School, New Zealand)

Developing Interactive Classroom Exercises for use with Mobile Devices to Enhance Class Engagement and
Problem-solving Skills
Debzani Deb (Winston-Salem State University, USA)
Mohammad Muztaba Fuad (Winston-Salem State University, USA)
Waleed Farag (Indiana University of Pennsylvania, USA)

Depecabot: A Hands on Workshop to Teach Robotics and to Improve Students Electronics Knowledge
Julio Pastor (University of Alcalá, Spain)
Pedro Revenga (University of Alcalá, Spain)
Marcelo Salazar Arcucci (University of Alcalá, Spain)
Ángel Sánchez García (University of Alcalá, Spain)
Carlos de la Rubia (University of Alcalá, Spain)
Juan García Domínguez (University of Alcalá, Spain)
Francisco Rodríguez (University of Alcalá, Spain)

A Novel Approach to Teaching Phased Array Antenna Systems
Paul B Crilly (U.S. Coast Guard Academy, USA)
Richard J Hartnett (U.S. Coast Guard Academy, USA)
Betty-Rose Santrach (U.S. Coast Guard Academy, USA)
Carlos Palenzuela (U.S. Coast Guard Academy, USA)

A first year, VHDL based, digital electronics course
José Daniel Muñoz Frias (Universidad Pontificia Comillas, Spain)
Sadot Alexandres (Universidad Pontificia Comillas, Spain)
Electrons to Light Bulbs: Understanding Electricity with a Multi-Level Simulation Environment ............................ 363
Elham Beheshti (Northwestern University, USA)
Asmaa Aljuhani (Northwestern University, USA)
Michael Horn (Northwestern University, USA)

Investigating Student Learning of the Voltage and Potential Concepts in Introductory Electrical Engineering....... 371
Dion Timmermann (Hamburg University of Technology, Germany)
Christian Kautz (Hamburg University of Technology, Germany)

A Model of Photo-Voltaic Generator for Education ...................................................................................................... 375
Joan Pons-Llinares (Universitat Politècnica de València, Spain)
José Belda-Gisbert (Universitat Politècnica de València, Spain)
Carla Montagud (Universitat Politècnica de València, Spain)
Jose Antonino-Daviu (Universitat Politècnica de València, Spain)

Roadmap towards the Openness of Educational Resources:
Outcomes of the participation in the eMadrid network.................................................................................................. 383
Edmundo Tovar (Technical University of Madrid, Spain)
Nelson Piedra (Technical University of Loja, Ecuador)
Jorge Lopez-Vargas (Technical University of Loja, Ecuador)
Janneth Chicaiza (Technical University of Loja, Ecuador)

Enhancing Higher Education Experience: The eMadrid initiative at UNED University............................................. 387
Miguel Rodriguez-Artacho (Universidad Nacional de Educación a Distancia, Spain)
Manuel Castro (Universidad Nacional de Educación a Distancia, Spain)
Luz Robles (Universidad Nacional de Educación a Distancia, Colombia)
Sergio Martín (Universidad Nacional de Educación a Distancia, Spain)
Salvador Ros (Universidad Nacional de Educación a Distancia, Spain)

Serious games: A journey from research to application ................................................................................................ 391
Pablo Moreno Ger (Complutense University of Madrid, Spain)
Ivan Martinez-Ortiz (Complutense University of Madrid, Spain)
Manuel Freire (Complutense University of Madrid, Spain)
Borja Manero (Complutense University of Madrid, Spain)
Baltasar Fernandez-Manjon (Complutense University of Madrid, Spain)

A Multidimensional Analysis of Trends in Educational Technology ............................................................................ 395
Carlos Delgado Kloos (Universidad Carlos III de Madrid, Spain)
María-Blanca Ibáñez (Universidad Carlos III de Madrid, Spain)
Carmen Fernandez-Panadero (Universidad Carlos III de Madrid, Spain)
Pedro J. Muñoz Merino (Universidad Carlos III de Madrid, Spain)
Iria Estevez-Ayres (Universidad Carlos III de Madrid, Spain)
Raquel Crespo (Universidad Carlos III de Madrid, Spain)
Carlos Alario Hoyos (Universidad Carlos III de Madrid, Spain)
Mar Pérez Sanagustín (Universidad Carlos III de Madrid, Spain)
Exploring on e-Learning Enhancement by Mean of Advanced Interactive Tools: The GHIA (Group of Advanced Interactive Tools) proposals

Xavier Alamán (Universidad Autónoma de Madrid, Spain)
Rosa M. Carro (Universidad Autonoma de Madrid, Spain)
Ivan Claros (Universidad Autónoma de Madrid, Spain)
Ruth Cobos (Universidad Autonoma de Madrid, Spain)
Leovy Echeverría (Universidad Autonoma de Madrid, Colombia)
Javier Gomez (Universidad Autónoma de Madrid, Spain)
Pablo A. Haya (Universidad Autonoma de Madrid, Spain)
Francisco Jurado (Universidad Autónoma de Madrid, Spain)
Germán Montoro (Universidad Autónoma de Madrid, Spain)
Jaime Moreno-Llorena (Universidad Autónoma de Madrid, Spain)
Alvaro Ortigosa (Universidad Autonoma de Madrid, Spain)
Pilar Rodriguez (Universidad Autonoma de Madrid, Spain)

Automatic Detection of Bad Programming Habits in Scratch: A Preliminary Study

Jesús Moreno León (Instituto Nacional de Tecnologias Educativas y de Formacion del Profesorado, Spain)
Gregorio Robles (Universidad Rey Juan Carlos, Spain)

EER2: Dissemination of Research and Teaching Innovations
Chair: Richard Layton
2:30 PM - 4:00 PM
Room: Aranjuez

Catalyzing Research-to-Practice Conversations: A Global, Interdisciplinary and Emergent Symposium in the Context of Learning to Design

Robin Adams (Purdue University, USA)
Andrew O. Brightman (Purdue University, USA)
Patrice Buzzanell (Purdue University, USA)
Monica Cardella (Purdue University, USA)
Nathalie Duval-Couetil (Purdue University, USA)
Michael Fosmire (Purdue University, USA)
Holly Jaycox (Purdue University, USA)
Shannon McMullen (Purdue University, USA)
Senay Purzer (Purdue University, USA)
David Radcliffe (Purdue University, USA)
Junaid Siddiqui (Purdue University, USA)
Fu Zhao (Purdue University, USA)

Learning from the Best: How Award-Winning Courseware Has Impacted Engineering Education

Flora McMartin (Broad-based Knowledge, LLC, USA)
Sarah Giersch (Broad-based Knowledge, LLC, USA)
Joseph Tront (Virginia Polytechnic University, USA)
Joshua Morrill (Morrill Solutions, USA)

Development and Propagation: A Case Study of the AIChE Concept Warehouse

Debra Gilbuena (Oregon State University, USA)
Christina Smith (Oregon State University, USA)
Milo Koretsky (Oregon State University, USA)

Promoting More Effective Communication of Stories in the Data

Richard Layton (Rose-Hulman Institute of Technology, USA)
Richard House (Rose-Hulman Institute of Technology, USA)
Matthew W Ohland (Purdue University, USA)
George Ricco (Purdue University, USA)
Enhancing Collaboration and Dissemination Through a Faculty Scheduled
Development Management Framework ............................................................... 432
Shohreh Hadian (Camosun College, Canada)

GBL2: Advances in Game Based Learning
Chair: Paul Anderson
2:30 PM - 4:00 PM
Room: La Granja

Taking It to the Next Interface Level: Advancing Game Design for Higher Education STEM Applications .......... 436
Elizabeth Lennon (Manhattan College, USA)
Brian Moriarty (Stevens Institute of Technology, USA)
Marko Zivkovic (Stevens Institute of Technology, USA)

A Game-Based Approach to Information Literacy and Engineering in Context ......................................................... 442
Kristin Boudreau (Worcester Polytechnic Institute, USA)
Laura R. Hanlan (Worcester Polytechnic Institute, USA)

BrasilEduca - An Open-Source MOOC platform for Portuguese speakers with gamification concepts ............... 446
Marcell Mesquita (Centro Universitário do Estado do Pará, Brazil)
Armando Toda (Universidade Estadual de Londrina, Brazil)
Jacques Brancher (Universidade Estadual de Londrina, Brazil)

Educational games for improving the teaching-learning process of a CLIL subject: Physics and Chemistry in
Secondary Education ................................................................................................. 450
Raquel Rodriguez (Universidad Antonio de Nebrija, Spain)
Manuel Blazquez (Universidad Antonio de Nebrija, Spain)
Beatriz López-Medina (Universidad Antonio de Nebrija, Spain)
Manuel Castro (Spanish University for Distance Education - UNED, Spain)
Elio Sancristóbal (Spanish University for Distance Education - UNED, Spain)
Sergio Martín (Spanish University for Distance Education - UNED, Spain)

The Impact of Open Educational Resources in Teacher Activities. A Perception Survey ............................................. 458
Sonia Valladares-Rodriguez (University of Vigo, Spain)
Roberto Perez Rodriguez (University of Vigo, Spain)
Manuel Fernández Iglesias (University of Vigo, Spain)
Montserrat Vazquez Gestal (University of Vigo, Spain)
Luis Anido-Rifón (University of Vigo, Spain)
Antonia Blanco Pesquera (University of Vigo, Spain)

Analysis of women enrollment in engineering programs at the Public University of Navarre ................................. 466
Gurutze Pérez-Artieda (Public University of Navarre, Spain)
Eugenio Gubía (Public University of Navarre, Spain)
Edurne Barrenechea (Public University of Navarre, Spain)
Pablo Sanchis (Public University of Navarre, Spain)
Antonio J López-Martin (Public University of Navarre, Spain)
David Astrain (Public University of Navarre, Spain)
Daniel Morato (Public University of Navarre, Spain)
Jesús López-Taberna (Public University of Navarre, Spain)
Ignacio R. Matias (Public University of Navarre, Spain)
Expanding women in undergraduate engineering: A mixed-methods analysis of recruitment cultures, practices, and policies .......................... 474
David Knight (Virginia Tech, USA)
Brian Novoselich (Virginia Tech, USA)
Lois Trautvetter (Northwestern University, USA)

Integrated Educational Research and Technical Experiences to Draw Females into the Energy Systems Area: The UPRM Experience ................................................................................................. 482
Lorena Delgado-Vazquez (University of Puerto Rico-Mayaguez, Puerto Rico)
Vivian Rodriguez (University of Puerto Rico-Mayaguez, Puerto Rico)
Luísa Feliciano-Cruz (University of Puerto Rico-Mayagüez, USA)
Liann Ruiz-Crespo (University of Puerto Rico-Mayaguez, Puerto Rico)
Ashley del Valle Morales (University of Puerto Rico-Mayaguez, Puerto Rico)
Eduardo Ortiz-Rivera (University of Puerto Rico-Mayaguez, Puerto Rico)

Understanding Gender Differences in Online Learning .................................................................................................................. 488
Julie Little-Wiles (Indiana University-Purdue University (IUPUI), USA)
Eugenia Fernandez (Indiana University-Purdue University (IUPUI), USA)
Patricia Fox (Indiana University-Purdue University (IUPUI), USA)

HFC1: Evaluating the Flipped Classroom Experience
Chair: Pramod Pathak
2:30 PM - 4:00 PM
Room: Escudo

Do Students Like the Flipped Classroom?
An Investigation of Student Reaction to a Flipped Undergraduate IT Course ................................................................. 492
Rob Elliott (IUPUI, USA)

Experimentation and Analysis of undergraduate students performance and satisfaction in a blended model of an introductory computer science and programming course ........................................ 499
Juliana Cristina Braga (ABC Federal University, Brazil)
Edson Pimentel (ABC Federal University, Brazil)
Itana Stiubiener (ABC Federal University, Brazil)
Silvia Dotta (ABC Federal University, Brazil)

An Analysis of Flip-Classroom Pedagogy in First Year Undergraduate Mathematics for Computing ..................... 507
Michael Bradford (National College of Ireland, Ireland)
Cristina Muntean (National College of Ireland, Ireland)
Pramod Pathak (National College of Ireland, Ireland)

A Pilot Flipped Engineering Education Class Utilizing the Online Delivery of Lectures with Speech-Synchronized PC-Screen-Capture Technology ................................................................. 512
Masanori Hanawa (University of Yamanashi, Japan)
Tatsuhiko Hinaga (University of Yamanashi, Japan)
Masayuki Morisawa (University of Yamanashi, Japan)
Hidetoshi Ando (University of Yamanashi, Japan)
Erik Tamaru (Fuji Xerox Co., Ltd., Japan)
Atsuhi Hirano (Fuji Xerox Co., Ltd., Japan)
Takeshi Nagamine (Fuji Xerox Co., Ltd., Japan)

Tools for the Flipped Classroom Model: an Experiment in Teacher Education ................................................................. 516
Aracelie Fassbinder (Federal Institute of Education, Science and Technology of the South of Minas Gerais, Brazil)
Glacicea Cruz (Federal University of Goiás (UFG), Brazil)
Danilo Moreira (Federal Institute of Education, Science and Technology of the South of Minas Gerais, Brazil)
Ellen Barbosa (University of São Paulo, Brazil)
PRO2: International Approaches to Teaching Professional Skills
Chair: Charles Wallace
2:30 PM - 4:00 PM
Room: Comendador

The development of transferable skills through continuous improvement: a case study in the UAE ..................... 524
Robert Craig (PETROLEUM INSTITUTE, UAE)

Co-curricular experiences link to nontechnical skill development for African-American engineers Communication, Teamwork, Professionalism, Lifelong Learning, and Reflective Behavior Skills ........... 530
Glenda Young (Virginia Tech, USA)
David Knight (Virginia Tech, USA)
Denise R. Simmons (Virginia Tech, USA)

A Suggested Strategy for Teamwork Teaching in Undergraduate Engineering Programmes Particularly in China ........................................................................................................... 537
Dan Zhang (Beijing University of Posts and Telecommunications, P.R. China)
Na Yao (Queen Mary, University of London, United Kingdom)
Laurie Cuthbert (Queen Mary, University of London, United Kingdom)
Steve Ketteridge (Queen Mary, University of London, United Kingdom)

An Investigation of the Team Knowledge and Team Performance of the Chinese Engineering Students in a Senior Technical Module ............................................................................................................................ 545
Dan Zhang (Beijing University of Posts and Telecommunications, P.R. China)
Paula Fonseca (Queen Mary, University of London, United Kingdom)
Laurie Cuthbert (Queen Mary, University of London, United Kingdom)
Steve Ketteridge (Queen Mary, University of London, United Kingdom)

Utilizing International Design Competitions for Enhancing 21st Century Engineering Skills: The Experience of Shell Eco-Marathon ......................................................................................................................... 553
Mahmoud Abdulwahed (Qatar University, Qatar)
Mohieddine Benammar (Qatar University, Qatar)
Mazen Omar Hasna (Qatar University, Qatar)
Saud Ghani (Qatar University, Qatar)

SCL: Mini Workshop - Developing Engineers for a Changing World through Modeling and Simulation-based Pedagogy
2:30 PM - 4:00 PM
Room: El Jardin

Mini Workshop - Developing Engineers for a Changing World through Modeling and Simulation-based Pedagogy ............................................................................................................................ 560
Kelsey J Rodgers (Purdue University, USA)
Heidi Diefes-Dux (Purdue University, USA)
Krishna Madhavan (Purdue University, USA)
Yi Kong (Purdue University, USA)

SCL2: Leveraging Student-centric Learning in Practice
Chair: Aubrie L Pfirman
2:30 PM - 4:00 PM
Room: Alcalá

Bridging Gaps in Engineering Education Design thinking a critical factor for project based learning ..................... 563
Ashis Jalote-Parmar (Indian Institute of Management, IIMA, India)
An Active Learning Methodology in Power Electronic Education
Francisco J. Maseda (University of the Basque Country, Spain)
Irene Martija (University of the Basque Country, Spain)
Itziar Martija (University of the Basque Country, Spain)

Inquiry-based approaches in K-12 classrooms to empower the next generation STEM workforce
Padmanabhan Seshaiyer (George Mason University, USA)
Jennifer Suh (George Mason University, USA)
Nathalia Peixoto (George Mason University, USA)
Mike Long (Howard Community College, USA)
Mimi Corcoran (George Mason University, USA)
Varinder Grewal (Robinson High School, USA)

A Classroom Observation Instrument to Assess Student Response to Active Learning
Cynthia Finelli (University of Michigan, USA)
Matt DeMonbrun (University of Michigan & School of Education, USA)
Prateek Shekhar (Virginia Polytechnic Institute, USA)
Maura Borrego (University of Texas, Austin, USA)
Michael Prince (Bucknell University, USA)
Charles Henderson (Western Michigan University, USA)
Cindy Waters (North Carolina A&T State University, USA)

Use of Argument Maps to Promote Critical Thinking in Engineering Education
Sean Rocke (The University of the West Indies, Trinidad and Tobago)
Cathy-Ann Radix (The University of the West Indies, Trinidad and Tobago)
Jeevan Persad (The University of The West Indies, Trinidad and Tobago)
Daniel Ringis (The University of the West Indies, Trinidad and Tobago)

A teacher's view about introductory programming teaching and learning:
difficulties, strategies and motivations
Anabela Gomes (University of Coimbra, Portugal)
António José Mendes (University of Coimbra, Portugal)

Leveraging Scrum Principles in Collaborative, Inter-disciplinary Service-Learning Project Courses
Brian Nejmeh (Messiah College, USA)
Daniel Weaver (Messiah College, USA)

Case study using Test-driven Learning methodology for building contextualized feedback by logical errors in Introductory Programming Learning
Dirson Campos (Federal University of Goiás, Portugal)
António José Mendes (University of Coimbra, Portugal)
Maria José Marcelino (University of Coimbra, Portugal)

"AliCe-Village" Alice as a Collaborative Virtual Learning Environment
Ahmad Al-Jarrah (New Mexico State University, USA)
Enrico Pontelli (New Mexico State University, USA)

Learning Supported by Peer Production and Digital Ink
José V Benlloch-Dualde (Universitat Politècnica de València, Spain)
Sara Blanc (Universitat Politècnica de València, Spain)
CBL3: Supporting Computer Based Learning
Chair: Jinghua Zhang
4:30 PM - 6:00 PM
Room: Patio 3

A Contribution to the Adoption of Software Product Lines in the Development of Mobile Learning Applications.... 628
Venilton Falvo Júnior (ICMC/USP, Brazil)
Nemesio Duarte Filho (ICMC/USP, Brazil)
Edson Oliveira Jr (UEM/PR, Brazil)
Ellen Barbosa (ICMC/USP, Brazil)

Teach Reconfigurable Computing using Mixed-grained Fabrics based Hardware Infrastructure ......................... 636
Chenchen Deng (Tsinghua University, P.R. China)
Leibo Liu (Tsinghua University, P.R. China)
Zhaoshi Li (Tsinghua University, P.R. China)
Shouyi Yin (Tsinghua University, P.R. China)
Shaojun Wei (Tsinghua University, P.R. China)

