

Program

39th
Annual

Frontiers in Education Conference *Imagining and Engineering Future CSET Education*

San Antonio, Texas
October 18–21, 2009



Frontiers in Education Conference October 18–21, 2009

39th Annual Frontiers in Education Conference *Imagining and Engineering Future CSET Education*



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WORK IN PROGRESS - A NOVEL METHOD OF CREATING AN ACADEMIC CONTENT REPOSITORY**Mark Phythian, Jim Taylor, Shirley Reushle, Glenn Harris, Alexander A. Kist and Ron Ayers**

This paper outlines a project aimed at addressing the issue of the scalability of online academic support. This project is being run during the Autumn semester at the University of Southern Queensland (USQ) Toowoomba Australia, in conjunction with the Australian Digital Futures Institute. The study attached to the project will use Design-Based Research to evaluate the effectiveness of a simple, but innovative academic content and metadata creation tool referred to as Academic Assist. Academic Assist has been recently developed at USQ, as a plug-in block for the moodle-based Learning Management System employed at USQ for its several hundred online subjects. The pilot project extends over nine subjects, including three consecutive subjects in computer engineering; and covers faculties of Engineering, Education, Business, Science and Arts. Results of the study including acceptance surveys, expert reviews and usage statistics will be presented at FIE 2009.

DO MULTI-USER VIRTUAL ENVIRONMENTS REALLY ENHANCE STUDENT'S MOTIVATION IN ENGINEERING EDUCATION?**Pilar Sancho, Javier Torrente and Baltasar Fernández-Manjón**

The use of Multi-User Virtual Environments (MUVES) in education is increasing mainly due to motivational aspects. However, more practical research about the impact of MUVES on students' motivation in real educational contexts is required. Here we present Mare Monstrum, a system which integrates a MUVE with a Learning Management System and uses a fantastic narrative metaphor for teaching programming. The impact of the theories implemented in Mare Monstrum on the students' motivation have been evaluated in several case studies in the Spanish higher education context. In this paper we describe the system, the underlying hypotheses we intend to prove, the case studies and, finally, we present a brief discussion on the results obtained.

Session T2F: New Ideas in Teaching Capstone Design

Chair: Marie Parette, Virginia Polytechnic Institute and State University

Time: Tuesday, October 20, 10:00 a.m. - 11:30 a.m.

*La Vista****A STUDY OF BIOLOGICALLY-INSPIRED DESIGN AS A CONTEXT FOR ENHANCING STUDENT INNOVATION*****Brent Nelson, Jamal Wilson and Jeannette Yen**

This article describes an investigation of the use of biologically-inspired design as a context from which to teach innovative design. The research compared ideation behavior among mechanical engineering students from a capstone design class to mechanical engineering students who had taken a semester-long course specifically focused on biologically-inspired design. Both groups of students were presented with the same design challenge, and pre-established metrics were used to characterize the novelty and variety of the resultant designs generated by the students. The designs from the biologically-inspired design students had an average novelty score 80% higher than those from the control group of capstone students, and the result was statistically-significant. The biologically-inspired design students also had a 37% higher average variety score, although a small sample size led to a high variance and prevented statistical significance. The increased scores for novelty and variety imply a greater tendency toward innovative design among the biologically-inspired design students. The source of greater innovation is unclear but may be due to improved analogical reasoning capabilities among the biologically-inspired design students.

A COMMON FRAMEWORK FOR DIVERSE CAPSTONE EXPERIENCES**Juliet K. Hurtig and John K. Estell**

Year-long senior design capstone courses used to be simple to manage; however, over the past several years they have become increasingly cross-disciplinary and technical in nature, to the point where a single faculty advisor will probably not have sufficient breadth and depth of expertise in all areas of the project to provide adequate guidance and supervision. The Electrical & Computer Engineering and Computer Science Department at Ohio Northern University has responded to this challenge through the establishment of a "Project Review Board" for each senior design capstone project that consists of three faculty members with the appropriate background and expertise to guide the project. This review board structure can be implemented at any institution, provides greater opportunities for both accurate assessment and student professional development, and builds upon previous publications regarding capstone assessment and design standards. This paper presents the details behind the changes that were successfully implemented in our revised capstone process.

WELCOME FROM THE GENERAL CHAIR



On behalf of host institutions Texas A&M University and San Antonio College and host city San Antonio, welcome to FIE 2009. Graduates in computer science, engineering, and engineering technology (CSET) will make important decisions that will influence directions of technological and societal developments. Indirectly, CSET education sways the future, and the conference theme, “Imagining and Engineering Future CSET Education,” envisions participants in serious, reflective conversations about the future of this key driver. The 2009 program continues previous FIE conversations as well as innovations necessary to provide students with essential technical, cultural and learning skills required to enter the global workplace.

