SOCIÉTÉ EUROPÉENNE POUR LA FORMATION DES INGÉNIEURS
EUROPEAN SOCIETY FOR ENGINEERING EDUCATION
EUROPÄISCHE GESELLSCHAFT FÜR INGENIEURAUSBILDUNG

Strengthening cooperation and excellence for tangible results in Europe and beyond

SEFI Annual Report 2015-2016

SEFI is the largest network of engineering education institutions and engineering stakeholders in Europe

"The passion for engineering education"

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Message from the President

We live in troublesome times and Europe has certainly changed dramatically over the last academic year. As an international NGO acting as the Society for European Engineering Education, SEFI does not have any party political observance or favour any particular nationality or religion. The changes in Europe call more than ever in the history of SEFI for societies like ours to harness ourselves and live up to our values of responsibility – to European Engineering Education (EE), of promoting diversity – in culture, ways of thinking, communication, socio-economic settings, and of inclusiveness – of all stakeholders in EE. The teaching and learning that results in creating young engineers is absolutely non-discriminative, and there is, more than ever, a need in today's Europe to collaborate between nations, regions and cultures in order to exchange ideas, expertise and students. Since the foundation of SEFI in 1973, we have witnessed steady progress towards a united, collaborative Europe. In the last academic year, this has come to an unprecedented abrupt halt. The SEFI values of responsibility, diversity and inclusiveness are under pressure, which is a challenge to all of us:

The refugees situation puts a strain on all of Europe, especially the Mediterranean countries. While the national governments are in disarray and Europe fails to handle this situation in joint consort, many universities (amongst them SEFI members) have opened their doors for refugees and offer them tutorials/instructions in various ways.

When the SEFI Board of Directors met in Brussels on November 16th 2015, we stood sharing a minute's silence at noon which was declared by the French authorities after the gruesome acts committed by deranged extremists in Paris on November 13th. Sadly, we have witnessed more of these atrocities all around the world. It causes worry and concern, as well as great mutual sympathy and solidarity. Unfortunately, it also paves the road for a polarized public opinion and xenophobia.

The consequences of the mind-blowing outcome of the Brexit referendum are still unclear, but expectedly it will be a major disadvantage to both British and European scholars and students in engineering, as collaboration and exchange will no longer run smoothly in the common framework we have grown accustomed to in Europe.

The thwarted military attempt of a *coup d'état* in Turkey has influenced the lives and professional environment of our colleagues in Turkey. The university sector is under investigation by the government in the aftermath of the coup, because of suspicion of infiltration by religious undemocratic forces. The situation is still evolving. We stand by all our Turkish colleagues and Turkish SEFI officials who believe that the only matter that should play a role in university promotion and governance is academic merit and expertise in research and teaching.

All of this only makes the work of SEFI even more important and challenging than ever before! Let us reflect on what makes up the fiber of our society.

We ultimately depend on the activities of our Working Groups (WG), Task Forces (TF) and Councils. It is here the important bulk of our work and value is produced. These activities follow life cycles like any other living thing, and we must nurture and cultivate this spine of our Society with great affection. While the WGs, TFs and Councils constitute an internal part of SEFI, we have developed several arenas for displaying, disseminating and communicating our work.

The international SEFI Annual Conference is the highlight of the year. SEFI would like to thank Tampere University of Technology for hosting this year's conference in Finland, and for their support in organizing our main event in such a professional and dedicated manner. SEFI constantly works on improving this event. We have introduced a SEFI vice-chair to continuously head the Scientific Committee over consecutive years, and conference papers will from now on be indexed on Scopus.

Organized in collaboration with the Conference of European Schools for Advanced Engineering Education and Research (CESAER), the European Convention for Engineering Deans (ECED) is an annual meeting opportunity for leaders and managers of engineering education institutions. The SEFI Debate has now been established as a channel to promote certain EE policies to decision makers in a more EU related context (EU Commission and Parliament). To facilitate direct and precise communication, we have a tradition of producing Positions Papers, which turns out to be a very efficient way of dissemination. Finally our bi-monthly European

Journal of Engineering Education is the flagship of showing what SEFI is and what SEFI can do for EE. Free on-line access will now be offered to SEFI individual members when their institution is a member of our network.