Using a Game-Like Module to Reinforce Student Understanding of Recursion .......................................................... 645
Jinghua Zhang (Winston-Salem State University, USA)
Mustafa Atay (Winston-Salem State University, USA)
Emanuel Smith (Winston-Salem State University, USA)
Rebecca Caldwell (Winston-Salem State University, USA)
Elva Jones (Winston-Salem State University, USA)

Engaging Computer Engineering Students with an Augmented Reality Software for Laboratory Exercises .......... 652
Jorge López Benito (CreativiTIC Innova SL, Spain)
Enara Artetxe González (CreativiTIC Innova SL, Spain)
Margarita Anastassova (CEA LIST, France)
Florent Souvestre (CEA LIST, France)

Signals and Systems Demonstrations for Undergraduates Using Android-based Localization .............................. 656
Paul Curtis (Arizona State University, USA)
Mahesh Banavar (Arizona State University, USA)
Xue Zhang (Arizona State University, USA)
Andreas Spanias (Arizona State University, USA)
Vitor Weber (Arizona State University, USA)

CUR1: Computer Science and Software Engineering Curricula Design 1
Chair: Jaspal Subhlok
4:30 PM - 6:00 PM
Room: Doblon

Student-Faculty Collaboration on Design of Innovative Agile Software Engineering Curriculum ......................... 660
Vladimir Uskov (Bradley University, USA)
Harika Govada (Bradley University, USA)

Research Methodology Education in Computing: Arrangements and Results from Two Courses .......................... 668
Matti Tedre (Stockholm University, Sweden)
Harko Verhagen (Stockholm University, Sweden)

Gamification of Software Engineering Curriculum ....................................................................................................... 674
Vladimir Uskov (Bradley University, USA)
Bhuvana Sekar (Bradley University, USA)
An Innovative Approach to Software Engineering Term Projects,
Coordinating Student Efforts Between Multiple Teams Over Multiple Semesters ....................................................... 682
John Bell (University of Illinois Chicago, USA)
Anushri Prabhu (University of Illinois Chicago, USA)

A Model for Designing Learning Experiences for Computer Science Curriculum................................................. 689
Ioana Ghergulescu (National College of Ireland, Ireland)
Paul Stynes (National College of Ireland, Ireland)
Pramod Pathak (National College of Ireland, Ireland)

**DIS1: Massively Open On-line Courses: Then and Now**
Chair: Manuel Castro
4:30 PM - 6:00 PM
Room: Escudo

**MOOCs with Attitudes Insights from a Practitioner Based Investigation**.............................................................. 693
Monika Chadaj (University of St Andrews, United Kingdom)
Colin Allison (University of St Andrews, United Kingdom)
Gordon Baxter (University of St Andrews, United Kingdom)

Analysis of demographics and results of student's opinion survey of a large scale MOOC deployment for the Spanish speaking community ......................................................... 702
Ignacio Despujol (Universitat Politècnica de València, Spain)
Carlos Turro (Universitat Politècnica de València, Spain)
Jaime Busquets (Universitat Politècnica de València, Spain)
Aristóteles Cañero (Universitat Politècnica de València, Spain)

Telescope, a MOOC's initiative in Latin America: Infrastructure, Best Practices, Completion and Dropout Analysis .......................................................................................... 710
Miguel Morales Chan (Galileo University, Guatemala)
Rocael Hernandez-Rizzardini (Galileo University, Guatemala)
Christian Guetl (Graz University of Technology, Austria)

This is NOT a MOOC! Reflections on On-Line Asynchronous Education............................................................ 717
Larry Richards (University of Virginia, USA)

Utilizing MOOCs for Blended Learning in Higher Education.................................................................................. 723
Ali Shafaat (Purdue University, USA)
Farshid Marbouti (Purdue University, USA)
Kelsey J Rodgers (Purdue University, USA)

**EER3: Diverse Perspectives and Experiences in Engineering and Computer Science**

4:30 PM - 6:00 PM
Room: Aranjuez

The People Part of Engineering: Engineering For, With, and As People .............................................................. 727
Nicholas D Fila (Purdue University, USA)
Justin Hess (Purdue University, USA)
Avneet Hira (Purdue University, USA)
Cole Joslyn (Purdue University, USA)
DeLean Tolbert (Purdue University, USA)
Morgan Hynes (Purdue University, USA)
Bilingualism as a Meaning-Making Resource for Learning Engineering ................................................................. 736
Alberto Esquinca (University of Texas at El Paso, USA)
Erika Mein (University of Texas at El Paso, USA)
Elsa Villa (University of Texas at El Paso, USA)
Angelica Monarrez (University of Texas at El Paso, USA)

Determining Student Beliefs about Engineering ........................................................................................................ 741
Mary Anderson-Rowland (Arizona State University, USA)
Armando Rodriguez (Arizona State University, USA)
Anita Grierson (Arizona State University, USA)

The Powerful Construction of Norms within Sophomore Engineering ........................................................................ 748
Janet Tsai (University of Colorado Boulder, USA)
Daria Kotys-Schwartz (University of Colorado Boulder, USA)
Daniel Knight (University of Colorado Boulder, USA)

A Pilot Study of the Dimensions of Disciplinary Culture among Engineering Students .............................................. 753
Homero Murzi (Virginia Polytechnic Institute and State University, USA)
Thomas L. Martin (Virginia Polytechnic Institute and State University, USA)
Lisa McNair (Virginia Polytechnic Institute and State University, USA)
Marie Paretti (Virginia Polytechnic Institute and State University, USA)

GBL1: Programming and Game Based Learning
Chair: Leônidas O. Brandão
4:30 PM - 6:00 PM
Room: La Granja

Serious Games for Motivating into Programming ......................................................................................................... 757
Raquel Hijon-Neira (Universidad Rey Juan Carlos, Spain)
J. Ángel Velázquez-Iturbide (Universidad Rey Juan Carlos, Spain)
Celeste Pizarro-Romero (Universidad Rey Juan Carlos, Spain)
Luís Carriço (University of Lisbon, Portugal)

A game Engine to Learn Computer Science Languages ................................................................................................ 765
Angel Serrano-Laguna (Complutense University of Madrid, Spain)
Javier Torrente (Complutense University of Madrid, Spain)
Borja Manero (Complutense University of Madrid, Spain)
Baltasar Fernandez-Manjon (Complutense University of Madrid, Spain)

Evaluation of the lasting impacts on employability of co-operative serious game-playing by first year Computing students: An exploratory analysis ..................................................................................... 772
Jyoti Bhardwaj (Edinburgh Napier University, United Kingdom)

A Review of Games Designed to Improve Introductory Computer Programming Competencies .................................. 781
Adilson Vahldick (University of Coimbra, Portugal)
António José Mendes (University of Coimbra, Portugal)
Maria José Marcelino (University of Coimbra, Portugal)

Object-Oriented Sokoban Solver: A Serious Game Project for OOAD and AI Education ............................................. 788
Zheng Li (Australian National University (ANU) & National ICT Australia (NICTA), Australia)
Liam O’Brien (Geoscience Australia, Australia)
Shayne Flint (Australian National University (ANU), Australia)
Ramesh Sankaranarayana (Australian National University (ANU), Australia)
GDI3: Developing a Diverse and Inclusive Faculty
Chair: DeLois Kijana Crawford
4:30 PM - 6:00 PM
Room: Patio 1

Institutional Transformation at a Large Private Technical University:
Reporting on the Accomplishments of a Combined Data Driven Top-Down and Bottom-Up Approach
Sharon Mason (Rochester Institute of Technology, USA)
Carol Marchetti (Rochester Institute of Technology, USA)
DeLois Kijana Crawford (Rochester Institute of Technology, USA)
Margaret Bailey (Rochester Institute of Technology, USA)
Susan Foster (Rochester Institute of Technology, USA)
Elizabeth Dell (Rochester Institute of Technology, USA)
Stefi Baum (Rochester Institute of Technology, USA)
Laurie Clayton (Rochester Institute of Technology, USA)
Maureen Valentine (Rochester Institute of Technology, USA)

Considerations for the Effective Mentoring of STEM Women of Color Faculty at a Striving Private Technical University
DeLois Kijana Crawford (Rochester Institute of Technology, USA)

Interactive Theatre to Engage Faculty in Difficult Dialogues: First Implementation
Michelle Madsen Camacho (University of San Diego, USA)
Susan M. Lord (University of San Diego, USA)
Lisa Baird (University of San Diego, USA)
Perla Myers (University of San Diego, USA)
Jane Friedman (University of San Diego, USA)
Sandra Sgoutas-Emch (University of San Diego, USA)

Emphasizing Professional Skills and Professional Values: Investigating the role of faculty's gender and departmental gender diversity
Matt DeMonbrun (University of Michigan, USA)
Michael G. Brown (University of Michigan, USA)

MINI WS: To what extent can instructors influence student motivation in the classroom?
4:30 PM - 6:00 PM
Room: El Escorial

To what extent can instructors influence student motivation in the classroom?
Jonathan 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 Gross (Bucknell University, USA)

PRO3: Assessing Student Professional Skills
Chair: Jesus Alfonso Perez Gama
4:30 PM - 6:00 PM
Room: Comendador

Fair Assessment of Group Work by Mutual Evaluation Based on Trust Network
Yumeno Shiba (Waseda University, Japan)
Toshiharu Sugawara (Waseda University, Japan)

Learning after learning: Perceptions of engineering alumni on skill development
Timothy Kinoshita (Virginia Tech, USA)
Glenda Young (Virginia Tech, USA)
David Knight (Virginia Tech, USA)
Developing well-rounded graduates through integration of soft skills in the teaching of engineering courses .......... 835
Hairuzila Idrus (Universiti Teknologi PETRONAS, Malaysia)

Professional Competency Attainment in a Project Based Learning Curriculum ................................. 844
Bart Johnson (Itasca Community College & Iron Range Engineering, Aalborg University, USA)
Ron Ulseth (Iron Range Engineering, USA)

Misalignment of everyday and technical language ................................................................................ 848
Mirjam Glessmer (Hamburg University of Technology, Germany)
Andrea Brose (Hamburg University of Technology, Germany)

SCL3: Student-centric Learning, Beyond the Classroom
Chair: Jenni Rikala
4:30 PM - 6:00 PM
Room: Alcalá

Learning to Learn: The Co-Evolution of an Institution and its Students ................................................ 852
Sebastian Dziallas (Franklin W. Olin College of Engineering, United Kingdom)
Sally Fincher (University of Kent, United Kingdom)

Transforming Engineering and Science Education Through Active Learning ........................................ 859
Massood Towhidnejad (Embry-Riddle Aeronautical University, USA)
Thomas Hilburn (Embry-Riddle Aeronautical University, USA)
Salamah Salamah (University of Texas El Paso, USA)

Long Term Impacts of Off-Campus Project Work on Student Learning and Development ..................... 864
Richard Vaz (Worcester Polytechnic Institute, USA)
Paula Quinn (Quinn Evaluation Consulting, USA)

Authentic Learning in Cybersecurity: Learning Opportunities and Pedagogical Challenges ..................... 869
Hwee-Joo Kam (Ferris State University, USA)
Greg Gogolin (Ferris State University, USA)
Gerald Emerick (Ferris State University, USA)

On the Evaluation of an Open Software Engineering Course ............................................................. 873
Eduardo Figueiredo (Federal University of Minas Gerais (UFMG), Brazil)
Juliana Pereira (Federal University of Minas Gerais (UFMG), Brazil)
Lucas Garcia (Federal University of Minas Gerais (UFMG), Brazil)
Luciana Lourdes (Federal University of Minas Gerais (UFMG), Brazil)

Individual creativity and team engineering design: a taxonomy for team composition .......................... 881
Kylie Berger (South Dakota School of Mines and Technology, USA)
Andrea Surovec (South Dakota School of Mines and Technology, USA)
Dean Jensen (South Dakota School of Mines and Technology, USA)
David Cropley (University of South Australia, Australia)

TLE: Improvisation as a Tool to Develop Creativity
4:30 PM - 6:00 PM
Room: El Jardin

Improvisation as a tool to develop creativity ............................................................................................. 885
Eti de Vries (Hanze University of Applied Sciences, The Netherlands)
Synergies between Writing Stories and Writing Programs in Problem-Solving Courses ............................................. 888
Candido Cabo (New York City College of Technology/CUNY, USA)
Reneta D. Lansiquot (New York City College of Technology/CUNY, USA)

Digital Technology Teachers' Perceptions of Computer Science: It is not all about programming ......................... 897
Elena Prieto (The University of Newcastle, Australia)
Regina Berretta (The University of Newcastle, Australia)

A first course in engineering design combining just-in-time CAD instruction within a horizontally integrated design project. ............................................................................................................... 902
Wilhelm Friess (University of Maine, USA)

Learning by Competing and Competing by Learning: Experience from the e-Yantra Robotics Competition.......... 909
Saraswathi Krithivasan (Indian Institute of Technology Bombay, India)
Saurav Shandilya (Indian Institute of Technology Bombay, India)
Kavi Arya (Indian Institute of Technology Bombay, India)
Krishna Lala (Indian Institute of Technology Bombay, India)
Piyush Manavar (Indian Institute of Technology Bombay, India)
Sachin Patil (Indian Institute of Technology Bombay, India)
Shailesh Jain (Indian Institute of Technology Bombay, India)

Emulating a Corporate Software Development Environment
Through Collaboration Between Student Projects in Six Courses ................................................................................ 917
Laura Grabowski (University of Texas-Pan American, USA)
Christine F Reilly (University of Texas - Pan American, USA)
Wendy A LawrenceFowler (The University of Texas-Pan American, USA)
Friday, October 24

**CBL4: Case Studies in Computer Based Learning**
9:00 AM - 10:30 AM
Room: Patio 3

*Desktop vs. Mobile: A Comparative Study of Augmented Reality Systems for Engineering Visualizations in Education* ................................................................. 924
Jorge D. Camba (Texas A&M University, USA)
Manuel Contero (Universitat Politècnica de València, Spain)
Gustavo Salvador-Herranz (Universidad CEU Cardenal Herrera, Spain)

Elena Verdu Pèrez (Universidad de Valladolid, Spain)
Luisa Reguera (Universidad de Valladolid, Spain)
Maria Jesús Verdu Pèrez (Universidad de Valladolid, Spain)
Juan Pablo de Castro Fernández (University of Valladolid, Spain)
Dan Kohen-Vacs (Holon Institute of Technology, Israel)
Eran Gal (Holon Institute of Technology, Israel)
Michaela Ronen (Holon Institute of Technology, Israel)

*Programming web-course analysis: how to introduce computer programming?* ......................................................... 939
Romenig Ribeiro (University of Sào Paulo, Brazil)
Leónidas O Brandão (University of Sào Paulo, Brazil)
Tulio Faria (University of Sào Paulo, Brazil)
Anarosa A. F. Brandão (University of Sào Paulo, Brazil)

*Learning and Practicing Object-Oriented Programming Using a Collaborative Web-based IDE* ......................... 947
Vu Nguyen (University of Science, VNU-HCMC, Vietnam)
Hai H Dang (University of Science, VNU-HCMC, Vietnam)
Kha N Do (University of Science, VNU-HCMC, Vietnam)
Tran Thu (University of Science, VNU-HCMC, Vietnam)

*Adaptive Learning in Computing for non-native Speakers* .................................................................................... 956
Yann Rimbaud (Edinburgh Napier University, United Kingdom)
Tom G McEwan (Edinburgh Napier University, United Kingdom)
Alistair Lawson (Edinburgh Napier University, United Kingdom)
Sandra Cairncross (Edinburgh Napier University, United Kingdom)

*Analysis of Self-Regulated Learning Strategies Oriented to the Design of Software Support* ......................... 960
Mario Manso Vazquez (University of Vigo, Spain)
Manuel Caeiro (University of Vigo, Spain)
Martin Llamas-Nistal (University of Vigo, Spain)

**EER4: Creativity and Innovativeness in Engineering**
Chair: Stuart Kellogg
9:00 AM - 10:30 AM
Room: Aranjuez

*Evaluation of a Distributed Collaborative Workspace as a Creativity Tool in the Context of Design Education* ...... 969
Gustavo Salvador-Herranz (Universidad CEU Cardenal Herrera, Spain)
Manuel Bañó-Hernández (Universidad CEU Cardenal Herrera, Spain)
Manuel Contero (Universitat Politècnica de València, Spain)
Jorge D. Camba (Texas A&M University, USA)
Creativity, Innovation, and Ingenuity Summer Enrichment Program - Collaborating with a Cultural Institution and Preliminary Assessment .......................................................... 976
Andrew L. Gerhart (Lawrence Technological University, USA)
Donald D. Carpenter (Lawrence Technological University, USA)

The relationship between creative self-concepts, perceptions of global readiness, and travel experiences of engineering students........................................................................ 981
Sarah Zappe (Penn State University, USA)
Philip Reeves (Penn State University, USA)
Irene Mena (Penn State University, USA)
Thomas Litzinger (Penn State University, USA)

Cultures of Innovation Among Chemical, Civil, and Mechanical Engineering Students: A Qualitative Study........ 988
Nicholas D Fila (Purdue University, USA)
Senay Purzer (Purdue University, USA)
Rami Chakroun (Purdue University, USA)

Characterizing Engineering Innovativeness through a Modified Delphi Study ......................................................... 995
Daniel Ferguson (Purdue University, USA)
Senay Purzer (Purdue University, USA)
Matthew W Ohland (Purdue University, USA)
Kathryn Jablokow (Pennsylvania State University, USA)
Jessica Menold (Pennsylvania State University, USA)

ETH: Defining and Assessing Engineering Ethics in an International Context
9:00 AM - 10:30 AM
Room: El Escorial

Defining and Assessing Engineering Ethics in an International Context ................................................................. 999
Carla Zoltowski (Purdue University, USA)
William Oakes (Purdue University, USA)
Patrice Buzzanell (Purdue University, USA)
Qin Zhu (Purdue University, USA)
Megan Kenny Feister (Purdue University, USA)

FYE2: First Year Engineering 2
Chair: Catherine E. Brawner
9:00 AM - 10:30 AM
Room: Doblon

First Year Engineering Experience at Ferdowsi University of Mashhad ..................................................................... 1001
Mohammad Molavi Kakhki (Ferdowsi University of Mashhad, Iran)
Asad Azemi (Pennsylvania State University, Brandywine Campus, USA)

Promoting positive start of electrical engineering studies - a teacher's perspective ....................................................... 1004
Sami Kujala (Aalto University, Finland)
Anu Lehtovuori (Aalto University, Finland)
Mikko Honkala (Aalto University, Finland)

First-Year Engineering Students' Nanotechnology Awareness, Exposure and Motivation Before and After Educational Interventions ........................................................................ 1012
Oguz Hanoglu (Purdue University, USA)
Anna Douglas (Purdue University, USA)
Krishna Madhavan (Purdue University, USA)
Heidi Diefes-Dux (Purdue University, USA)
Enhancing an introductory programming course with physical computing modules ................................................ 1019
Miguel Rubio (University of Granada, Spain)
Rocio Romero-Zaliz (University of Granada, Spain)
Carolina Mañoso Hierro (UNED - Universidad Nacional de Educación a Distancia, Spain)
Ángel Pérez de Madrid y Pablo (UNED - Universidad Nacional de Educación a Distancia, Spain)