FIE 2009 has a thought-provoking technical program that, like every FIE conference, was made possible by a large group of dedicated professionals who volunteered their time. The program co-chairs from the sponsoring societies (IEEE Education Society, the IEEE Computer Society, and the ASEE Educational Research and Methods Division) include Mani Mina, David Cordes and Richard Layton. They were joined by the international program co-chairs, Melany M. Ciampi and Edmundo Tovar Caro, in reviewing abstracts, managing the paper review process, and organizing the paper sessions. With the help of 35 volunteers, they coordinated review of 563 abstracts and 393 manuscripts to select 369 papers for the conference, from which the authors submitted 355 full papers and works-in-progress. Also, our special sessions and workshop chair, Dan Moore, has selected a compelling set of special sessions and workshops that includes 9 workshops, 12 special sessions, and 2 panel sessions.

There is a great deal of conference structure that must be planned in addition to the FIE technical program to make FIE the special conference that it is. From the opening reception to the exhibits, awards program, meals and social events, details must be decided with an eye toward enhancing the experience for our attendees. Ingrid St. Omer, as the New Faculty Fellows Chair, has coordinated and driven the process through which the new faculty fellows, a valuable influx of new people and ideas, are selected. The FIE 2009 Awards Chair, Tony Mitchell, has overseen selection of the award recipients from the IEEE Education Society. Robert Hofinger had another great year putting together an exciting set of exhibits and tutorials. Ed Jones has continued his role as conference historian, and Dan Budny has continued his outstanding work on the conference Web page and proceedings.

Kevin Curry, along with the other staff at Kansas University Continuing Education, has made everything possible through an outstanding level of logistics support for the conference.

Jerry O’Connor and Dan Dimitriu, both from San Antonio College, have worked with local organizations to assemble an outstanding reception.

Texas A&M University is proud to host FIE 2009 with the emphasis on innovation. The Dwight Look College of Engineering has pioneered many innovations in its engineering education programs that have been replicated elsewhere. The College is one of the largest engineering colleges in the nation, with more than 10,000 students and 12 departments. Three undergraduate programs are ranked either first or second, and the College ranks among the top five producers in the country for undergraduate engineering degrees.

The FIE Steering Committee selected the River Walk in San Antonio as the site for FIE 2009, because it offers an outstanding venue for walking, river taxis, eating, shopping and night life. Popular sites to visit across San Antonio include The Alamo, Sea World San Antonio, the El Mercado shopping district, the San Antonio Zoo and the San Antonio Museum of Art. *Travel & Leisure* ranked the city second in America for ethnic food, and Tex Mex aficionados will find fulfillment in San Antonio.

The planning committee, Texas A&M, San Antonio College, and San Antonio all welcome you October 18-21, and we look forward to your participation in the exciting FIE 2009 conference.

Jeff Froyd
Texas A&M University
FIE09 General Chair

FIE 2009 PLANNING COMMITTEE

General Chair

Jeff Froyd
Texas A&M University

Assistant to the General Chair

Kevin Curry
University of Kansas Continuing Education

ASEE/ERM Program Co-Chair

Richard Layton
Rose-Hulman Institute of Technology

IEEE/Computer Society Program Co-Chair

David Cordes
University of Alabama

IEEE/Education Society Program Co-Chair

Mani Mina
Iowa State University

Special Sessions, Panels & Workshop Chair

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Rose-Hulman Institute of Technology

Exhibits Chair

Robert J. Hofinger
Purdue University

Publications Chair

Dan Budny
University of Pittsburgh

New Faculty Fellows Chair

Ingrid St. Omer
University of Kentucky

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Edmundo Tovar Caro
Universidad Politecnica de Madrid

International Co-Chair, South America

Melany M. Ciampi
Vice President, COPEC-Council of Researches in Education and Sciences

International Co-Chair, Central America

Javier Quezada
Technologico de Monterey

Conference Historian

Ed Jones
Iowa State University

Awards Chair

Tony Mitchell
North Carolina State University

FIE Steering Committee Chair

Daniel J. Moore
Rose-Hulman Institute of Technology

FIE STEERING COMMITTEE

ASEE Educational Research and Methods Division

Representatives

P.K. Imbrie, Purdue University
(June 2006–June 2009)
Daniel Moore, Rose-Hulman Institute of Technology
(June 2004–June 2010)
Jennifer Karlin, South Dakota School of Mines and Technology (June 2008–June 2011)
Cynthia Finelli, University of Michigan
(June 2009–June 2012)

IEEE Computer Society Representatives

Ann Sobel, Miami University
(June 2004–June 2010)
Arnold Pears, Uppsala University (Sweden)
(June 2008–June 2011)
Fernando Naveda, Rochester Institute of Technology
(June 2006–June 2012)

IEEE Education Society Representatives

Russ Meier, Milwaukee School of Engineering
(June 2007–June 2010)
Edmundo Tovar Caro, Universidad Politecnica de Madrid (June 2008–June 2011)
Susan M. Lord, University of San Diego
(June 2006–June 2012)

FUTURE FIE CONFERENCES

FIE 2010	Northern Virginia / Washington, D.C.
FIE 2011	Rapid City, S.D.
FIE 2013	Oklahoma City, Okla.

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.