The Board of Directors (BOD) is playing an increasingly important role in SEFI-life. From the beginning of this academic year individual directors take responsibility for specific strategic or commissioned activities which are outlined in the Action Plan agreed by the General Assembly last year. It is very valuable that dominant and well-respected individuals take on SEFI roles and functions. This helps promoting our Society. It also helps creating a stronger and more resilient organisation with many pillars of support around Europe.

It is important to emphasize that SEFI is the largest network in Europe for Engineering Education, and that SEFI holds excellent relations with all other engineering networks/organizations – both regionally and globally. SEFI is also the only totally inclusive organization for Engineering Education in Europe. Engineers are educated at various institutions to various functions in the job market: The academic research-based EE and the applied industry-based EE are reciprocal to one another and take place in different learning environments using different types of pedagogy. Both kinds of educational institutions are members of SEFI. All other stakeholders are also welcomed as members of SEFI: Individuals, professional societies, industry and corporate institutions, educators, deans, directors, rectors and of course students! This diversity in our membership makes SEFI unique!

The importance, strengths and results of our multifaceted and colourful society is thoroughly demonstrated in this Annual Report 2015-2016.

SEFI has had another active year, thanks to the contributions of its members, its appointed and elected officers, and its small and experienced staff at HQ in Brussels.

SEFI is grateful for the support of our corporate members in general: Dassault Systèmes, National Instruments, Mathworks and Granta, and our events' sponsors in particular: Dassault Systèmes, Mathworks, CD Adapco and Quanser.

Particular thanks go also to our WGs Chairs and to all members of our BOD. Special thanks to those amongst BOD members who have accepted to lead specific lines of our Action Plan (2015-2016).

Under the 2013-2015 presidency of Prof. Kamel Hawwash of University of Birmingham, SEFI developed a clear vision for the development of the Society which was communicated in the SEFI 2015-2020 Strategy. A special thanks to him for making the first year of my presidency so easy – just following the Action Plan.

It is a great pleasure and an honour to serve as President for SEFI. It is very satisfactory to collaborate and exchange ideas with institutional, individual and corporate members, with colleagues from the BOD and SC, with the HQ, and with the presidents and officers of our partner organisations.

We live in troublesome times. The challenges are many in Europe. The Annual Report 2015-2016 clearly illustrates the ability and impact of our Society. Maybe it is also fair to conclude, that our Society could do even more? Let us see. We will certainly try to do more and show that SEFI really matters for the individual and for Engineering Education - for Europe and the rest of the world!

Professor Martin E. Vigild

28th President of SEFI 2015-2017

Technical University of Denmark

45th SEFI Annual Conference

"Education Excellence for Sustainability"

Terceira Island, Azores (Portugal)
18-21 September 2017
www.isep.ipp.pt/sefi2017
Organised by ISEP-Instituto Superior de Engenharia do Porto

First Announcement

SEFI invites you to participate in its 45th Annual Conference, organised by the Instituto Superior de Engenharia do Porto (ISEP), in the Azores (Portugal). SEFI Annual Conferences have been organised in different parts of Europe and represent a unique opportunity for the members of SEFI and all those interested by or involved in engineering education and research to exchange views and opinions, to establish new contacts with peers and other higher Engineering Education stakeholders. The themes of the conferences reflect the objectives of the Society and the priorities identified by its members. In 2016 the conference is organised in Tampere on the theme of "Engineering Education on Top of the World: Industry-University Cooperation", and in 2018, it will be organised by DTU in Copenhagen on *"Creativity, Innovation and Entrepreneurship for Engineering Education Excellence"*. We invite you to join us in 2017 in Terceira Island (Azores) to cooperate on "Education Excellence for Sustainability", a theme that is of paramount importance for the Azores Islands a world reference on the successful sustainability development aligned with the wonderful landscape values. The strategical placement in the middle of the Atlantic Ocean is also an opportunity to bridge with American colleagues organising a collocated event prior to the SEFI Conference.