First-Year Engineering Students' Self-Reported Knowledge of Nanotechnology -
The Development of a Coding Scheme ......................................................................................................................... 1027
Oguz Hanoglu (Purdue University, USA)
Kelsey J Rodgers (Purdue University, USA)
Yi Kong (Purdue University, USA)
Krishna Madhavan (Purdue University, USA)
Heidi Diefes-Dux (Purdue University, USA)

GBL3: Diverse Perspectives on Game Based Learning
Chair: Oscar Coltell
9:00 AM - 10:30 AM
Room: La Granja

Proposal of a computerized environment to support the development of game-based learning .................... 1031
Joao Coelho Neto (Northern Paraná Public University, Brazil)
Sheila Reinehr (Pontifical Catholic University, Brazil)
Andreia Malucelli (Pontifical Catholic University, Brazil)

Designing Serious Games for Learning Support in Medicine Studies:
A Specific Method to Elicit and Formalize Requirements ........................................................................................... 1039
Oscar Coltell (Universitat Jaume I, Spain)
Ximo Granell (Universitat Jaume I, Spain)
Ricardo Tosca (Universitat Jaume I, Spain)
Pedro Latorre (Universitat Jaume I, Spain)
José Sánchez (Universitat Jaume I, Spain)
Luis Vicente Lizán (Universitat Jaume I, Spain)
Francisco Ros-Bernal (Universitat Jaume I, Spain)
Conrado Martinez-Cadenas (Universitat Jaume I, Spain)

Updating Aristotle, Freytag & Campbell With Lakoff and Frames: Designing Interactive Narratives In Games.... 1043
Gordon Goodman (Rochester Institute of Technology, USA)
David Simkins (Rochester Institute of Technology, USA)
Physical Response to Feedback in Game-Based Learning .......................................................................................... 1050
Kelsey J Rodgers (Purdue University, USA)
Mariana Tafur (Purdue University, USA)
Farshid Marbouti (Purdue University, USA)
Justin Seipel (Purdue University, USA)

Engineering education through an intercontinental PLM collaborative project: The Global Factory Case Study .. 1054
Ricardo Mejía-Gutiérrez (Universidad EAFIT, Colombia)
Ricardo Carvajal-Arango (Universidad EAFIT, Colombia)
Julien Zins (Ecole Nationale d’Ingenieurs de Metz, France)

GDI4: Overcoming Gender, Diversity, and Inclusivity as Barriers to Education
Chair: Oladipo Onipede
9:00 AM - 10:30 AM
Room: Patio 1

The Effect of Institution Mission Drift on STEM Faculty Career Advancement at a Striving University .......... 1062
DeLois Kijana Crawford (Rochester Institute of Technology, USA)
Empowering Early Mastery of Spatial Visualization Skills in Underrepresented Minority Engineering Students... 1068
Olufunmilayo Adebayo (Cornell University, USA)
Emily Farrar (Cornell University, USA)
Rick Evans (Cornell University, USA)
Tyi McCray (Cornell University, USA)
Traci Nathans-Kelly (Cornell University, USA)

Promoting Inclusive Design Practice at the Global Game Jam: A Pilot Evaluation................................. 1076
Michael Scott (Brunel University, United Kingdom)
Gheorghita Ghinea (Brunel University, United Kingdom)
Ian Hamilton (Independent Accessibility Consultant, United Kingdom)

Finding Effective Ways to Teach Non-traditional Students: A Different Model of Teaching and Learning........... 1080
Sara Hooshangi (The George Washington University, USA)

Getting Better With Age: Older Students Achieve Higher Grades and Graduation Rates ......................... 1083
Jacqueline McNeil (Purdue University, USA)
Russell Long (Purdue University, USA)
Matthew W Ohland (Purdue University, USA)

MINI WS: Mini-Workshop - Inquiry Based Learning Activities: Hands on Activities to Improve Conceptual Understanding
9:00 AM - 10:30 AM
Room: El Jardin

Mini-Workshop - Inquiry Based Learning Activities: Hands on Activities to Improve Conceptual Understanding............................................................................................................................. 1088
James Widmann (California Polytechnic State University, USA)
Brian Self (California Polytechnic State University, USA)
Michael Prince (Bucknell University, USA)

PRO4: Techniques and Tools to Teach Professional Skills
Chair: Karl O. Jones
9:00 AM - 10:30 AM
Room: Comendador

Developing Professional Skills at Tertiary Level: A Model to Integrate Competencies across the Curriculum...... 1090
Fermin Sanchez (Universitat Politecnica de Catalunya - BarcelonaTech, Spain)
Antonia Soler (Universitat Politecnica de Catalunya - BarcelonaTech, Spain)
David Lopez (Universitat Politecnica de Catalunya - BarcelonaTech, Spain)
Carme Martin (Universitat Politecnica de Catalunya - BarcelonaTech, Spain)
Alicia Ageno (Universitat Politecnica de Catalunya - BarcelonaTech, Spain)
Lluis Belanche Muñoz (Universitat Politecnica de Catalunya, Spain)
Jose Cabre (Universitat Politecnica de Catalunya - BarcelonaTech, Spain)
Erik Cobo (Universitat Politecnica de Catalunya - BarcelonaTech, Spain)
Rafel Farré (Universitat Politecnica de Catalunya - BarcelonaTech, Spain)
Jordi Garcia (Universitat Politecnica de Catalunya - BarcelonaTech, Spain)
Pere Marès (Universitat Politecnica de Catalunya - BarcelonaTech, Spain)

Instruction in Software Project Communication through Guided Inquiry and Reflection ............................. 1099
Shreya Kumar (Michigan Technological University, USA)
Charles Wallace (Michigan Technological University, USA)
An Immersive Platform for Collaborative Projects ................................................................. 1108
Lisa Dow (University of St Andrews, United Kingdom)
Anne Campbell (University of St Andrews, United Kingdom)
Alan H. D. Miller (University of St Andrews, United Kingdom)
John McCaffery (University of St Andrews, United Kingdom)
Iain Oliver (University of St Andrews, United Kingdom)
Sarah Kennedy (University of St Andrews, United Kingdom)
Colin Allison (University of St Andrews, United Kingdom)

Transversal Competencies of Electrical and Computing Engineers considering market demand ............. 1117
Leandro Yanaze (Polytechnical School of University of Sao Paulo, Brazil)
Roseli Lopes (Polytechnical School of University of Sao Paulo, Brazil)

Developing Engineering Students’ Language and Cultural Skills for Academic and Professional Success........ 1121
Laura Hahn (University of Illinois at Urbana-Champaign, USA)
LuAnn Sorenson (University of Illinois at Urbana-Champaign, USA)

Educational web platform for performing the engineering experimental work ............................................. 1125
Itziar Martija (University of the Basque Country, Spain)
Francisco J. Maseda (University of the Basque Country, Spain)
Irene Martija (University of the Basque Country, Spain)

Mobile open online laboratories:
A way towards connectionist massive online laboratories with x-API (c-MOOLs) ........................................... 1129
Hamadou Saliah-hassane (TELUQ - University of Quebec, Canada)
Adrien Reuzeau (Université de Rennes 1, France)

Simplifying the Implementation of Educational Online Laboratories ......................................................... 1136
Danilo G. Zutin (Carinthia University of Applied Sciences, Austria)
Amir Mujkanovic (Carinthia University of Applied Science, Austria)
Michael Auer (Carinthia University of Applied Science, Austria)

An Automatic Assessment Model for Remote Laboratories ........................................................................ 1139
Susana Romero (University of Deusto, Spain)
Mariluz Guenaga (Deusto Institute of Technology – DeustoTech, Spain)
Javier Garcia-Zubia (University of Deusto, Spain)
Pablo Orduña (Deusto Institute of Technology - DeustoTech, University of Deusto, Spain)

Remote Laboratories for Renewable Energy Courses at Jordan Universities ............................................. 1143
A. Y. Al-Zoubi (Princess Sumaya University for Technology, Jordan)
Bashar Hammad (The Hashemite University, Jordan)
Salvador Ros (Spanish University for Distance Education - UNED, Spain)
Llanos Tobarra (Spanish University for Distance Education - UNED, Spain)
Roberto Hernandez (Spanish University for Distance Education - UNED, Spain)
Rafael Pastor Vargas (Spanish University for Distance Education - UNED, Spain)
Manuel Castro (Spanish University for Distance Education - UNED, Spain)
**SCL5: Student-centric Learning in Engineering**  
Chair: Jordi Fortuny-Santos  
9:00 AM - 10:30 AM  
Room: Alcalá

Teaching Effective Requirements Engineering for Large-scale Software Development with Scaffolding .......... 1147  
Maria Feldgen (Universidad de Buenos Aires, Argentina)  
Osvaldo Clua (Universidad de Buenos Aires, Argentina)

Several Issues and Possible Solutions in Compulsory Project-based Course .......................................................... 1155  
Ya Zhou (Beijing Institute of Technology, P.R. China)  
Yuejin Zhao (Beijing Institute of Technology, P.R. China)  
Yao Hu (Beijing Institute of Technology, P.R. China)  
Liquan Dong (Beijing Institute of Technology, P.R. China)  
Ming Liu (Beijing Institute of Technology, P.R. China)  
Dayuan Yan (Beijing Institute of Technology, P.R. China)

xPBL: a Methodology for Managing PBL when Teaching Computing .............................................................. 1162  
Simone Santos (UFPE, Brazil)  
Felipe Soares (CESAR, Brazil)  
W. Lins (CESAR, Brazil)

Improving Communication Skills: Students' Viewpoint on a Content & Language Integrated Learning Project.... 1170  
Montserrat Alsina (Universitat Politècnica de Catalunya-BarcelonaTech, Spain)  
Jordi Fortuny-Santos (Universitat Politècnica de Catalunya-BarcelonaTech, Spain)  
Conxita Lao-Luque (Universitat Politècnica de Catalunya-BarcelonaTech, Spain)  
Francesc Xavier de las Heras-Cisa (Universitat Politècnica de Catalunya-BarcelonaTech, Spain)

An Industry-Mentored Undergraduate Software Engineering Project ............................................................... 1177  
Azim Abdool (The University of the West Indies, Trinidad and Tobago)  
Akash Pooransingh (The University of the West Indies, Trinidad and Tobago)

The Learner Experience of Student-Led International Group Project Work in Software Engineering ................. 1181  
Roger McDermott (Robert Gordon University, United Kingdom)  
Julian Bass (Robert Gordon University, United Kingdom)  
JayPrakash Lalchandani (International Institute for Information Technology, India)

**TLE4: Developing Professional Competencies**  
Chair: Venky Shankararaman  
9:00 AM - 10:30 AM  
Room: La Galería

Subject-Level Quality Assurance In Computing: Experiences From Three National Perspectives .................... 1189  
Roger McDermott (Robert Gordon University, United Kingdom)  
Mats Daniels (Uppsala University, Sweden)  
Marta Lárusdóttir (Reykjavik University, Iceland)

From employability attributes to professional identity: students transitioning to the workplace ....................... 1197  
Sally Smith (Edinburgh Napier University, United Kingdom)  
Emilia Sobolewska (Edinburgh Napier University, United Kingdom)  
Ian Smith (Edinburgh Napier University, United Kingdom)

Using mobile devices and internet technologies in problem-based learning: design of a suitable active and collaborative learning environment in engineering education ..................................................... 1205  
Carlos Efrén Mora Luis (La Laguna University, Spain)  
Jorge Martín-Gutiérrez (La Laguna University, Spain)  
Antonio Manuel González Marrero (La Laguna University, Spain)
Design of a competences based teaching model supported in the integration of repositories and LMS platforms for the Automatic Control of Processes course

Isabel Cristina Gómez Galvis (EAFIT University, Colombia)
Adalberto Gabriel Díaz Torres (EAFIT University, Colombia)
Claudia María Zea Restrepo (EAFIT University, Colombia)
Luis Felipe Zapata Rivera (EAFIT University, Colombia)

A Practical Guide for Novice Supervisors of Master's Thesis

Alicia Triviño (University of Malaga, Spain)
Sebastian Rivas (University of Malaga, Spain)

Pursuing the Frontiers: The History and Future of the Frontiers in Education Conference
11:00 AM - 12:30 PM
Room: El Jardin

Pursuing the Frontiers: The History and Future of the Frontiers in Education Conference

Larry Richards (University of Virginia, USA)

CBL5: Models and Methods in Computer Based Learning

Chair: Pramod Abichandani
11:00 AM - 12:30 PM
Room: Patio 3

Enhancing web-based learning resources with quizzes through an Authoring Tool and an Audience Response System

Aldo Gordillo (Universidad Politécnica de Madrid, Spain)
Enrique Barra (Universidad Politécnica de Madrid, Spain)
Juan Quemada Vives (Universidad Politécnica de Madrid, Spain)

Student Perceptions of Indexed, Searchable Videos of Faculty Lectures

Lecia Barker (University of Texas at Austin, USA)
Christopher L Hovey (Northeastern University, USA)
Jaspal Subhlok (University of Houston, USA)
Tayfun Tuna (University of Houston, USA)

iPlan: a model of lesson plans to help teaching process in Web learning environment

Reginaldo do Prado (University of São Paulo, Brazil)
Leônidas O Brandão (University of São Paulo, Brazil)
Anarosa A. F. Brandão (University of São Paulo, Brazil)

Performance Evaluation of an Intelligent Multimedia Learning Assistant Platform

Chenn-Jung Huang (National Dong Hwa University, Taiwan)
Shun-Chih Chang (National Dong Hwa University, Taiwan)
Heng-Ming Chen (National Dong Hwa University, Taiwan)
Chao-Yi Chen (National Dong Hwa University, Taiwan)

A Cloud Enabled Virtual Reality Based Pedagogical Ecosystem for Wind Energy Education

Pramod Abichandani (Drexel University, USA)
William Fligor (Drexel University, USA)
Eli Fromm (Drexel University, USA)

From 2D to 3D: Teaching terrain representation in engineering studies through Augmented Reality: Comparative versus 3D pdf

Francisco Javier Ayala Álvarez (I.E.S. Politécnico Jesús Marín, Spain)
Elidia Blázquez (Universidad de Málaga, Spain)
Francisco Montes Tubio (Universidad de Córdoba, Spain)
CUR2: Computer Science and Software Engineering Curricula Design 2
11:00 AM - 12:30 PM
Room: Doblon

Case studies in computing education: presentation, evaluation and assessment of four case study-based course design and delivery models ................................................................. 1267
Ilse Baumgartner (Singapore Management University, Singapore)
Venky Shankarakaraman (Singapore Management University, Singapore)

Dutch-Russian Double Degree Master's Program Curricula in Computational Science and High Performance Computing ................................................................. 1275
Anna Bilyatdinova (ITMO University, Russia)
Alexey Dukhanov (ITMO University, Russia)
Klavdiya Bochenina (ITMO University, Russia)
Valeria V. Krzhizhanovskaya (University of Amsterdam, The Netherlands)
Alexander Boukhanovsky (ITMO University, Russia)
Peter Sloot (University of Amsterdam, The Netherlands)

RIT's New Minor in Free and Open Source Software and Free Culture: A Five Year Journey Driven By Student-Centered, Applied Research ................................................................. 1283
Stephen Jacobs (Rochester Institute of Technology, USA)
Amit Ray (Rochester Institute of Technology, USA)
Jon Schull (Rochester Institute of Technology, USA)

Diversifying Cybersecurity Education: A Non-Technical Approach to Technical Studies ................................................................. 1286
Hwee-Joo Kam (Ferris State University, USA)
Pairin Katerattanakul (Ferris State University, USA)

Explorations in Computing: Could this be the Key to Retention? ................................................................. 1290
Linda Ott (Michigan Technological University, USA)

EER5: Modeling and Predicting Student Behavior
Chair: Laura R. Hanlan
11:00 AM - 12:30 PM
Room: Aranjuez

SETAP: Software Engineering Teamwork Assessment and Prediction Using Machine Learning ................................................................. 1299
Dragutin Petkovic (San Francisco State University, USA)
Marc Sosnick-Pérez (San Francisco State University, USA)
Shihong Huang (Florida Atlantic University, USA)
Rainer Todtenhoefer (University of Applied Science, Fulda, Germany)
Kazunori Okada (San Francisco State University, USA)
Swati Arora (San Francisco State University, USA)
Ramasubramanian Sreenivasen (San Francisco State University, USA)
Lorenzo Flores (San Francisco State University, USA)
Sonal Dubey (San Francisco State University, USA)

Predicting Students' Performance on Intelligent Tutoring System - Personalized Clustered BKT (PC-BKT) Model ................................................................. 1307
Prema Nedungadi (Amrita University, India)
Remya MS (Amrita University, India)
Student Attitudes and Measures of Success in Information Seeking in an Introductory Mechanical Engineering Design Course ................................................................. 1313
Laura R. Hanlan (Worcester Polytechnic Institute, USA)
Rebecca Ziino (Worcester Polytechnic Institute, USA)
Allen Hoffman (Worcester Polytechnic Institute, USA)

Academic Predictors of Cooperative Education Participation .......................................................................................................................... 1317
Nichole Ramirez (Purdue University, USA)
Joyce B. Main (Purdue University, USA)
Trina Fletcher (Purdue University, USA)
Matthew W Ohland (Purdue University, USA)

Measuring the Relationship between Study Habits and Preferred Learning Style in Higher Education ................................. 1323
Elena Fitkov-Norris (Kingston University, United Kingdom)
Ara Yeghiazarian (Kingston University, United Kingdom)

GBL4: Game Based Learning, Theory and Applications
11:00 AM - 12:30 PM
Room: La Granja

Evaluating Software Engineering Simulation Games: the UGALCO framework .............................................................. 1327
Daniela Peixoto (Centro Federal de Educação Tecnológica, Brazil)
Rodolfo Resende (Universidade Federal de Minas Gerais, Brazil)
Clarindo Pádua (Universidade Federal de Minas Gerais, Brazil)

An Extensible Online Environment for Teaching Data Science Concepts through Gamification ............................. 1336
Paul Anderson (College of Charleston, USA)
Clayton Turner (College of Charleston, USA)
Jacob Dierksheide (College of Charleston, USA)
Renee McCauley (College of Charleston, USA)

A mobile-device based serious gaming approach for teaching and learning Java programming ............................. 1344
Tobias Jordine (Stuttgart Media University, Germany)
Ying Liang (University of the West of Scotland, United Kingdom)
Edmund Ihler (Stuttgart Media University, Germany)

Interactive Visualizations for Teaching Quantum Mechanics and Semiconductor Physics ............................. 1349
Rose Peng (Georgia Institute of Technology, USA)
William Dorn (Georgia Institute of Technology, USA)
Azad Naeemi (Georgia Institute of Technology, USA)
Nassim JafariNaimi (Georgia Institute of Technology, USA)

GDI: Special Session - "Stereotype Threat" and my Students: What can I do about it?
11:00 AM - 12:30 PM
Room: El Escorial