WELCOME FROM THE FIE STEERING COMMITTEE

I would like to welcome each of you to the 39th edition of the Frontiers in Education Conference and to San Antonio. The conference theme: “Imagining and Engineering Future CSET Education” resulted in many interesting and thought-provoking papers, special sessions, panels and workshops. I suspect you will find it challenging to fit in all the sessions of interest to you while still allowing time for the “hallway” discussions that are so much a part of FIE. I also encourage you to keep your eye open for new ideas for papers and collaborations for the 40th celebration of FIE in Washington, D.C. in late October 2010. I am, as I hope you are, looking forward to another exceptional opportunity to share ideas, discover new methods and approaches, pick up some new techniques and learn from each other.

A small group of engineering faculty interested in improving engineering education for our students joined together in 1971 in Atlanta for the first FIE conference and “planted the seeds” for what has become the conference you are attending today. A conference with a modest and overwhelmingly “local” attendance of around 100 in 1971 has grown to one that today has over 600 participants and authors from around the world. Organizing a conference with such growth while trying to provide truly “frontier” ideas, concepts and processes is no small task. The three sponsoring societies came together to form the FIE Steering Committee to help ensure the annual conference continues to provide participants with the opportunity to engage in a professionally enriching conference on the frontiers of engineering and computing education. The steering committee is tasked with addressing the various aspects of the conference—future locations, costs, and growth—as well as providing oversight of the logistics and publications segments. Each society has three representatives on the committee, and we all encourage your input and suggestions for making each edition better than the previous. Please feel free to contact anyone on the committee. The membership may be found at: <http://fie-conference.org/misc/roster.html>.

The FIE Steering Committee meets twice a year, once in the summer and at the annual FIE conference, to address strategic directions and plans for future FIE conferences. Some of the questions we continue to discuss include:

- Are we meeting the mission and vision of the conference?
- What is the “best” size for the conference?
- Should we have a separate international conference or occasionally have the annual conference at an international location?
- Are we still a conference on the frontiers of science, engineering, and computing education?
- Is the current format and mix of papers, workshops, panels and socializing events correct?
- What is the “best” method to provide the conference proceedings for each attendee as well provide an archive of prior proceedings?
- Do the conference locations provide good diversity not only geographically but also in terms of cultural and social opportunities?

While the conference is sponsored by the ASEE ERM Division, the IEEE Computer Society and the IEEE Education Society, it really is *your* conference. We need input from you as to where we take the conference in the future. I encourage you to stop any of the Steering Committee Members (they will have a ribbon on their badge), and tell them what you think about the conference and how we can make it even better. We are also always looking for volunteers to host future conferences and will be glad to answer questions about chairing an upcoming FIE.

Please enjoy the conference, and I look forward to meeting as many of you as possible.

Finally, I would like to challenge each of you to share at least three new ideas, techniques or approaches you learn at the conference this year with your students and colleagues within two weeks of your returning home.

- Fernando Naveda , Rochester Institute of Technology
- Arnold Pears, Uppsala University, Sweden
- Ann Sobel, Miami University Ohio
- Susan Lord, University of San Diego

- Edmundo Tovar-Caro, Universidad Politecnica de Madrid
- Russ Meier, Milwaukee School of Engineering
- Cynthia Finelli, University of Michigan
- Dan Moore (Chair), Rose-Hulman Institute of Technology
- Jennifer Karlin, South Dakota School of Mines and Technology

Please contact me if you have questions about or suggestions for the Steering Committee. The next FIE Conference is scheduled for Washington D.C. in 2010. We hope to see all of you there.

*Dan Moore, Chair
FIE Steering Committee
Rose-Hulman Institute of Technology
dan.j.moore@rose-hulman.edu*

WELCOME FROM THE PROGRAM CO-CHAIRS

Welcome to FIE 2009! We hope that you will find your experience here enjoyable and valuable as you participate in the broad range of paper and panel sessions, workshops and social activities that have been scheduled.

This year's conference theme is "Imagining and Engineering Future Computer Science, Engineering, and Technology (CSET) Education." Looking ahead ourselves, we have introduced a new feature this year—papers submitted in one of three categories: Innovative Practice, Research-to-Practice, and Research.

If you are new to the conference, you will find sessions on a wide variety of topics related to engineering education.

If you have been to FIE before, you will discover some new opportunities: tracks with an emphasis on global engineering will surprise you with useful approaches from international contexts, and special sessions in nearly every track of the conference offer an alternative to traditional conference sessions. There is much to be learned from colleagues in all disciplines, so be adventurous!

Our authors deserve the credit for the quality of this conference—their innovative and compelling work and their promising works-in-progress are a sure bet. The reviewers who volunteered hundreds of hours to ensure the quality of our program also earned our gratitude.

Enjoy your time at FIE 2009!

ASEE/ERM Program Co-Chair
Richard A. Layton
Rose-Hulman Institute of Technology

International Co-Chair, Europe
Edmundo Tovar Caro
Universidad Politécnica de Madrid

IEEE/Computer Society Program Co-Chair
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University of Alabama

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Council of Researches in Educ. and Sciences

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