We look forward for contributions under the following sub-themes:

- Sustainability and Engineering Education
- University-Business cooperation
- Engineering Skills
- Quality Assurance and Accreditation
- Continuing Engineering Education and
- Lifelong Learning
- Open and Online Engineering Education
- Ethics in Engineering Education
- Curriculum Development
- Attractiveness of Engineering Education
- Physics and Engineering Education
- Engineering Education Research
- Gender and Diversity
- "I want to contribute to solve local problems"

We also welcome student contributions and workshops proposals.
An ASEE Global Colloquium (www.asee.org) will be preceding the SEFI conference allowing an increase in networking possibilities above the Atlantic Ocean.
Opportunities will also be given to participate in solving local engineering issues. Some will be presented in loco but we encourage participants to research and propose solutions for existing challenges in engineering and engineering education in Azores.
For details about the SEFI Conference 2017, please regularly consult the conference web site.

The submission of extended abstracts will be open until 19 March 2017.
Instructions for papers authors and workshops are available from 1 October 2016 on www.isep.ipp.pt/sefi2017.

The conference language is English. All accepted papers will be referenced in SCOPUS.

isep Instituto Superior de Engenharia do Porto

SEFI European Society for Engineering Education
Europäische Gesellschaft für Ingenieur-Ausbildung
Société Européenne pour la Formation des Ingénieurs

2015-2016 Highlights

This report has been published for the first time in the Annual Report 2014-2015 due to the SEFI Annual Conference 2015 being held in June.

"Diversity in engineering education: an opportunity to face the new trends of engineering "

The SEFI 2015 Annual Conference brought together a broad variety of Engineering Education actors from Europe and beyond. In total 285 participants from over 38 Countries met at Polytech Orléans in Orléans, France on June 29 to July 2, 2015.

More than 150 papers were presented in the course of 7 parallel sessions covering the theme of **the conference** "Diversity in engineering education: an opportunity to face the new trends of engineering**".**

Keynote presentations were given by Joëlle Bonnet from Mercedes Benz (FR), Teri Reed from Texas A&M University (US), Christophe Morace from ENSTA Bretagne (FR) and Alison Gourvès-Hayward from Telecom Bretagne (FR) , and Jette Egelund Holgaard from Aalborg University (DK) .

The Conference participants in front of the Château de la Villette, where was hosted the Gala Dinner.

A full report is available on www.sefi.be

SEFI Leonardo da Vinci Medalist 2015

The 2015 Leonardo Da Vinci Medal was awarded to Mr. Charles Champion President of Airbus Operations SAS and Executive Vice President Engineering.

Mr Champion is a keen contributor to Engineering Education, part of the "Fly your Ideas" initiative, a UNESCO supported global competition for Students, founder of the Chair for Eco-Design of Aircraft but more noticeably the establishment with the Global Engineering Deans Council of the GEDC Airbus Diversity Award, which recognises people and project worldwide that have brought diversity and inclusion into the engineering student body.

SEFI President 2013-2015 Prof. K. Hawwash and medallist C. Champion

SEFI-BEST Memorandum of Understanding

After years of collaboration and common initiatives and following the awarding of the SEFI F. Maffiolli Award in 2014, the Board of European students in Technology and SEFI have decided to formalise their relations by drafting a Memorandum of Understanding.

The formal signature between SEFI and BEST, took place during the closing ceremony of the conference and the document was signed by the then Presidents of both organisations, K. Hawwash for SEFI and J. Clemente for BEST.

SEFI Fellowships 2015

The 2015 SEFI fellowships have been awarded to Dr. Anette Kolmos and Prof. Oliver Moravcik in recognition of their long lasting and active involvement in engineering education and in SEFI.