Special Session - "Stereotype Threat" and my Students: What can I do about it? ..................................................... 1353
Elizabeth A. Eschenbach (Humboldt State University, USA)
Mary Virnoche (Humboldt State University, USA)
Susan M. Lord (University of San Diego, USA)
Michelle Madsen Camacho (University of San Diego, USA)
**HFC2: Flipped Classroom in Practice**
Chair: Luis M. Sanchez Ruiz
11:00 AM - 12:30 PM
Room: Escudo

**Engineering Teaching Methods using Hybrid Technologies based on the Motivation and Assessment of Student's Profiles**
David Fonseca (Ramon Llull University, Spain)
Sergi Villagrasa (Ramon Llull University, Spain)
Francesc Valls (Universitat Politècnica de Catalunya, Spain)
Ernest Redondo (Universitat Politècnica de Catalunya, Spain)
August Climent (UOLS, Andorra)
Lluis Vicent (UOLS, Andorra)

**Engaging students in creative learning tasks with social networks and video-based learning**
Jaime Urquizu-Fuentes (Universidad Rey Juan Carlos, Spain)
Isidoro Hernán (Universidad Rey Juan Carlos, Spain)
Estefanía Martín (Universidad Rey Juan Carlos, Spain)

**B-Learning of Photovoltaics Systems using OrcaL PSPICE**
Juan Aguilar-Peña (University of Jaén, Spain)
Francisco Muñoz-Rodríguez (University of Jaén, Spain)
Catalina Rus-Casas (University of Jaén, Spain)

**Enhancing Video Lectures with Digital Footnotes**
Viraj Kumar (PES University, India)

**Teaching Electric Circuits Using a Flipped Classroom Approach**
Asad Azemi (Pennsylvania State University, USA)

---

**PRE1: Research and Practice in Precollege Education**
Chair: Mary M Capraro
11:00 AM - 12:30 PM
Room: Comendador

**Science, Technology, Engineering and Mathematics (STEM) Education:**

*A Longitudinal Examination of Secondary School Intervention*
Sandra B Nite (Texas A&M University, USA)
Jim Morgan (Texas A&M University, USA)
Mary M Capraro (Texas A&M University, USA)
Robert M Capraro (Texas A&M University, USA)
Cheryl A Peterson (Texas A&M University, USA)

*A Qualitative Study on the Effects of Participation in Pre-College Engineering Programs on First-Year Engineering Students*
Noah Salzman (Purdue University, USA)
Monica Cardella (Purdue University, USA)
Matthew W Ohland (Purdue University, USA)
STEM Integration: Evidence of Student Learning in Design-Based Curricula................................................................. 1393
Tamara J. Moore (Purdue University, USA)
Morgan Hynes (Purdue University, USA)
Senay Purzer (Purdue University, USA)
Aran Glancy (University of Minnesota, USA)
Emilie Siverling (Purdue University, USA)
Kristina Tank (University of Minnesota, USA)
Corey A Mathis (Purdue University, USA)
Selcen Guzey (University of Minnesota, USA)

What motivates STEM teachers to attend professional development? A case study in Chilian high schools............ 1400
Gina C. Adam (University of California, Santa Barbara, USA)
Vanessa Natalie Dominguez (University of California, Santa Barbara, USA)
Danielle B. Harlow (University of California, Santa Barbara, USA)

Might Young Makers Be the Engineers of the Future?............................................................................................... 1408
Shawn Jordan (Arizona State University at the Polytechnic Campus, USA)
Micah Lande (Arizona State University at the Polytechnic Campus, USA)

SBM1: Student Retention and Persistence
Chair: Lisa Zidek
11:00 AM - 12:30 PM
Room: Patio 1

Understanding the use of paper and online logbooks for final year undergraduate engineering projects .......... 1412
Manish Malik (University of Portsmouth, United Kingdom)

Building motivation by student-teaching ...................................................................................................................... 1416
John Pollard (British University in Egypt, Egypt)
Sara Al Menabawy (British University in Egypt, Egypt)

Prediction of the Change of Learners' Motivation in Programming Education for Non-Computing Majors .......... 1421
Hidekuni Tsukamoto (Osaka University of Arts, Japan)
Yasuhiro Takemura (Osaka University of Arts, Japan)
Hideo Nagumo (Niigata Seiryo University, Japan)
Akito Monden (Nara Institute of Science and Technology, Japan)
Ken-ichi Matsumoto (Nara Institute of Science and Technology, Japan)

Motivations and Experiences of Older Transfer Students in Engineering................................................................. 1428
Catherine E. Brawner (Research Triangle Educational Consultants, USA)
Catherine Mobley (Clemson University, USA)

Leveraging student motivation in engineering skills acquisition..................................................................................... 1436
Jeevan Persad (University of the West Indies at St. Augustine, Trinidad and Tobago)
Daniel Ringis (University of the West Indies at St. Augustine, Trinidad and Tobago)
Cathy-Ann Radix (The University of the West Indies at St. Augustine, Trinidad and Tobago)

Scratching the surface of digital literacy... but we need to go deeper.......................................................................... 1440
Jon Bustillo (University of the Basque Country, Spain)
Pablo Garaizar (University of Deusto, Spain)
SCL4: Reflection and Student-centric Learning
Chair: Robert Craig
11:00 AM - 12:30 PM
Room: Alcalá

Implementing Reflection In Technical Courses ................................................................. 1444
Luciana Barroso (Texas A&M University, USA)
Jim Morgan (Texas A&M University, USA)

Evaluating Effectiveness of Active Learning in Computer Science using Metacognition ................................................................. 1450
Murali Mani (University of Michigan-Flint, USA)
Nuha Alkabour (University of Michigan-Flint, USA)
Damilola Alao (University of Michigan-Flint, USA)

Which hat are you wearing today? Enabling perspectives while learning computer science ................................................................. 1458
Abhay Doke (Tata Consultancy Services Limited, India)
Gaurav Kumar Singh (Tata Consultancy Services Limited, India)
Varun Kumar (Tata Consultancy Services Limited, India)
Savita Bhat (Tata Consultancy Services Limited, India)
Niranjan Pedanekar (Tata Consultancy Services Limited, India)

Transforming Challenges into Reflections: Enabling Metacognitive Development ................................................................. 1462
Jordyn Burger (Olin College of Engineering, USA)
Paige Cote (Olin College of Engineering, USA)
Nitya Dhanushkodi (Olin College of Engineering, USA)
Jonathan Stolk (Olin College of Engineering, USA)
Yevgeniya V Zastavker (Olin College of Engineering, USA)

Co-operative learning versus self-directed learning in engineering: student preferences and implications ................................................................. 1466
Arthur Swart (Central University of Technology, South Africa)
Trudy Sutherland (Vaal University of Technology, South Africa)

TLE5: What do We Teach and How do Students Learn?
Chair: Diana Bairaktarova
11:00 AM - 12:30 PM
Room: La Galería

Generation of Critical Mass in Education: An approach based on multiple vortexes ................................................................. 1471
Jose Reginaldo Hughes Carvalho (Federal University of Amazonas, Brazil)
Elaine H. T. de Oliveira (Federal University of Amazonas, Brazil)
Alessandra Silva (Samsung Eletrônica da Amazônia (SEDA), Brazil)

Combining Thermodynamics and Public Policy:
Exploring the Benefits of this Alternative Instructional Method ................................................................. 1479
Ryan Muckel (Rochester Institute of Technology, USA)
Margaret Bailey (Rochester Institute of Technology, USA)

Development of Low-Cost Robot Manipulators for Kinematic Control Practices ................................................................. 1487
José Alberto Naves Cocota, Jr. (Universidade Federal de Ouro Preto, Brazil)
Tiago Pinheiro dos Santos (Universidade Federal de Ouro Preto, Brazil)
Paulo Henrique Magalhaes (Universidade Federal de Ouro Preto, Brazil)
Thiago D'Angelo (Universidade Federal de Ouro Preto, Brazil)
Luciana Castanheira (Universidade Federal de Ouro Preto, Brazil)

Brain-based Programming continued ................................................................. 1495
Barbara Sabitzer (Alpen-Adria-Universität Klagenfurt, Austria)
Stefan Pasterk (Alpen-Adria-Universität Klagenfurt, Austria)
Critical Thinking, Peer-Writing, and the Importance of Feedback

Asa Cajander (Uppsala University, Sweden)
Mats Daniels (Uppsala University, Sweden)
Anne-Kathrin Peters (Uppsala University, Sweden)
Roger McDermott (Robert Gordon University, United Kingdom)

ASM1: Novel Assessment Approaches
Chair: Jia-Ling Lin
2:30 PM - 4:00 PM
Room: Patio 3

Designing Assessments that Mimic Employment Scenarios, Engage Students and Expand Students' Skills
Karl O. Jones (Liverpool John Moores University, United Kingdom)
Kevin Johnston (Liverpool John Moores University, United Kingdom)
Colin Robinson (Liverpool John Moores University, United Kingdom)
Rebecca Bartlett (Liverpool John Moores University, United Kingdom)
Marya Burgess (BBC, United Kingdom)

The Evolution of a Criterion Referenced System of Grading for Engineering Science Coursework
John Heywood (The University of Dublin, Ireland)

Digital Ink for Cognitive Assessment of Computational Thinking
Ana Paula Ambrosio (Federal University of Goias, Brazil)
Cleon Pereira, Jr. (Federal University of Goias, Brazil)
Fouad Georges (University Salgado de Oliveira, Brazil)

Academic performance assessment using Augmented Reality in engineering degree course
Albert Sánchez (Universitat Politècnica de Catalunya Barcelona Tech, Spain)
Ernest Redondo (Universitat Politècnica de Catalunya Barcelona Tech, Spain)
David Fonseca (Ramon Llull University, Spain)
Isidro Navarro (Ramon Llull University, Spain)

An approach to Assessment of Knowledge Acquisition by using Three-Dimensional Virtual Learning Environment
Eunice Nunes (Federal University of Mato Grosso, Brazil)
Romero Tori (University of São Paulo, Brazil)
Fatima Nunes (University of São Paulo, Brazil)
Licinio Roque (University of Coimbra, Portugal)

CUR3: Civil, Chemical, and Mechanical Engineering Curricula Design
Chair: Alicia Triviño
2:30 PM - 4:00 PM
Room: Doblon

Evaluation of a New Approach to Life-Long Learning in Civil and Environmental Engineering Curricula
Diane Bondehagen (Florida Gulf Coast University, USA)
Claude Villiers (Florida Gulf Coast University, USA)
Robert O'Neill (Florida Gulf Coast University, USA)

Developing Computer Based Laboratory Exercises for an MEP Course
In A Construction Science and Management Program
Rogelio Palomera-Arias (University of Texas at San Antonio, USA)
Data-driven Curriculum Redesign in Civil Engineering ................................................................. 1555
Debra Fowler (Texas A&M University, USA)
Whitney Anthony (Texas A&M University, USA)
Nathaniel Poling (Texas A&M University, USA)
Jim Morgan (Texas A&M University, USA)
Kelly Brumbelow (Texas A&M University, USA)

Engineering a Discipline-Specific Communication Course in Chemical Engineering ............................ 1564
Elif Eda Miskioglu (The Ohio State University, USA)
David Wood (The Ohio State University, USA)

Implementing a Competitive Learning Framework in Chemical Engineering Degree in Spain and its Applicability on an Inter-University Scenario ......................................................... 1568
Alicia Triviño (Universidad de Malaga, Spain)
Ernesto De la Rubia (Universidad de Malaga, Spain)
Francisco-Angel Moreno (Universidad de Malaga, Spain)
Francisco Javier Lopez-Martinez (Universidad de Malaga, Spain)
Juan José Sánchez-Martínez (Universidad de Malaga, Spain)

DIS2: Assessing Student Success Factors in Distance Learning
Chair: Anurima Chatterjee
2:30 PM - 4:00 PM
Room: Escudo

Recommending Learning Objects Based on Utility and Learning Style ................................................. 1572
Grace Borges (UFABC, Brazil)
Itana Stiubiener (UFABC, Brazil)

What is Learning Presence and What can it Tell Us About Success in Learning Online? ......................... 1581
Ruth E H Wertz (Valparaiso University, USA)

Social, Cognitive, Teaching, and Metacognitive Presence in General and Focus Group Discussion:
Case Study in Blended e-Learning Linear Algebra Class ........................................................................ 1587
Kasiyah Junus (Universitas Indonesia, Indonesia)
Lia Sadita (Universitas Indonesia, Indonesia)
Heru Suhartanto (Universitas Indonesia, Indonesia)

A learner profile analysis based on competences to improve online teaching strategies ......................... 1593
Ana-Elena Guerrero-Roldán (Universitat Oberta de Catalunya, Spain)
Elena Rodriguez-Gonzalez (Universitat Oberta de Catalunya, Spain)

Bridging Achievement Gaps Amongst School Students through a Technology-based Blended Learning Model ..... 1599
Anurima Chatterjee (Educational Initiatives Pvt. Ltd., India)
Pranav Kothari (Educational Initiatives Pvt. Ltd., India)

EER/SCL: Designing and Refining Reflection Activities for Engineering Education
2:30 PM - 4:00 PM
Room: El Escorial

Designing and Refining Reflection Activities for Engineering Education ............................................. 1607
Jennifer Turms (University of Washington, USA)
Brook Sattler (University of Washington, USA)
Anette Kolmos (Aalborg University, Denmark)
**EER6: Engineering Education Research Methods and Methodologies**

**Chair:** Adam R Carberry  
**Time:** 2:30 PM - 4:00 PM  
**Room:** Aranjuez

---

**Using Realtime Transcription to do Member-Checking During Interviews**  
Mel Chua (Purdue University, USA)  
Robin Adams (Purdue University, USA)

---

**Well, That Didn't Work A Troubled Attempt to Quantitatively Measure Engineering Students' Lifelong Learning Development Over Two Years of College**  
Jonathan Stolk (Franklin W. Olin College of Engineering, USA)  
Robert Martello (Franklin W. Olin College of Engineering, USA)  
Kathleen Koehler (LASPAU Academic and Professional Programs for the Americas, USA)  
Katherine Chen (California Polytechnic State University at San Luis Obispo, USA)  
Roberta Herter (California Polytechnic State University at San Luis Obispo, USA)

---

**From Methods to Methodology: Reflection on Keeping the Philosophical Commitments of Interpretative Phenomenological Analysis**  
James Huff (Harding University, USA)  
Jonathan Smith (Birkbeck College, University of London, United Kingdom)  
Brent Jesiek (Purdue University, USA)  
Carla Zoltowski (Purdue University, USA)  
William Graziano (Purdue University, USA)  
William Oakes (Purdue University, USA)

---

**Application of Design Research Methodology to a Context-Sensitive Study in Engineering Education**  
Rémy Crepon (Universidad Complutense Madrid (UCM), Spain)

---

**FAC3: Faculty Development: Initiatives and Research**

**Chair:** Uma Garimella  
**Time:** 2:30 PM - 4:00 PM  
**Room:** La Granja

---

**Moving Towards Outcome-based Education - Faculty Development Initiatives**  
Uma Garimella (Nalla Malla Reddy Engineering College, India)  
Divya Nalla (Nalla Malla Reddy Engineering College, India)

---

**Fostering teacher motivation for training using Massive Open Online Courses**  
Zoraida Callejas (University of Granada, Spain)  
Belen Prados-Suarez (University of Granada, Spain)

---

**What are the significant factors that have influenced the adoption of Moodle by staff in a Māori tertiary institution?**  
Tane R Kaka (Te Wānanga o Aotearoa, New Zealand)

---

**The Lighthouse Project: Researching Educator Professional Development for Diversity in Computing**  
Kathryn Cooke (University of Virginia, USA)  
Joanne Cohoon (University of Virginia, USA)  
James Cohoon (University of Virginia, USA)
The Quest for the Mythical Phoenix: Attendee Narratives at an Engineering Education Faculty Workshop .......... 1662
Mel Chua (Purdue University, USA)
Emily Dringenberg (Purdue University, USA)

INT: Special Session: Potential Futures for Engineering Education through Scenario Planning
2:30 PM - 4:00 PM
Room: El Jardin

Special Session: Potential Futures for Engineering Education through Scenario Planning .......................... 1666
Jeffrey E Froyd (Texas A&M University, USA)
Susan M. Lord (University of San Diego, USA)
Matthew W Ohland (Purdue University, USA)
Kishore Prahallad (International Institute of Information Technology, India)
Euan Lindsay (Charles Sturt University, Australia)
Burton Dicht (IEEE, USA)

PRE2: Programs and Activities in Precollege Education
Chair: Rosa Maria Vasconcelos
2:30 PM - 4:00 PM
Room: Comendador

DISSECT: An Experiment in Infusing Computational Thinking in K-12 Science Curricula ......................... 1668
Kenza Arraki (New Mexico State University, USA)
Kasha Blair (New Mexico State University, USA)
Taylor Burgett (New Mexico State University, USA)
Jessica Greenling (New Mexico State University, USA)
Jessica Haebe (New Mexico State University, USA)
G. Lee (New Mexico State University, USA)
Amanda Peel (New Mexico State University, USA)
Victor Szczepanski (New Mexico State University, USA)
Enrico Pontelli (New Mexico State University, USA)
Sarah Hug (University of Colorado at Boulder, USA)

Classroom Makerspaces: Identifying the Opportunities and Challenges .................................................... 1677
Avneet Hira (Purdue University, USA)
Cole Joslyn (Purdue University, USA)
Morgan Hynes (Purdue University, USA)

SM4T: Scratch MOOC for Teens A pioneer pilot experience in Uruguay ...................................................... 1682
Inés Friss de Kereki (Universidad ORT Uruguay, Uruguay)
Víctor Paulós (Universidad ORT Uruguay, Uruguay)

Increasing 11th Grader's Interest in STEM Majors via a NAE Grand Challenge: Securing Cyberspace-Themed Project ................................................................. 1686
Donald Fehlinger, Jr. (Drexel University, USA)
Jessica Ward (Drexel University, USA)
Adam Fontecchio (Drexel University, USA)

Embedding Android Signal Processing Apps in a High School Math Class - An RET Project .......... 1689
Mahesh Banavar (Arizona State University, USA)
Deepta Rajan (Arizona State University, USA)
Andrew Strom (Corona Del Sol High School, USA)
Photini Spanias (Arizona State University, USA)
Xue Zhang (Arizona State University, USA)
Henry Braun (Arizona State University, USA)
Andreas Spanias (Arizona State University, USA)
SBM2: Student Motivation
Chair: Margaret D. Sullivan
2:30 PM - 4:00 PM
Room: Patio 1

Results of a Large-Scale, Multi-Institutional Study of Undergraduate Retention in Computing
Lecia Barker (University of Texas at Austin, USA)
Christopher L Hovey (Northeastern University, USA)
Leisa Thompson (University of Virginia, USA)

First Generation College Students’ Access to Engineering Social Capital:
Towards Developing a Richer Understanding of Important Alterns
Aubrie L Pfirman (Clemson University, USA)
Matthew Miller (Clemson University, USA)
Gerardo Santana Alvarez (Clemson University, USA)
Julie Martin (Clemson University, USA)

Using reflective practices to reduce dropout rates among first year students at a University of Technology, a South African perspective
Rangith Kuriakose (Central University of Technology, South Africa)
Hermanus Vermaak (Central University of Technology, South Africa)

Black Engineering Transfer Students: What Explains Their Success?
Clemencia Cosentino (Mathematica Policy Research, USA)
Margaret D Sullivan (Mathematica Policy Research, USA)
Nikhil Gahlawat (Mathematica Policy Research, USA)
Matthew W Ohland (Purdue University, USA)
Russell Long (Purdue University, USA)

Developing a Culture of Support for Recruitment and Retention of American Indian Students
Carter Kerk (South Dakota School of Mines and Technology, USA)
Stuart Kellogg (South Dakota School of Mines and Technology, USA)

SCL6: Impact of Student-centric Learning
Chair: James Widmann
2:30 PM - 4:00 PM
Room: Alcalá

The Impact of active learning strategies in second cycle students of an engineer course: a case study
Cristina Gaspar Oliveira (Universidade de Aveiro, Portugal)
Paulo André (Universidade de Lisboa, Portugal)

Developing a Smart Grid Cybersecurity Education Platform and a Preliminary Assessment of Its First Application
Timothy Yardley (University of Illinois at Urbana-Champaign, USA)
Suleyman Uludag (The University of Michigan - Flint, USA)
Klara Nahrstedt (University of Illinois at Urbana-Champaign, USA)
Peter Sauer (University of Illinois at Urbana-Champaign, USA)

Content Recommendation in an Inquiry-based Learning Environment
Otavio Acosta (Federal University of Rio Grande do Sul, Brazil)
Patricia Behar (Federal University of Rio Grande do Sul, Brazil)
Eliseo Reategui (Federal University of Rio Grande do Sul, Brazil)

Initial motivation and progress with doctoral studies in computer science - A case study from a Finnish university
Sami Kollanus (Univ. of Jyväskylä, Finland)
Learning Fundamental Mechanics Relationships Using Inquiry-Based Learning Activities......................... 1755
Brian Self (California Polytechnic State University, USA)
James Widmann (California Polytechnic State University, USA)

A Systematic Mapping Study on Practical Approaches to Teaching Software Engineering......................... 1759
Maíra Marques Samary (Universidad de Chile, Chile)
Alcides Quispe (Universidad de Chile, Chile)
Sergio Ochoa (Universidad de Chile, Chile)

TLE6: Technologies and Practices for Teaching and Learning Engineering
Chair: Adrian Rusu
2:30 PM - 4:00 PM
Room: La Galería

Developing Novel Practices of Somatic Learning to Enhance Empathic Perspective-Taking for Ethical Reasoning and Engineering Design................................................................. 1767
Holly Jaycox (Purdue University, USA)
Justin Hess (Purdue University, USA)
Carla Zoltowski (Purdue University, USA)
Andrew O. Brightman (Purdue University, USA)

A Service-Oriented Reference Architecture for Mobile Learning Environments........................................... 1772
Nemesio Duarte Filho (University of São Paulo, Brazil)
Ellen Barbosa (University of São Paulo, Brazil)

Is a Mac "PC" in Engineering? ..................................................................................................................... 1780
Cory Brozina (Virginia Tech, USA)
Courtney Smith (Virginia Tech, USA)
Suzanne Nicewonder (Virginia Tech, USA)
Ben Lutz (Virginia Tech, USA)

Deployment and Analysis of Lecture Recording in Engineering Education................................................ 1786
Carlos Turro (Universitat Politècnica de València, Spain)
Ignacio Despujol (Universitat Politècnica de València, Spain)
Aristóteles Cañero (Universitat Politècnica de València, Spain)
Jaime Busquets (Universitat Politècnica de València, Spain)

Interdisciplinary Faculty-Faculty Collaborations for the Development of Learning Technologies.................. 1791
Adrian Rusu (Rowan University, USA)
Matthew Bealor (Rowan University, USA)
Hector Lopez (Rowan University, USA)

ASM2: Uses of Assessment to Promote Learning
5:00 PM - 6:30 PM
Room: Patio 3

The Effects of Test-Enhanced Learning on Student Learning in an Electric Circuits Course......................... 1799
Archie Holmes (University of Virginia, USA)

Including Peer and Self-Assessment in a Continuous Assessment Scheme in Electrical and Electronics Engineering Courses........................................................................................................ 1806
Juan Carlos Gonzalez de Sande (Universidad Politecnica de Madrid, Spain)
Adarsh Murthy (National Institute of Technology Karnataka-Surathkal, Mangalore, India)
Promoting student commitment and responsibility through self- and peer-assessment ............................................. 1811
Carlos Serra-Toro (Universitat Jaume I, Spain)
V. Javier Traver (Universitat Jaume I, Spain)
Juan C Amengual (Universitat Jaume I, Spain)

Redesign the Engineering Teaching and Assessment Methods to
Provide More Information to Improve Students’ Learning ................................................................. 1815
Omar M. Ashour (Pennsylvania State University, The Behrend College, USA)
Shraddha Sangalkar (Pennsylvania State University, The Behrend College, USA)
Russell L. Warley (Pennsylvania State University, The Behrend College, USA)
Oladipo Onipede (Pennsylvania State University, The Behrend College, USA)

Prediction of students’ academic performance:
Adapt a methodology of predictive modeling for a small sample size ......................................................... 1821
John Mativo (University Of Georgia, USA)
Shaobo Huang (University of Southern California, USA)

CUR4: Using Learning Theories to Guide Curriculum Design
5:00 PM - 6:30 PM
Room: Doblon

100% PBL Curriculum Startup Phase Complete ................................................................. 1824
Ron Ulseth (Itasca Community College, USA)
Bart Johnson (Itasca Community College, USA)

Upgrading the Engineering Curriculum Through Thematic Learning Modules ........................................ 1832
Fazeel Khan (Miami University, USA)
Kumar Singh (Miami University, USA)

Using a cyclic model of knowledge transfer for the development of transdisciplinary learning environments ....... 1836
Klavdiya Bochenina (ITMO University, Russia)
Irina Boukhankasaya (ITMO University, Russia)
Anna Bilyatdinova (ITMO University, Russia)
Alexey Dukanov (ITMO University, Russia)
Anna Lutsenko (ITMO University, Russia)

A Practice-then-Apply Scaffolding Approach to Engineering Design Education ........................................ 1845
Adam R Carberry (Arizona State University, USA)
Nathan Johnson (Arizona State University, USA)
Mark Henderson (Arizona State University, USA)

Designing a Blended Learning Curriculum in the Development of Video Games ........................................ 1848
Angela Restrepo (Universidad de los Andes, Colombia)
Pablo Figueroa (Universidad de los Andes, Colombia)

DIS3: Distance Education in Multiple Disciplines
Chair: Bridget Benson
5:00 PM - 6:30 PM
Room: Escudo

Experience with Teaching Digital Design Online ................................................................. 1851
Bridget Benson (California Polytechnic State University, USA)
Bryan Mealy (California Polytechnic State University, USA)

Efficacy of an Online Writing Program on URM Students in Engineering ........................................ 1858
Patricia R Backer (San Jose State University, USA)
Online Resource Platform for Mathematics Education .......................................................... 1865
Edmund Nevin (Dublin Institute of Technology, Ireland)
Marisa Llorens (Dublin Institute of Technology, Ireland)
Eileen Mageean (Dublin Institute of Technology, Ireland)

The Use of Self-Monitoring Tools for Linear Algebra Course in Student Centered e-Learning Environment .......... 1873
Kasiyah Junus (Universitas Indonesia, Indonesia)
Harry Santoso (Universitas Indonesia, Indonesia)
Lia Sadita (Universitas Indonesia, Indonesia)

Comparison of the Impact of Two Research Experiences for Undergraduate Programs on Preparing Students for Global Workforces .......................................................... 1877
Gisele Ragusa (University of Southern California, USA)
Cheryl Matherly (University of Tulsa, USA)
Sarah R. Phillips (Rice University, USA)

EER7: Reflection and Metacognition
Chair: Chris Venters
5:00 PM - 6:30 PM
Room: Aranjuez

"I Just Google It": A Qualitative Study of Information Strategies in Problem Solving Used by Upper and Lower Level Engineering Students ......................................................... 1884
Anna Douglas (Purdue University, USA)
Connor Rohan (Purdue University, USA)
Michael Fosmire (Purdue University, USA)
Casey Smith (Purdue University, USA)
Amy S Van Epps (Purdue University, USA)
Senay Purzer (Purdue University, USA)

Using the Engineering Design Process as a Metacognitive Learning Strategy to Improve Student Performance ... 1890
Peter Shull (Penn State University, USA)

Reflecting on Engineering Concepts: Effects on Critical Thinking ......................................................... 1895
Polly Piergiovanni (Lafayette College, USA)

Using Cooperative Learning to Enhance Critical Reflection ........................................................................ 1899
Meriel Huggard (Trinity College Dublin, Ireland)
Frank Boland (Trinity College Dublin, Ireland)
Ciaran Mc Goldrick (Trinity College Dublin, Ireland)

Writing and Conceptual Knowledge in Statics: Does Learning Approach Matter? ........................................ 1907
Chris Venters (East Carolina University, USA)
Lisa McNair (Virginia Polytechnic Institute and State University, USA)
Marie Paretti (Virginia Polytechnic Institute and State University, USA)

FAC2: Supporting and Empowering Faculty
Chair: Luis Amaral
5:00 PM - 6:30 PM
Room: La Granja

Potential Minimum Viable Value Propositions for Engineering Education Scholarship ...................................... 1915
Jeffrey E Froyd (Texas A&M University, USA)
R Cheville (Bucknell University, USA)
Thomas Siller (Colorado State University, USA)
New Faculty Development: Creating a Community of Practice ................................................................. 1920
Mary Lynn Brannon (The Pennsylvania State University, USA)
Sarah Zappe (The Pennsylvania State University, USA)

A Program Designed to Empower Engineering Educators ................................................................. 1925
Melany M Ciampi (Safety, Health and Environment Research Organization, Brazil)
Claudio R Brito (Science and Education Research Council, Brazil)
Luis Amaral (University of Minho, Portugal)
Rosa Maria Vasconcelos (University of Minho, Portugal)
Victor F. A. Barros (Science and Education Research Council, Portugal)

An Examination of the Climate for Quality Teaching in Engineering ................................................. 1930
Jacqueline McNeil (Purdue University, USA)
Catherine E. Brawner (Research Triangle Educational Consultants, USA)
Matthew W Ohland (Purdue University, USA)

A Higher Education Social Network to Share and Promote Teaching Innovation Experiences ........ 1934
Lina García-Cabrera (University of Jaén, Spain)
José Ramón Balsas Almagro (University of Jaén, Spain)
Ildefonso Ruano Ruano (University of Jaén, Spain)

PHI: Special Session: Agents for STEM Change - Articulating the Goals of Our Community
5:00 PM - 6:30 PM
Room: El Jardin

Special Session: Agents for STEM Change - Articulating the Goals of Our Community .................... 1942
Rebecca Bates (Minnesota State University, Mankato, USA)
R Cheville (Bucknell University, USA)
Jennifer Karlin (SD School of Mines and Technology, USA)
Lisa Benson (Clemson University, USA)
Cynthia Finelli (University of Michigan, USA)
Susan M. Lord (University of San Diego, USA)

PRE: Pre-College (K-12) Engineering Education: Getting Them Early ... and Keeping Them!
5:00 PM - 6:30 PM
Room: El Escorial

Pre-College (K-12) Engineering Education: Getting Them Early ... and Keeping Them! .................... 1944
Larry Richards (University of Virginia, USA)
Susan Donohue (University of Virginia, USA)

PRE3: Measuring the Outcomes of Precollege Education
Chair: David Reeping
5:00 PM - 6:30 PM
Room: Comendador

"STEM Academies" and Their Effect on Student Perceptions of Engineering ......................................... 1948
David Reeping (Ohio Northern University, USA)
Kenneth Reid (Virginia Tech, USA)

Middle School Students' Understanding and application of the Engineering Design Process ............... 1954
Linda S. Hirsch (New Jersey Institute of Technology, USA)
Suzanne Berliner Heyman (New Jersey Institute of Technology, USA)
John Carpinelli (New Jersey Institute of Technology, USA)
Howard Kimmel (New Jersey Institute of Technology, USA)
STEM Integration in the Middle Grades: A Case Study of Teacher Implementation ................................. 1960
Tamara J. Moore (Purdue University, USA)
Corey A Mathis (Purdue University, USA)
Selcen Guzey (University of Minnesota, USA)
Aran Glancy (University of Minnesota, USA)
Emilie Siverling (Purdue University, USA)

Initial Findings of High School Pre-engineering and Non-engineering Students' Design Cognition ............... 1968
Matthew Lammi (NC State University, USA)
John Wells (Virginia Polytechnic Institute & State University, USA)
Cameron Denson (NC State University, USA)
Marie Paretti (Virginia Polytechnic Institute & State University, USA)
Christopher Williams (Virginia Polytechnic Institute & State University, USA)
John Gero (George Mason University, USA)

Development of Non-Cognitive Skills in Minority Engineering Outreach Programs ...................................... 1972
Tasha Zephirin (Purdue University, USA)
DeLean Tolbert (Purdue University, USA)
Darryl Dickerson (Purdue University, USA)
Freddy Solis (Purdue University, USA)

SBM3: Student Beliefs, Motivation, and Persistence Through the College Years
Chair: Rodany A. Merida
5:00 PM - 6:30 PM
Room: Patio 1

Attitude towards Capstone Project: Looking from Gender and Stage Perspectives ................................... 1976
Rex Bringula (University of the East, Philippines)
Rodany A Merida (University of the East, Philippines)
John Benedic Enriquez (University of the East, Philippines)
Gil Francis Abinal (University of the East, Philippines)
Jose Mari Ramos (University of the East, Philippines)

The Use of Physiological Tools to Identify Changes in Affective Responses for Graduate Students Recently Admitted into a Scientific Discipline ................................................................. 1983
Idalis Villanueva (Utah State University, USA)
Adam Raikes (Utah State University, USA)
Nathan Ruben (Utah State University, USA)
Sydney Schaefer (Utah State University, USA)
Jake Gunther (Utah State University, USA)

That's Not My Style: Understanding the Correlation of Learning Style Preferences, Self-Efficacy, and Student Performance in an Introductory Chemical Engineering Course .......................... 1988
Elif Eda Miskioglu (The Ohio State University, USA)
David Wood (The Ohio State University, USA)

The Development of a Virtual Socializer-Based Intervention Targeting Low-Achieving Second-Year Engineering Students ................................................................. 1991
Kevin Sevilla (The University of Queensland, Australia)
Marie Paretti (Virginia Tech, USA)

Development of an Instrument to Measure the Self-efficacy of Teaching Engineering Design (SETED) .......... 1996
Erik Ward (NC State University, USA)
Matthew Lammi (NC State University, USA)
SER1: Explorations in Service Learning
5:00 PM - 6:30 PM
Room: Alcalá

The Impacts of Service Learning on Students and Community Members:
Lessons from Design Projects for Older Adults................................................................. 1999
Caitrin Lynch (Olin College of Engineering, USA)
Lynn Andrea Stein (Olin College of Engineering, USA)
Sharon Grimshaw (Olin College of Engineering, USA)
Elizabeth Doyle (Olin College of Engineering, USA)
Lois Camberg (Olin College of Engineering, USA)
Ela Ben-Ur (Olin College of Engineering, USA)

Miguel A. Pando (University of North Carolina at Charlotte, USA)
Brett Tempest (University of North Carolina at Charlotte, USA)
Marcial Blondet (Catholic University of Peru (PUCP), Peru)
Sandra Dika (University of North Carolina at Charlotte, USA)

Engineers Without Borders: An Empirical Investigation of Member's Defining Characteristics ........... 2013
Daniel Knight (University of Colorado Boulder, USA)
Kaitlin Litchfield (University of Colorado at Boulder, USA)
Amy Javernick-Will (University of Colorado Boulder, USA)

Cultural Considerations in Service Learning with American Indian Reservation Community Stakeholders ....... 2018
Jennifer Benning (South Dakota School of Mines and Technology, USA)
Andrea Surovek (South Dakota School of Mines and Technology, USA)
Daniel Dolan (South Dakota School of Mines and Technology, USA)
Lyle Wilson (Oglala Lakota College, USA)
Andrew Thompson (Oglala Lakota College, USA)
Rob Pyatt (University of Colorado Boulder, USA)

Preliminary Results of a Freshmen Capstone Project to Design
Educational Modules for Teachers in the Dominican Republic.................................................. 2022
David Reeping (Ohio Northern University, USA)
John K. Estell (Ohio Northern University, USA)
Kenneth Reid (Virginia Tech, USA)

TLE7: Improving Academic Experiences
5:00 PM - 6:30 PM
Room: La Galería

Making Examinations 'More Enjoyable'.................................................................................. 2029
Karl O. Jones (Liverpool John Moores University, United Kingdom)
John Skiffington (Liverpool John Moores University, United Kingdom)
Rebecca Bartlett (Liverpool John Moores University, United Kingdom)

Improving the Student Academic Experience through Lean Engineering Principles......................... 2034
Denise R. Simmons (Virginia Tech, USA)
Glenda Young (Virginia Tech, USA)

How to make a distributed programming course a big fun................................................................ 2038
Evgeny Osipov (Lulea University of Technology, Sweden)
Arash Mousavi (Lulea University of Technology, Sweden)
Enhanced learning by promoting engineering competencies ................................................................. 2044
Sofia Cassel (Uppsala University, Sweden)
Aletta Nylen (Uppsala University, Sweden)
Björn Victor (Uppsala University, Sweden)

A Recommendation System to Support the Students Performance in Programming Contests .................. 2050
Lilian Paula (Federal Institute of Education, Science and Technology of the South of Minas Gerais, Brazil)
Aracele Fassbinder (Federal Institute of Education, Science and Technology of the South of Minas Gerais, Brazil)
Ellen Barbosa (University of São Paulo, Brazil)

Saturday, October 25

ASM3: Evaluation of Assessment Approaches and Instruments
9:00 AM - 10:30 AM
Room: Patio 3

Assessing the Assessment - Insights into CS1 Exams .............................................................................. 2058
Ela Zur (The Open University of Israel, Israel)
Tamar Vilner (The Open University of Israel, Israel)

A Multi-Perspective Framework for Evaluating Software Engineering Education by Assessing Students' Competencies ............................................................................................................... 2065
Yvonne Sedelmaier (Coburg University of Applied Sciences and Arts, Germany)
Dieter Landes (Coburg University of Applied Sciences and Arts, Germany)

Development and Validation of a Nano Size and Scale Instrument (NSSI) .................................................. 2073
Yi Kong (Purdue University, USA)
Heidi Diefes-Dux (Purdue University, USA)
Kelsey J Rodgers (Purdue University, USA)
Anna Douglas (Purdue University, USA)
Krishna Madhavan (Purdue University, USA)

A case study of using multiple choice questions, supported by ICT, in an introductory Physics course for engineers ..................................................................................................................... 2077
Diana Urbano (Universidade do Porto, Portugal)
Cristina Gaspar Oliveira (Universidade de Aveiro, Portugal)
Paulo Coelho Oliveira (Instituto Superior de Engenharia do Porto, Portugal)

Items’ difficulty level determination based on a Statics test with parameters variation ................................ 2081
Andrés Restrepo (EAFIT University, Colombia)
Jorge L. Restrepo (EAFIT University, Colombia)
Jaime Barbosa (EAFIT University, Colombia)

CSC1: Computer Science Teaching
9:00 AM - 10:30 AM
Room: Doblon

Open Hardware Platforms in a First Course of the Computer Engineering Undergraduate Program ............... 2085
Ricardo Santos (Federal University of Mato Grosso do Sul, Brazil)
Using Cybersecurity as an Engineering Education Approach on Computer Engineering to Learn about Smart Grid Technologies and the Next Generation of Electric Power Systems................................. 2092
Daniel Navarro (University of Puerto Rico-Mayaguez, Puerto Rico)
Jean Mendez (University of Puerto Rico-Mayaguez, Puerto Rico)
Kidany Berrios (University of Puerto Rico-Mayaguez, Puerto Rico)
Eduardo Ortiz-Rivera (University of Puerto Rico-Mayaguez, Puerto Rico)
Emmanuel Arzuaga (University of Puerto Rico-Mayaguez, USA)

Augmented Learning Roads for Internet Routing........................................................................................................ 2100
John McCaffery (University of St Andrews, United Kingdom)
Alan H. D. Miller (University of St Andrews, United Kingdom)
Iain Oliver (University of St Andrews, United Kingdom)
Colin Allison (University of St Andrews, United Kingdom)

SCAM, a Flexible, Scheme-like Language for Teaching Programming Language Concepts................................. 2109
John Lusth (The University of Alabama, USA)

Active learning method in "System Analysis and Control" area................................................................................. 2113
Dmitry Nikolaevich Bazylev (ITMO University, Russia)
Alexey Margun (ITMO University, Russia)
Konstantin Žimenko (ITMO University, Russia)
Alexandr Shehukin (ITMO University, Russia)
Artem Kremlev (ITMO University, Russia)

MobiMonitor: a Mobile App for Monitoring Distance Courses in the Amazon Region............................................. 2126
Ketlen K. Teles Lucena (Federal University of Amazonas, Brazil)
Jath da Silva e Silva (Federal University of Amazonas, Brazil)
Vitor Brengartner (Federal University of Amazonas, Brazil)
Elaine H. T. de Oliveira (Federal University of Amazonas, Brazil)
Bruno Gadelha (Federal University of Amazonas, Brazil)

An Agent-based Tutoring System for Learning Propositional Logic Using Multiple Linked Representations ............ 2134
Evandro Costa (Federal University of Alagoas, Brazil)
Emanuelle Tuane Silva (Federal University of Alagoas, Brazil)
Anderson Santos (Federal University of Alagoas, Brazil)
Alexandre Carlos Santos Azevedo (Federal University of Alagoas, Brazil)
Priscylla Silva (Federal University of Alagoas, Brazil)
Marlos Silva (Federal Institute of Education, Science and Technology, Brazil)
Hemilis Rocha, HJ (Federal University of Alagoas, Brazil)
Caroline Lima (Federal University of Alagoas, Brazil)
Computer Networks Virtualization with GNS3: Evaluation a solution to optimize resources and achieve a distance learning ................................................................. 2141
Pablo Gil (University of Alicante, Spain)
Gabriel Jesus Garcia (University of Alicante, Spain)
Angel Delgado (University of Alicante, Spain)
Rosa Medina (University of Alicante, Spain)
Antonio Calderon (University of Alicante, Spain)
Patricia Marti (University of Alicante, Spain)

Keyword Extraction for Mining Meaningful Learning-Contents on the Web Using Wikipedia................................. 2145
Tetsuya Toyota (National Institute of Informatics, Japan)
Yuan Sun (National Institute of Informatics, Japan)

EER8: Problem Solving, Mathematics and Design
Chair: Robert M Capraro
9:00 AM - 10:30 AM
Room: Aranjuez

Monica Cardella (Purdue University, USA)
DeLean Tolbert (Purdue University, USA)

Cognitive Strategies and Misconceptions in Introductory Statics Problems ............................................................... 2152
Wade Goodridge (Utah State University, USA)
Idalis Villanueva (Utah State University, USA)
Benjamin Call (Utah State University, USA)
Maria Valladares (Utah State University, USA)
Nicholas J. A. Wan (Utah State University, USA)
Christopher Green (Utah State University, USA)

Identifying the variation of experiences when dealing with problems in complex systems ........................................ 2156
John Mendoza-Garcia (Purdue University / Pontificia Universidad Javeriana, USA)
Monica Cardella (Purdue University, USA)
William Oakes (Purdue University, USA)

Pathways to Engineering: Mathematics as a Mediator of Engineering Success ................................................................. 2160
Sandra B Nite (Texas A&M University, USA)
Jim Morgan (Texas A&M University, USA)
Mary M Capraro (Texas A&M University, USA)
Robert M Capraro (Texas A&M University, USA)
Cheryl A Peterson (Texas A&M University, USA)

An Examination of Mathematics Preparation For and Progress Through Three Introductory Computer Science Courses......................................................... 2165
Christine F Reilly (University of Texas - Pan American, USA)
Emmett Tomai (University of Texas - Pan American, USA)
**FAC1: Faculty Roles**

9:00 AM - 10:30 AM

Room: La Granja

**Epistemological Frames of Graduate Teaching Assistants and Instructors in Studio-Based Engineering Classes**

Christina Smith (Oregon State University, USA)
Debra Gilbuena (Oregon State University, USA)
Devlin Montfort (Oregon State University, USA)
Milo Koretsky (Oregon State University, USA)

**Practical implications in engineering education: Who is supposed to do what?**

Jennifer Turns (University of Washington, USA)
Drew Paine (University of Washington, USA)
Brook Sattler (University of Washington, USA)

**On the Role of a "Caring" Professor in Developing a Proper Learning Environment**

Waddah Akili (Geotechnical Engineering, USA)

**A Self-Assessment of the Use of Evidence-Based Instructional Practices in Engineering**

Sarah Zappe (Pennsylvania State University, USA)
Daniel Merson (Pennsylvania State University, USA)
Kirsten Hochstedt (Pennsylvania State University, USA)
Lindsey Schrott (Pennsylvania State University, USA)
Thomas Litzinger (Pennsylvania State University, USA)

**Making Teachers from Students: How Learning Environments May Foster an Interest in Teaching**

Adam Coppola (Olin College of Engineering, USA)
Yevgeniya V Zastavker (Olin College of Engineering, USA)
Jeremy M Goodman (Olin College of Engineering, USA)
Rebecca Christianson (Olin College of Engineering, USA)
Anne LoVerso (Olin College of Engineering, USA)
Cecelia Auerswald (Olin College of Engineering, USA)
Doyung Lee (Olin College of Engineering, USA)

---

**INT1: International Dimensions of Engineering Education**

9:00 AM - 10:30 AM

Room: La Galería

**Parallel Virtual Urban Workshop: A "reasonable-cost" methodology for academic internationalization in problem-solving oriented postgraduate subjects**

Ester Higueras (Technical University of Madrid, Spain)
Jose Fernández-Güell (Technical University of Madrid, Spain)
Francisco Lamíquiz (Technical University of Madrid, Spain)
Marcela Riva Monti (Technical University of Madrid, Spain)

**Engineering International Programs at the Public University of Navarre: a satisfactory on-going experience in a context of industrial globalization**

Pablo Sanchis (Public University of Navarre, Spain)
Antonio J López-Martín (Public University of Navarre, Spain)
Jesús López-Taberna (Public University of Navarre, Spain)
Gurutze Pérez-Artieda (Public University of Navarre, Spain)
Eugenio Gubía (Public University of Navarre, Spain)
Edurne Barrenechea (Public University of Navarre, Spain)
David Astrain (Public University of Navarre, Spain)
Daniel Morato (Public University of Navarre, Spain)
Ignacio R. Matias (Public University of Navarre, Spain)
Opening up an interuniversity collaboration among Catalan university academic staff
The case of CIRAX pilot experience ............................................................................................................................. 2218
Teresa Sancho-Vinuesa (Universitat Oberta de Catalunya, Spain)
M. Rosa Estela (Universitat Politècnica de Catalunya, Spain)
Joana Villalonga Pons (Universitat Oberta de Catalunya (UOC), Sweden)
Clàudia Sánchez-Bonvehí (Consorci de Serveis Universitaris de Catalunya, Spain)

Thinking out of the box: C-projectors and morphological overview ........................................................................... 2226
Wim Zeiler (University of Technology Eindhoven, The Netherlands)

MINI WS: Special Session on Design & Failure: How Philosophy and Belief Impact Design Education
9:00 AM - 10:30 AM
Room: El Jardin

Special Session on Design & Failure: How Philosophy and Belief Impact Design Education ................................. 2234
Stephen Frezza (Gannon University, USA)
Mani Mina (Iowa State University, USA)

PRE4: Delivery Techniques for Precollege Education
Chair: Ann Kaiser
9:00 AM - 10:30 AM
Room: Comendador

CorePal: A standards-based content hub for STEM fields .......................................................................................... 2238
Smitesh Bakrania (Rowan University, USA)
Krishan Bhatia (Rowan University, USA)
Kauser Jahan (Rowan University, USA)

A Mobile Program for Enhancing Engineering Education ......................................................................................... 2243
Kauser Jahan (Rowan University, USA)
Nancy K DeJarnette (Rowan University, USA)

Pathways To Effective K-12 STEM Programs .............................................................................................................. 2248
Howard Kimmel (New Jersey Institute of Technology, USA)
Levellle Burr-Alexander (New Jersey Institute of Technology, USA)
Linda S. Hirsch (New Jersey Institute of Technology, USA)
Ronald Rockland (New Jersey Institute of Technology, USA)
John Carpinelli (New Jersey Institute of Technology, USA)
Marie Aloia (Bayonne High School, USA)

Using K-12 STEM education and outreach to inspire student-driven leadership initiatives in Singapore .............. 2254
Dara R Fisher (Harvard University, USA)
Aikaterini Bagiati (Massachusetts Institute of Technology, USA)
John Brisson (Massachusetts Institute of Technology, USA)

Constructivist Learning Environments to Bridge the Gap from High School to Engineering University Degrees .......................................................................................................... 2262
Inmaculada Calet (University of Granada, Spain)
Belen Prados-Suarez (University of Granada, Spain)
Zoraida Callejas (University of Granada, Spain)
SBM4: Student Beliefs, Motivation, and Persistence in Precollege and the First Year of University Study
Chair: Eugenia Fernandez
9:00 AM - 10:30 AM
Room: Patio 1

An Award Winning Program for Increasing Participation in STEM ................................................................. 2270
Peggy Doerschuk (Lamar University, USA)
Cristian Bahrim (Lamar University, USA)
Jennifer Daniel (Lamar University, USA)
Joseph Kruger (Lamar University, USA)
Judith Mann (Lamar University, USA)
Christopher Martin (Lamar University, USA)

Changes in Student Goal Orientation Across the Semester in Undergraduate Computer Science Courses .......... 2278
Melissa Patterson Hazley (University of Nebraska - Lincoln, USA)
Duane F Shell (University of Nebraska-Lincoln, USA)
Leen-Kiat Soh (University of Nebraska-Lincoln, USA)
Lee Miller (University of Nebraska-Lincoln, USA)
Vlad Chiriacescu (University of Nebraska-Lincoln, USA)
Elizabeth Ingraham (University of Nebraska - Lincoln, USA)

Early Course and Grade Predictors of Persistence in Undergraduate Engineering Majors ...................................... 2285
James Middleton (Arizona State University, USA)
Stephen Krause (Arizona State University, USA)
Sean Maass (Arizona State University, USA)
Kendra Beeley (Arizona State University, USA)
James Collofello (Arizona State University, USA)
Robert Culbertson (Arizona State University, USA)

Student Performance in First Year, Mathematics, and Physics Courses:
Implications for Success in the Study of Electrical and Computer Engineering .................................................. 2292
Jane Simpson (Indiana University-Purdue University Indianapolis, USA)
Eugenia Fernandez (Indiana University-Purdue University Indianapolis, USA)

SER2: Service Learning Challenges
9:00 AM - 10:30 AM
Room: Alcalá

Gender and Volunteer Computing ......................................................................................................................... 2296
Feng Raoking (University of Virginia, USA)
Joanne Cohoon (University of Virginia, USA)
Kathryn Cooke (University of Virginia, USA)
Michela Taufer (University of Delaware, USA)
Trilce Estrada (University of New Mexico, USA)

Impact of Team-Based Learning on Promoting Creative Thinking in Undergraduate Engineering Students ....... 2301
Homero Murzi (National University of Tachira (UNET), USA)
Omar Perez (University of the Andes (ULA), Venezuela)

Dissemination of Community Engagement in Engineering and Computing ......................................................... 2305
William Oakes (Purdue University, USA)
Carla Zoltowski (Purdue University, USA)
Maeve Drummond (Purdue University, USA)
Volunteerism in Engineering Outreach: Motivations and Surprising Outcomes for Undergraduate Mentors........ 2312
Leslie (To-Nhu) Nguyen (Rice University, USA)
Luz M. Rocha (Rice University, USA)
Chloe (Boi-Chau) Nguyen (Rice University, USA)
Brent C Houchens (Rice University, USA)
Angie M. Bautista-Chavez (Harvard University, USA)

Development and implementation of engineering modules into a 9th grade biochemistry class based on the NAE Grand Challenges.................................................................................... 2320
Kamau Wright (Drexel University, USA)
Stephanie Dunda (Science Leadership Academy, USA)
Jessica Ward (Drexel University, USA)
Mary Jo Grdina (Drexel University, USA)
Timothy Kurzweg (Drexel University, USA)

ASM4: Assessment in Engineering and Computer Science
11:00 AM - 12:30 PM
Room: Patio 3

Work integrated learning at a university of technology: assessment and management ........................................... 2327
Rangith Kuriakose (Central University of Technology, South Africa)
Arthur Swart (Central University of Technology, South Africa)

Towards the use of an automatic assessment system in the teaching of software testing........................................ 2333
Draylson Souza (University of São Paulo, Brazil)
Bruno Oliveira (University of São Paulo, Brazil)
José Maldonado (University of São Paulo, Brazil)
Simone Souza (University of São Paulo, Brazil)
Ellen Barbosa (University of São Paulo, Brazil)

Test Anxiety and Online Testing: A Study................................................................. 2341
Amruth N. Kumar (Ramapo College of New Jersey, USA)

Motivation-Participation Conflation:
Investigating Response Bias in Intra-Semester Longitudinal Class Surveys............................................. 2347
Alex Dillon (Franklin W. Olin College of Engineering, USA)
Jonathan Stolk (Franklin W. Olin College of Engineering, USA)

CAP1: The Capstone Experience
Chair: Vasiliki Ikonomidou
11:00 AM - 12:30 PM
Room: Alcalá

Evaluation and assessment of professional skills in the Final Year Project......................................................... 2352
Fermin Sanchez (Universitat Politècnica de Catalunya - BarcelonaTech, Spain)
Juan Climent (Universitat Politècnica de Catalunya - BarcelonaTech, Spain)
Julita Corbalan (Universitat Politècnica de Catalunya - BarcelonaTech, Spain)
Pau Fonseca i Casas (Universitat Politècnica de Catalunya - BarcelonaTech, Spain)
Jordi Garcia (Universitat Politècnica de Catalunya - BarcelonaTech, Spain)
José R. Herrero (Universitat Politècnica de Catalunya - BarcelonaTech, Spain)
Xavier Llinàs (Universitat Politècnica de Catalunya - BarcelonaTech, Spain)
Horacio Rodríguez (Universitat Politècnica de Catalunya - BarcelonaTech, Spain)
Maria-Ribera Sancho (Universitat Politècnica de Catalunya - BarcelonaTech, Spain)
Marc Alier (Universitat Politècnica de Catalunya - BarcelonaTech, Spain)
Jose Cabre (Universitat Politècnica de Catalunya - BarcelonaTech, Spain)
David Lopez (Universitat Politècnica de Catalunya - BarcelonaTech, Spain)
A Methodology to Introduce Sustainability into the Final Year Project to Foster Sustainable Engineering Projects .......................................................... 2360
David Lopez (Universitat Politècnica de Catalunya - BarcelonaTech, Spain)
Fermin Sanchez (Universitat Politècnica de Catalunya - BarcelonaTech, Spain)
Eva Vidal (Universitat Politècnica de Catalunya - BarcelonaTech, Spain)
Josep Pegueroles (Universitat Politècnica de Catalunya - BarcelonaTech, Spain)
Marc Alier (Universitat Politècnica de Catalunya - BarcelonaTech, Spain)
Jose Cabre (Universitat Politècnica de Catalunya - BarcelonaTech, Spain)
Jordi Garcia (Universitat Politècnica de Catalunya - BarcelonaTech, Spain)
Helena Garcia (Universitat Politècnica de Catalunya - BarcelonaTech, Spain)

Advantages of Agile Methodologies for Software and Product Development in a Capstone Design Project .......... 2367
Diane Rover (Iowa State University, USA)
Curtis Ullerich (Google, USA)
Ryan Scheel (Garmin, USA)
Julie Wegter (Epic Systems, USA)
Cameron Whipple (The Boeing Company, USA)

An Effective Structure for a Senior-Level Capstone Design Course ........................................................................................................ 2376
Karl Cox (Virginia Tech, USA)
Paul Plassmann (Virginia Tech, USA)

Project Ownership and Student Performance in User-Centered Senior Design Projects ........................................... 2384
Vasiliki Ikonomidou (George Mason University, USA)
Caitlin Laurence (George Mason University, USA)
Nathalia Peixoto (George Mason University, USA)

How to produce quality theses at universities in a large scale SciPro IT system - Supporting the Scientific Process ........................................................................................................ 2388
Henrik Hansson (Stockholm University, Sweden)

CUR5: Global Experiences in Curriculum Design
11:00 AM - 12:30 PM
Room: Doblon

In Search of High Quality in Postsecondary Education in Colombia ......................................................................... 2389
Jesus Alfonso Perez Gama (Fundación de Educación Superior San José, Colombia)
Andrey Ali Alvarez Gaitan (Fundación de Educación Superior San José, Colombia)
Guillermo Hoyos Gomez (Fundación de Educación Superior San José, Colombia)
Claudia Lucia Caro Gomez (Fundación de Educación Superior San José, Colombia)
Martha Isabel Rozo Arteaga (Fundación de Educación Superior San José, Colombia)
Alexis Mena Mena (Fundación de Educación Superior San José, Colombia)

Preparing Global Engineers: USA-India Academia & Industry led approach ........................................................... 2397
Manoj Pokkiyarath (Amrita Vishwa Vidyapeetham University, India)
Raghu Raman (Amrita Vishwa Vidyapeetham University, India)
Krishnashree Achuthan (Amrita Vishwa Vidyapeetham University, India)
Bharat Jayaraman (University at Buffalo, USA)

An Innovation Model in Curriculum Design for Teaching Engineering at Universidad EAFIT ........................................ 2403
Claudia Maria Zea Restrepo (Universidad EAFIT, Colombia)
Alberto Rodriguez (Universidad EAFIT, Colombia)
Natalia Andrea Bueno Pizarro (Universidad EAFIT, Colombia)
Merging Pedagogical Approaches: University of Glasgow-UESTC Joint Education Programme in Electronics and Electrical Engineering

Kathleen Meehan (University of Glasgow, United Kingdom)
John H. Davies (University of Glasgow, United Kingdom)
Scott Roy (University of Glasgow, European Union)
John Marsh (University of Glasgow, United Kingdom)
Yun Li (University of Glasgow, United Kingdom)
Shiquan Gao (University of Electronic Science and Technology of China, P.R. China)
Dillon Zhou (University of Electronic Science and Technology of China, P.R. China)
Zhiqin Zhao (University of Electronic Science and Technology of China, P.R. China)
Xingang Liu (University of Electronic Science and Technology of China, P.R. China)
Fengwu Luo (University of Electronic Science and Technology of China, P.R. China)

Supporting the design and development of Project Based Learning courses

Javier García Martín (Universidad Politécnica de Madrid, Spain)
Carlos López López (Universidad Politécnica de Madrid, Spain)
Jorge E. Perez-Martinez (Universidad Politécnica de Madrid, Spain)

DIS5: Computer Tools for Distance Education 2
Chair: Hector R. Amado-Salvaterra
11:00 AM - 12:30 PM
Room: Escudo

No University Credit, No Problem? Exploring Recognition of Non-Formal Learning
William Jobe (Stockholm University, Sweden)

Overcoming LMS Internet Dependency
Alberto Castro, Jr. (Federal University of Amazonas, Brazil)
Rallyson Ferreira (Federal University of Amazonas, Brazil)

Digital Technologies for Doctoral Dialogues at a Distance
Marian Petre (The Open University, United Kingdom)
Shailey Minocha (The Open University, United Kingdom)
Leonor Barroca (The Open University, United Kingdom)

Teaching and Promoting Web Accessibility in Virtual Learning Environments
A staff training experience in Latin-America
Hector R. Amado-Salvaterra (Galileo University, Guatemala)
Rocael Hernandez-Rizzardini (Galileo University, Guatemala)
Jose Ramon Hilera (University of Alcala, Spain)

EER10: Out-of-School Time Learning Communities
Chair: Archie Holmes
11:00 AM - 12:30 PM
Room: Aranjuez

A Kit-based Approach to Preparing Undergraduate Students for Research
Micaela Aguilar (The University of Alabama, USA)
John Lusth (The University of Alabama, USA)
Sarah Dunlap (The University of Alabama, USA)
Debra McCallum (The University of Alabama, USA)
Susan Burkett (The University of Alabama, USA)

Making It Together, Locally: A Making Community Learning Ecology in the Southwest USA
Micah Lande (Arizona State University at the Polytechnic campus, USA)
Shawn Jordan (Arizona State University at the Polytechnic campus, USA)
Hackerspaces and Engineering Education
Cindy Harnett (University of Louisville, USA)
Thomas Tretter (University of Louisville, USA)
Stephanie Philipp (Miami University, USA)

Assessing the Functions: Understanding the Functions of an Undergraduate Research Mentor
Courtney Smith (Virginia Tech, USA)
Marie Paretti (Virginia Tech, USA)
William Hession (Virginia Tech, USA)
Leigh Ann Krometis (Virginia Tech, USA)

Hacker School Begins to Write a Book: A massive collaborative autoethnography by a maker community
Mel Chua (Hacker School, USA)

New teaching approaches and student motivation lead to documented gains in engineering education
Aljoscha Reinert (Hamburg University of Technology, Germany)
Nils Vollmann (Hamburg University of Technology, Germany)
Marco Heyder (Hamburg University of Technology, Germany)
Wolfgang Krautschneider (Hamburg University of Technology, Germany)

LANI: Assessing Student Performance Using Learning Analytics
Chair: Cory Brozina
11:00 AM - 12:30 PM
Room: La Granja

Predicting Students' grades Based on free style Comments Data by Artificial Neural Network
Shaymaa Sorour (Kafr Elsheik University, Japan)
Tsunenori Mine (Kafr University, Japan)
Kazumasa Goda (Kafr University, Japan)
Sachio Hirokawa (Kyushu University, Japan)

Using a Learning Analytics Tool for Evaluation in Self-Regulated Learning
Ana Rodriguez Grobas (University of Santiago de Compostela, Spain)
Borja Vazquez Barreiros (University of Santiago de Compostela, Spain)
Manuel Lama (University of Santiago de Compostela, Spain)
Adriana Gewerc (University of Santiago de Compostela, Spain)
Manuel Mucientes (University of Santiago de Compostela, Spain)

Monitoring Student Performance Using Data Clustering and Predictive Modelling
Alana Morais (Universidade Federal de Campina Grande, Brazil)
Joseana Araújo (Universidade Federal de Campina Grande, Brazil)
Evandro Costa (Universidade Federal de Alagoas, Brazil)

Learning Analytics for the Prediction of the Educational Objectives Achievement
Manuel Fernández-Delgado (University of Santiago de Compostela, Spain)
Manuel Mucientes (University of Santiago de Compostela, Spain)
Borja Vazquez Barreiros (University of Santiago de Compostela, Spain)
Manuel Lama (University of Santiago de Compostela, Spain)

MINI WS: A Student-Centered Approach to Designing Teaming Experiences
11:00 AM - 12:30 PM
Room: El Jardin

A Student-Centered Approach to Designing Teaming Experiences
Jessica Townsend (Olin College of Engineering, USA)
Lynn Andrea Stein (Olin College of Engineering, USA)
Mark Somerville (Olin College of Engineering, USA)
PRE5: Teachers in Precollege Education
Chair: Nancy K. DeJarnette
11:00 AM - 12:30 PM
Room: Comendador

Engineers as Second-Career Teachers: The Perceived Contribution of Engineering Education and Career to Teaching .................................................................................................................. 2506
Orna Muller (ORT Braude College of Engineering, Israel)
Yael Furman Shaharabani (ORT Braude College of Engineering, Israel)
Miri Shacham (ORT Braude College of Engineering, Israel)

Investigation of Pre-University Pathways into Engineering .......................................................................................................................... 2511
Marisa Exter (Purdue University, USA)
Ji Hyun Yu (Purdue University, USA)
Todd P Shuba (Purdue University, USA)
Carla Zoltowski (Purdue University, USA)
Monica Cardella (Purdue University, USA)
William Oakes (Purdue University, USA)
Mindy Hart (Purdue University, USA)
Jean Trusedell (Purdue University, USA)

Examining and Mapping CS Teachers' Technological, Pedagogical and Content Knowledge (TPACK) in K-12 Schools ............................................................................................................ 2515
Michail Giannakos (Norwegian University of Science and Technology & Old Dominion University, Norway)
Spyros Doukakis (The American College of Greece – Pierce, Greece)
Helen Crompton (Old Dominion University, USA)
Nikos Chrisochoides (The Hellenic Ministry of Education, USA)
Nikos Adamopoulos (High School of Pyrgos, Greece)
Panagiota Giannopoulou (The Lycée Léonin Educational Institution, Greece)

Introducing Computational Thinking through Stealth Teaching ....................................................................................................................... 2522
Massood Towhidnejad (Embry-Riddle Aeronautical University, USA)
Christopher Kestler (Embry-Riddle Aeronautical University, USA)
Shafagh Jafer (Embry-Riddle Aeronautical University, USA)
Victor Nicholas (Embry-Riddle Aeronautical University, USA)

Teachers' Attitudes, Competencies, and Readiness to Adopt Mobile Learning Approaches ........................................................................... 2529
Jenni Rikala (University of Jyväskylä, Finland)
Leena Hiltunen (University of Jyväskylä, Finland)
Mikko Vesisenaho (University of Jyväskylä, Finland)

PW11: Challenges and Opportunities in Partnering with Industry
11:00 AM - 12:30 PM
Room: La Galeria

A Professional Project Based Learning Method in Mobile Robotics............................................................................................................ 2537
Annemarie Kokosy (Institut Supérieur d'Electronique et du Numérique (ISEN), France)
Mihai V. Micea (Politehnica University of Timisoara, Romania)
Philippe Saey (KU Leuven, Belgium)

On Industry Academia Relations in The Arab Gulf States: Challenges and Potential Solutions ....................................................... 2544
Waddah Akli (Geotechnical Engineering, USA)
Virtual placements for informatics students in open source business across Europe................................................................. 2551
Francisco J. García-Peñalvo (University of Salamanca, Spain)
Juan Cruz-Benítez (University of Salamanca, Spain)
Miguel Á. Conde (University of León, Spain)
Dai Griffiths (Bolton University, United Kingdom)

The Role of University-Industry Liaisons to Enhance Engineering Curricular Development................................................. 2556
Francisco Falcone (Universidad Pública de Navarra, Spain)
Pablo Sanchis (Universidad Pública de Navarra, Spain)
Antonio J López-Martín (Universidad Pública de Navarra, Spain)
Ana Alejos (Universidad de Vigo, Spain)

Innovative Incorporation of Industry Certifications to Enhance Recruiting and Retention in Civil Engineering ... 2560
Luis Mata (Lawrence Technological University, USA)
Donald D. Carpenter (Lawrence Technological University, USA)

SBM5: Pathways into Engineering and Computer Science Education
Chair: Tom G McEwan
11:00 AM - 12:30 PM
Room: Patio 1

A Disciplinary Comparison of Trajectories of U.S.A. Engineering Students................................................................. 2564
Susan M. Lord (University of San Diego, USA)
Richard Layton (Rose-Hulman Institute of Technology, USA)
Matthew W Ohland (Purdue University, USA)

From Interest to Decision in Cooperative Education Programs................................................................................. 2568
Trina Fletcher (Purdue University, USA)
Joyce B. Main (Purdue University, USA)
Nichole Ramirez (Purdue University, USA)
Matthew W Ohland (Purdue University, USA)

Student Beliefs as Barriers to Articulation................................................................................................................... 2571
Debbie Meharg (Edinburgh Napier University, United Kingdom)
Stephanie Craighill (Edinburgh Napier University, United Kingdom)

Looking Upstream: Identifying and Describing the Entry Points into Engineering Transfer Pathways .................. 2576
Catherine Mobley (Clemson University, USA)
Catherine E. Brawner (Research Triangle Educational Consultants, USA)
Russell Long (Purdue University, USA)

Factors that influence confidence: Untangling the influences of gender, achievement, and hands-on activities..... 2580
Marisa K. Orr (Louisiana Tech University, USA)
Christa Swafford (Louisiana Tech University, USA)
Sara Hahler (Louisiana Tech University, USA)
David Hall (Louisiana Tech University, USA)
SS3: Building dispositions towards models and model-based reasoning in engineering education
11:00 AM - 12:30 PM
Room: El Escorial

Building dispositions towards models and model-based reasoning in engineering education ........................................ 2585
Alexandra E Coso (Georgia Institute of Technology, USA)
Joseph Le Doux (Georgia Institute of Technology, USA)
Wendy Newstetter (Georgia Institute of Technology, USA)
Alisha A. Waller (Georgia Institute of Technology, USA)
Milo Koretsky (Oregon State University, USA)
Audrey Champagne (University at Albany, SUNY, USA)

CSE1: Learning to Program
Chair: Juan M Montero
2:30 PM - 4:00 PM
Room: Alcalá

Meaningful Categorisation of Novice Programmer Errors ........................................................................................................ 2589
Davin McCall (University of Kent, United Kingdom)
Michael Kölling (University of Kent, United Kingdom)

Rethinking Task Types for Novice Programmers .................................................................................................................. 2597
Matthias Laengrich (TU Dresden, Germany)
Joerg Schulze (University of Applied Sciences Zittau / Goerlitz, Germany)

Replication in Ecuador of a Multinational Study on Performance of Programming Students ............................................. 2605
J. Ángel Velázquez-Iturbide (Universidad Rey Juan Carlos, Spain)
Jorge Menéndez (Escuela Politécnica Superior de Chimborazo, Ecuador)
Julio Santillán (Escuela Politécnica Superior de Chimborazo, Ecuador)
Germania Veloz-Remache (Escuela Politécnica Superior de Chimborazo, Ecuador)
Eduardo Villa-Villa (Escuela Politécnica Superior de Chimborazo, Ecuador)

Prototyping: A Key Skill for Innovation and Life-Long Learning ....................................................................................... 2613
Vimal Viswanathan (Tuskegee University, USA)
Olufunmilola Atilola (Georgia Institute of Technology, USA)
Joseph Goodman (Georgia Tech Research Institute, USA)
Julie Linsey (Georgia Institute of Technology, USA)

Failure Rates in Introductory Programming: A 2006-2012 Study at a Brazilian University ............................................. 2621
Marlos Silva (Federal Institute of Education, Science and Technology, Brazil)
Evandro Costa (Federal University of Alagoas, Brazil)
Emanuele Tuane Silva (Federal University of Alagoas, Brazil)
Paulo Barbosa (Federal University of Alagoas, Brazil)
Juliana Cavalcanti (Federal University of Alagoas, Brazil)

CUR6: Mathematics and Science Curricula Design
2:30 PM - 4:00 PM
Room: Doblon

ROBOTRADER Competition: Educating Engineering Students in Financial Markets ...................................................... 2628
Eduardo Lopez-Gonzalo (Universidad Politécnica Madrid, Spain)

Robotics Engineering Program and Curriculum Development ......................................................................................... 2634
Rachid Manseur (State University of New York at Oswego, USA)
Design and Implementation of a New Engineering Mathematics Course
Zohra Manseur (State University of New York at Oswego, USA)
Rachid Manseur (State University of New York at Oswego, USA)

A Modular Approach to Using the Engineering Design Process in Secondary Science Curriculum: Experiences in Singapore and the United States
Ann Kaiser (La Salle Academy, USA)

Modernizing Probability and Statistics Engineering Curricula
James Rowland (University of Kansas, USA)

DES1: Novel Approaches for Teaching Design
2:30 PM - 4:00 PM
Room: Patio 3

Pumpkin Carving as an Exercise in Design Process Thinking
William E Genereux (Kansas State University, USA)
Katrina Lewis (Kansas State University, USA)

Dealing with common problems in engineering degrees’ Final Year Projects
Mikel Villamañe (University of the Basque Country UPV/EHU, Spain)
Begoña Ferrero (University of the Basque Country UPV/EHU, Spain)
Ainhoa Álvarez (University of the Basque Country, UPV/EHU, Spain)
Mikel Larrañaga (University of the Basque Country, UPV/EHU, Spain)
Ana Arruarte (University of the Basque Country UPV/EHU, Spain)
Jon A. Elorriaga (University of the Basque Country UPV/EHU, Spain)

Using alien-centered design for teaching iteration in the design process in undergraduate design courses
John Mendoza-Garcia (Purdue University / Pontificia Universidad Javeriana, USA)
Monica Cardella (Purdue University, USA)

EER9: Creating Successful Teams
Chair: Susan Nolen
2:30 PM - 4:00 PM
Room: Aranjuez

Taking Care of the Team in a First-Year Design Experience Course
Mark Fontenot (Southern Methodist University, USA)
Katherine Canales (Southern Methodist University, USA)
Andrew Quicksall (Southern Methodist University, USA)

Productively Engaging Student Teams in Engineering: The Interplay between Doing and Thinking
Milo Koretsky (Oregon State University, USA)
Susan Nolen (University of Washington, USA)
Debra Gilbuena (Oregon State University, USA)
Gavin Tierney (University of Washington, USA)
Simone Volet (Murdoch University, Australia)

Evidence for the Persistent Effects of an Intervention to Mitigate Gender-Stereotypical Task Allocation Within Student Engineering Teams
Lynn Andrea Stein (Olin College of Engineering, USA)
Deyna Aragon (Olin College of Engineering, USA)
Daniel Moreno (Olin College of Engineering, USA)
Jeremy M Goodman (Olin College of Engineering, USA)
Using Discourse Analysis to Understand "Failure Modes" of Undergraduate Engineering Teams

Ryan Eggert (Franklin W. Olin College of Engineering, USA)
Aditi Joshi (Franklin W. Olin College of Engineering, USA)
Saarth Mehrotra (Franklin W. Olin College of Engineering, USA)
Yevgeniya V Zastavker (Franklin W. Olin College of Engineering, USA)
Veronica Darer (Wellesley College, USA)

ENT1: Cultural Dimensions in Entrepreneurship
Chair: Andrew O. Brightman
2:30 PM - 4:00 PM
Room: Patio 1

SEEDing Evidence-Based Educational Practices into Economic Development

Jennifer Karlin (South Dakota School of Mines and Technology, USA)
Eric James (Huron Consulting Group, USA)

Critical Learning Experiences for Korean Engineering Students to Promote Creativity and Innovation

Jennifer Suh (George Mason University, USA)
Nathalia Peixoto (George Mason University, USA)
Padmanabhan Seshaiyer (George Mason University, USA)
Daniel Suh (Pohang University of Science and Technology, Korea)
Kwan Hong Lee (Red Venture, USA)
Yunsuk Jung (Pohang University of Science and Technology, Korea)

Exploring Institutional Climate and Engineering Ethical Reasoning: A Cross-Institutional Study

Megan Kenny Feister (Purdue University, USA)
Qin Zhu (Purdue University, USA)
Carla Zoltowski (Purdue University, USA)
Patrice Buzzanell (Purdue University, USA)
William Oakes (Purdue University, USA)
Alan Mead (Illinois Institute of Technology, USA)

Examining the Role of Culture in Assessing Individual Ethical Reasoning on Multidisciplinary Engineering Project Teams

Qin Zhu (Purdue University, USA)
Megan Kenny Feister (Purdue University, USA)
Carla Zoltowski (Purdue University, USA)
Patrice Buzzanell (Purdue University, USA)
William Oakes (Purdue University, USA)
Alan Mead (Illinois Institute of Technology, USA)

An Ethics Transfer Case Assessment Tool for Measuring Ethical Reasoning Abilities of Engineering Students Using Reflexive Principlism Approach

Justin Hess (Purdue University, USA)
Jonathan Beever (Penn State University, USA)
Andrew Iliadis (Purdue University, USA)
Lorraine Kisselburgh (Purdue University, USA)
Carla Zoltowski (Purdue University, USA)
Matthew Krane (Purdue University, USA)
Andrew O. Brightman (Purdue University, USA)
IDP1: Interdisciplinary Learning
2:30 PM - 4:00 PM
Room: La Galería

Computer Science for Non-Technological Cyber Programs ................................................................. 2739
Amir Rubinstein (Tel Aviv University, Israel)

The use of Unmanned Aerial Vehicles for an Interdisciplinary Undergraduate Education:
Solving Quadrotors Limitations ............................................................................................................. 2747
Carlos Molina-Peña (University of Puerto Rico-Mayaguez, Puerto Rico)
Reynaldo Belfort (University of Puerto Rico-Mayaguez, Puerto Rico)
Rafael Pol (University of Puerto Rico-Mayaguez, Puerto Rico)
Oscar Chacon-Rosario (University of Puerto Rico-Mayaguez, Puerto Rico)
Luis Rivera (University of Puerto Rico-Mayaguez, Puerto Rico)
Daniel Ramos (University of Puerto Rico-Mayaguez, Puerto Rico)
Eduardo Ortiz-Rivera (University of Puerto Rico-Mayaguez, Puerto Rico)

Engineers of the World Unite An Integrated Course on Embedded Systems and Social Movements .......... 2753
Lynne Slivovsky (California Polytechnic State University, USA)
Thomas Trice (California Polytechnic State University, USA)

Realising student potential through a truly international experience ........................................................ 2758
Ian Smith (Edinburgh Napier University, United Kingdom)
Lise Thenault (Edinburgh Napier University, United Kingdom)
Yuxin Zhang (Shanghai Normal University, United Kingdom)

An Educational and Research Cooperation between Brazil and Germany on Industrial Automation Topics .... 2763
Vicente F. Lucena, Jr. (Federal University of Amazonas, Brazil)
Peter Göhner (University of Stuttgart, Germany)
Nasser Jazdi (University of Stuttgart, Germany)

LAN2: Tools and Techniques for Learning Analytics 1
2:30 PM - 4:00 PM
Room: La Granja

Computer Tutors Can Address Students Learning to Solve Complex Engineering Problems ...................... 2767
Paul Steif (Carnegie Mellon University, USA)
Luoting Fu (Carnegie Mellon University, USA)
Levent Kara (Carnegie Mellon University, USA)

Ensuring the integrity and interoperability of educational usage and
social data through Caliper framework to support competency-assessment ......................................... 2775
Alex Rayon (University of Deusto, Spain)
Mariluz Guenaga (University of Deusto, Spain)
Asier Núñez (University of Deusto, Spain)

Challenges and Perspectives in an Undergraduate Flipped Classroom Experience:
Looking through the Lens of Learning Analytics .................................................................................... 2784
Michail Giannakos (Norwegian University of Science and Technology & Old Dominion University, Norway)
Nikos Chrisochoides (Old Dominion University, USA)

Using Web-Based Learning Logs to Analyze Students' Conceptual Understanding of
Truss Analysis in an Engineering Statics Course ...................................................................................... 2789
Joel Mejia (Utah State University, USA)
Wade Goodridge (Utah State University, USA)
Christopher Green (Utah State University, USA)
MINI WS: Helping Students to Learn to Use Diagramming as a Problem Solving Tool
2:30 PM - 4:00 PM
Room: El Jardin

Helping Students to Learn to Use Diagramming as a Problem Solving Tool
------------------------------------------ 2793
Alisha A. Waller (Georgia Institute of Technology, USA)
Joseph Le Doux (Georgia Institute of Technology, USA)

OER1: Evaluating Open Educational Resources
Chair: William Jobe
2:30 PM - 4:00 PM
Room: Escudo

Open Educational Resources for Enhancing the Learning of Calculus in Engineering Education
------------------------------------------ 2795
M. Rosa Estela (Universitat Politècnica de Catalunya, Spain)
Joana Villalonga Pons (Universitat Oberta de Catalunya, Sweden)

Exploring the Use of Student Taught Classes to Introduce
New Technical Topics to Engineering Undergraduates
------------------------------------------ 2803
Anish Simhal (University of Virginia, USA)
Venkata-Gautam Kanumuru (University of Virginia, USA)
Archie Holmes (University of Virginia, USA)
Edward Berger (University of Virginia, USA)

Recommendation of OERs shared in social media based-on Social Networks Analysis approach
------------------------------------------ 2811
Jorge Lopez-Vargas (Technical University of Loja, Ecuador)
Nelson Piedra (Technical University of Loja, Ecuador)
Janneth Chicaiza (Technical University of Loja, Ecuador)
Edmundo Tovar (Technical University of Madrid, Spain)

e-Yantra Lab Setup Initiative: Sustainable Knowledge Creation and
Scalable Infrastructure Creation at Engineering Colleges
------------------------------------------ 2819
Saraswathi Krithivasan (Indian Institute of Technology Bombay, India)
Krishna Lala (Indian Institute of Technology Bombay, India)
Kavi Arya (Indian Institute of Technology Bombay, India)
Saurav Shandilya (Indian Institute of Technology Bombay, India)
Shailesh Jain (Indian Institute of Technology Bombay, India)
Piyush Manavvar (Indian Institute of Technology Bombay, India)
Sachin Patil (Indian Institute of Technology Bombay, India)

PRE6: Diversity in Precollege Education
2:30 PM - 4:00 PM
Room: Comendador

Increasing Awareness of Computer Science in High School Girls
------------------------------------------ 2827
Gerald Gannod (Miami University, USA)
Janet Burge (Miami University, USA)
Victoria Mele (Miami University, USA)
Maureen Doyle (Northern Kentucky University, USA)
Karen Davis (University of Cincinnati, USA)
Robotics Education Initiative for Analyzing Learning and Child-Parent Interaction

Francisco Cuellar (Pontificia Universidad Catolica del Peru, Peru)
Christian Penaloza (Osaka University, Japan)
Pedro Garret (Pontificia Universidad Catolica del Peru, Peru)
David Olivo (Pontificia Universidad Catolica del Peru, Peru)
Miriam Mejia (Pontificia Universidad Catolica del Peru, Peru)
Nancy Valdez (Pontificia Universidad Catolica del Peru, Peru)
Agueda Mija (Pontificia Universidad Catolica del Peru, Peru)

Across-the-ages: A Study of Robotics in Caribbean Education

Tricia Gilkes (Ministry of Education, Trinidad and Tobago)
Cathy-Ann Radix (The University of the West Indies, Trinidad and Tobago)
Daniel Ringis (The University of the West Indies, Trinidad and Tobago)

Pre-College Interactions, Early Expectations, and Perceived Barriers of First Year Black and Latino Engineering Students

Sandra Dika (University of North Carolina at Charlotte, USA)
Miguel A. Pando (University of North Carolina at Charlotte, USA)
Brett Tempest (University of North Carolina at Charlotte, USA)
Krystal Fox (University of North Carolina at Charlotte, USA)

An approach for engineering education at an early stage

Kazuhide Sugimoto (Okinawa National College of Technology, Japan)

SER: STEM Education Outreach through IEEE's Pre-University Programs - Engaging volunteers to benefit K-12 education and local communities
2:30 PM - 4:00 PM
Room: El Escorial

STEM Education Outreach through IEEE's Pre-University Programs - Engaging volunteers to benefit K-12 education and local communities

Sohaib Qamar Sheikh (IEEE Region 8, United Kingdom)
Efthymia Arvaniti (IEEE Region 8, Germany)

CSE2: Innovation in Computing Education
4:30 PM - 6:00 PM
Room: Alcalá

The Importance of Productive Dialog in Computer Science Students' Creative Thinking

Deller Ferreira (Universidade Federal de Goiás, Brazil)
Anderson Gonçalves (Universidade Federal de Goiás, Brazil)
Luciana Berreta (Universidade Federal de Goiás, Brazil)

A Brave New World Developing Methodology to Investigate Individual and Collaborative Student Practice in Computer Science Education

Daniel Knox (University of Kent, United Kingdom)

The Student Prompt: Student Feedback and Change in Teaching Practices in Postsecondary Computer Science

Lecia Barker (University of Texas at Austin, USA)
Jane Gruning (University of Texas at Austin, USA)

Research into the Computational Thinking for the Teaching of Computer Science

Ying Li (Beihang University, P.R. China)
Enhancing the Quality of Software Design through Multi-touch Interfaces
Mohammed Basheri (King Abdulaziz University, Saudi Arabia)
Malcolm Munro (Durham University, United Kingdom)

CUR7: Experiences in Curriculum Design
Chair: Ziming (Tom) Qi
4:30 PM - 6:00 PM
Room: Doblon

Social Context, Singular Focus
David Chesney (The University of Michigan, USA)

Towards a methodology to Inclusive Curriculum Design
An experience presented within an Accessible Virtual Learning Environment
Hector R. Amado-Salvatierra (Galileo University, Guatemala)
Rocael Hernandez-Rizzardini (Galileo University, Guatemala)

Towards Designing and Developing Curriculum for the Challenges of the Smart Grid Education
Suleyman Uludag (University of Michigan - Flint, USA)
Peter Sauer (University of Illinois at Urbana-Champaign, USA)
Klara Nahrstedt (University of Illinois at Urbana-Champaign, USA)
Timothy Yardley (University of Illinois at Urbana-Champaign, USA)

Instructional Module Development (IMOD) System: A User Study on Curriculum Design Process
Odesma Dalrymple (Arizona State University, USA)
Srividya K Bansal (Arizona State University, USA)
Ashraf Gaffar (Arizona State University, USA)
Randi Taylor (Arizona State University, USA)

Student Perception and Knowledge:
Assessment of Online Computational-Experimental (ComEx) Learning Modules
Kumar Singh (Miami University, USA)
Fazeel Khan (Miami University, USA)

A Master Degree Program Development for the Study Pathways from Bachelor of Engineering Technology
Ziming (Tom) Qi (Otago Polytechnic, New Zealand)
Caroline Terpstra (Otago Polytechnic, New Zealand)
John Findlay (Otago Polytechnic, New Zealand)

DES2: Design (and Design Learning) as a Process
4:30 PM - 6:00 PM
Room: Patio 3

Appearances matter: The perceived complexity, coherence, mystery, and legibility of Makerspace labs
Morgan Hynes (Purdue University, USA)
Wendy Hynes (Purdue University, USA)

Student Peer Feedback on Design
Farshid Marbouti (Purdue University, USA)
Monica Cardella (Purdue University, USA)
Heidi Diefes-Dux (Purdue University, USA)

Self-Regulated Learning Activities in Engineering Design Education
Oenardi Lawanto (Utah State University, USA)
Students Discovering Their Own Design Processes: Using Design Process Representations to Learn about Designing .............................................................................. 2947
Cynthia J. Atman (University of Washington, USA)
Janet McDonnell (University of the Arts London, United Kingdom)
Ryan C. Campbell (University of Washington, USA)
Jennifer Turns (University of Washington, USA)

How is Design Organized? A Preliminary Study of Spatiotemporal Organization in Engineering Design............... 2952
Carlye Lauff (University of Colorado Boulder, USA)
Daria Kotys-Schwartz (University of Colorado Boulder, USA)
Mark Rentschler (University of Colorado Boulder, USA)
Joanna Weidler-Lewis (University of Colorado Boulder, USA)
Kevin O’Connor (University of Colorado Boulder, USA)

EDT1: Technology Enhanced Learning Experiences
4:30 PM - 6:00 PM
Room: La Galería

A Web-based Application for the Management and Evaluation of Tutoring Requests in PBL-based Massive Laboratories .............................................................................................. 2957
Luis Fernando D’Haro (Universidad Politécnica de Madrid, Spain)
Fernando Fernández-Martínez (Universidad Carlos III de Madrid, Spain)
Ricardo Cordoba (Universidad Politécnica de Madrid, Spain)
Juan M Montero (Universidad Politecnica de Madrid, Spain)

OTILIA - An Architecture for the Recommendation of Teaching-Learning Techniques Supported by an Ontological Approach ..................................................................................... 2965
Dulce Mota (University of Porto, Portugal)
Carlos Vaz de Carvalho (Polytechnic Institute of Porto, Portugal)
Luis Paulo Reis (University of Minho, Portugal)

Web-Enabled Formative Feedback and Learning Resources for Enhancing Student Attitude, Achievement, and Persistence ....................................................................................... 2972
Stephen Krause (Arizona State University, USA)
Sean Maass (Arizona State University, USA)
Adam R Carberry (Arizona State University, USA)
Cindy Waters (North Carolina A & T State University, USA)
Milo Koretsky (Oregon State University, USA)
Candace Chan (Arizona State University, USA)

ENT2: Exploring the limits of Entrepreneurship
Chair: Kavi Arya
4:30 PM - 6:00 PM
Room: Patio 1

Cross-Disciplinary Collaboration in Entrepreneurship: Engineering and Business Students Really Can Work Together......................... 2980
Lisa Zidek (Florida Gulf Coast University, USA)
Sandra King Kauanui (Florida Gulf Coast University, USA)

Developing an Engineering and Entrepreneurship Collaborative Project................................................................. 2984
Chad Davis (University of Oklahoma, USA)
James J. Sluss, Jr. (University of Oklahoma, USA)
Ron Bolen (University of Oklahoma, USA)
Incorporating Entrepreneurship Topic into a Mobile Computing Course
Xiaoyuan Suo (Webster University, USA)
Tianye Niu (Zhejiang University School of Medicine, P.R. China)

Innovation Corps for Learning: Evidence-based Entrepreneurship™ to Improve (STEM) Education
Rocio Chavela Guerra (American Society for Engineering Education, USA)
Karl Smith (University of Minnesota & Purdue University, USA)
Ann McKenna (Arizona State University, USA)
Chris Swan (Tufts University, USA)
Russell Korte (Colorado State University, USA)
Shawn Jordan (Arizona State University, USA)
Micah Lande (Arizona State University, USA)
Robert MacNeal (Working Company, USA)

LAN3: Tools and Techniques for Learning Analytics 2
Chair: Mariluz Guenaga
4:30 PM - 6:00 PM
Room: La Granja

Collecting and Making Sense of Video Learning Analytics
Michail Giannakos (Norwegian University of Science and Technology & Old Dominion University, Norway)
Konstantinos Chorianopoulos (Ionian University, Greece)
Nikos Chrisochoides (Old Dominion University, USA)

Visual learning analytics techniques applied in software engineering subjects
Miguel Á. Conde (University of León, Spain)
Francisco J. García-Peñalvo (University of Salamanca, Spain)
Diego Gómez-Aguilar (University of Salamanca, Spain)
Roberto Theron (University of Salamanca, Spain)

The use of social tagging to support the cataloguing of learning objects
Anderson Amaral (Federal University of São Carlos & Federal University of São Carlos, Brazil)
Luciana Zaina (Federal University of São Carlos, Campus Sorocaba, Brazil)
José Rodrigues, Jr (University of Sao Paulo & ICMC-USP, Brazil)
Renan de Aguiar (Federal University of São Carlos, Brazil)
Marcos Cavalcante Barboza (Federal University of Sao Carlos & The National University of Ireland, Galway, Ireland)

Using infographics as a tool for introductory data analytics education in 9-12
Jamie L Kennedy (Drexel University, USA)
Pramod Abichandani (Drexel University, USA)
Adam Fontecchio (Drexel University, USA)

MAT1: Mathematics in Engineering and Computer Science
Chair: Duane F. Shell
4:30 PM - 6:00 PM
Room: Comendador

Improving Learning of Computational Thinking Using Computational Creativity Exercises in a College CS1 Computer Science Course for Engineers
Duane F Shell (University of Nebraska-Lincoln, USA)
Melissa Patterson Hazley (University of Nebraska - Lincoln, USA)
Leen-Kiat Soh (University of Nebraska-Lincoln, USA)
Lee Miller (University of Nebraska-Lincoln, USA)
Vlad Chiriacescu (University of Nebraska-Lincoln, USA)
Elizabeth Ingraham (University of Nebraska - Lincoln, USA)
Whole Mathematics Competences Assessment at Aerospace Engineering Sophomore ................................. 3036
Sergio Blanes (Universitat Politècnica de València, Spain)
Francisco Minguez (Universitat Politècnica de València, Spain)
Jose Antonio Moraño (Universitat Politècnica de València, Spain)
Maria Dolores Roselló (Universitat Politècnica de València, Spain)
Luis M. Sanchez Ruiz (Universitat Politècnica de València, Spain)

A new didactic approach in Engineering Education for conceptual understanding of Euler’s Formula .......... 3040
Brit-Maren Block (Leuphana University of Lueneburg, Germany)
Paolo Mercorelli (Leuphana University of Lueneburg, Germany)

A Multi-Layer Universally Designed Workspace for Tracking Students Skills and Mastery Transition in Mathematics Manipulation in Inclusive Education ........................................ 3047
Nancy Alajarmeh (New Mexico State University, USA)
Enrico Pontelli (New Mexico State University, USA)
Taylor Burgett (New Mexico State University, USA)

Mathematics for all: a Game-Based Learning Environment for Visually Impaired Students ....................... 3055
Frederico Diogo Carvalho Ferreira (Universidade Nova de Lisboa, Portugal)
Sofia Cavaco (Universidade Nova de Lisboa, Portugal)

MINI WS: Beyond Reflection: Using Discourse Analysis to Understand Your Classroom Culture
4:30 PM - 6:00 PM
Room: Aranjuez

Beyond Reflection: Using Discourse Analysis to Understand Your Classroom Culture ............................... 3063
Yevgeniya V Zastavker (Franklin W. Olin College of Engineering, USA)
Veronica Darer (Wellesley College, USA)

MINI WS: Building Diversity by Embracing Intellectual Diversity
4:30 PM - 6:00 PM
Room: El Jardin

Building Diversity by Embracing Intellectual Diversity ............................................................. 3066
Stuart Kellogg (South Dakota School of Mines and Technology, USA)

MINI WS: Quality Course Development for Online Learning
4:30 PM - 6:00 PM
Room: El Escorial

Quality Course Development for Online Learning ................................................................. 3070
Michael DeAntonio (New Mexico State University, USA)
Sandra R Johnson (New Mexico State University, USA)

OER2: Platforms and Technologies for Open Educational Resources
4:30 PM - 6:00 PM
Room: Escudo

Facilitating the creation of interactive multi-device Learning Objects using an online authoring tool .......... 3072
Aldo Gordillo (Universidad Politécnica de Madrid, Spain)
Enrique Barra (Universidad Politécnica de Madrid, Spain)
Juan Quemada Vives (Universidad Politécnica de Madrid, Spain)
A flexible open source web platform to facilitate Learning Object evaluation
Aldo Gordillo (Universidad Politécnica de Madrid, Spain)
Enrique Barra (Universidad Politécnica de Madrid, Spain)
Juan Quemada Vives (Universidad Politécnica de Madrid, Spain)

Towards a Learning Object pedagogical quality metric based on the LORI evaluation model
Aldo Gordillo (Universidad Politécnica de Madrid, Spain)
Enrique Barra (Universidad Politécnica de Madrid, Spain)
Juan Quemada Vives (Universidad Politécnica de Madrid, Spain)

Education Quality Enhancement Through Open Education Adaptation
Jose Luis Martín (Universidad Politécnica de Madrid, Spain)
Edmundo Tovar (Universidad Politécnica de Madrid, Spain)
Jesús Sánchez López (Universidad Politécnica de Madrid, Spain)
Pilar Martínez García (Universidad Politécnica de Madrid, Spain)

Open iTunesU. A new service to manage open learning resources
Alberto Pesquera (Spanish University for Distance Education - UNED, Spain)
Esther Reula (Spanish University for Distance Education - UNED, Spain)
Elio Sancristobal (Spanish University for Distance Education - UNED, Spain)
Manuel Castro (Spanish University for Distance Education - UNED, Spain)
Timothy Read (Spanish University for Distance Education - UNED, Spain)
Inés Gil-Jaurena (Spanish University for Distance Education - UNED, Spain)

Author Index