Dr. Anette Kolmos is UNESCO Chair for Problem-Based Learning in Engineering Science and Sustainability in Aalborg University, former President of SEFI (2009-2011), Founder of the SEFI working group on Engineering Education Research and of IIDEA—International Institute for the Development of Engineering Academics. She was also the recipient of the 2013 IFEES Global Award for Excellence in Engineering Education.

Prof. Oliver Moravcik (depicted here on the left) is Vice-Rector of the Slovak University of Technology of Bratislava (STU) in charge of strategic projects and development, former member of the SEFI Board of Directors, Organiser of the 2010 SEFI-IGIP Annual Conference held in Trnava, Slovakia, former Director for Advanced technologies Research Institute of STU and former Dean in STU

SEFI GENERAL ASSEMBLY 2015

The General Assembly of SEFI met on Thursday 2 July 2015 in Orléans. Among the decisions taken by the General Assembly, the SEFI Action Plan for 2015-2017 has been accepted unanimously, setting the course of actions in line with the long term priorities of the SEFI 2015-2020 strategy. During the year, directors were appointed as persons in charge of specific actions within SEFI.

Changes in the working groups have also been presented with the appointment of new officers and the the renewal of the Board of Directors Mandates have started as of October 1st 2015 for 3 years. The open Vice-Presidency for 2015-2018 has seen the election of Prof. Luis Manuel Sanchez Ruiz (Associate Dean and Head of International Relations at ETSID - Universitat Politècnica de València).

The list of SEFI Officers for 2015-2016 is available at the end of this report.

The 2016 General Assembly will be held in Tampere (FI) on 14 September 2016 during the 2016 SEFI Annual Conference.

Annual Conferences Proceedings are available online on the SEFI website.
All SEFI Conference papers back to 2005 and going forward into the future are indexed on Scopus.

SEFI Annual Conference 12-15 September 2016 Tampere, Finland

44th SEFI Annual Conference

Engineering Education on Top of the World: Industry University Cooperation

12-15 September 2016, Tampere, Finland
Organised by the Tampere University of Technology

2015-2016 Highlights

Activities for Deans

European Convention for Engineering Deans 2016

80 European engineering deans attended the 8th European Convention of Engineering deans (ECED 2016) that also welcomed representatives of Mathworks and Quanser who sponsored the Convention together with Dassault Systèmes.

This 8th Deans Convention was this year brilliantly organized by the University College London (UCL), and in particular by Prof. John Mitchell, Vice dean Education, Director of the integrated Engineering Programme, UCL, and Ms. Paula Broome. ECED is known to be the SEFI/CESAER European networking event for engineering deans bringing them together to discuss current issues in engineering education and research.
The general theme of this convention was "Schools of Engineering at the Forefront – Meeting Challenges of the ***Engineering Profession"*** and it offered the participants plentiful opportunities for debate and discussions. At its conclusion, an agenda – the London Agenda – listing the most important challenges and opportunities for European schools of engineering today was discussed and was finalized by the respective teams in UCL, SEFI and CESAER, including the feedback of all participants. It will be circulated for the first time during the SEFI 2016 Annual Conference. The ECED was organized in three sessions. Session I: Engineering Education: Meeting the Engineering *Profession's needs* - Session II: Engineering Research and Innovation: Meeting the needs for Sustainable Development and Session III: Engineering Schools Adapting to Change: How much, how fast – and in what way?, including a lot of time for interactive discussions and exchanges with the speakers and among the participants, through the plenary discussions, flipped activities (the video of two invited speakers had been posted on You tube before the event offering the participants to comment the presentations before the event itself) and more traditional break-out sessions in small groups.
We notably heard the very interesting presentations of the following participants and speakers: Prof. Dr.-Ing. Gerhard Müller, Senior Vice President Academic and Student Affairs, Technische Universität München (TUM); Professor Sarah Spurgeon, Head of the School of Engineering and Digital Arts, University of Kent; Rachel Schroeder, Head of Employment Marketing Airbus & Airbus Group; Prof. Martin E. Vigild, DTU, Senior Vice President, SEFI President; Professor Rao Bhamidimarri, Vice-President (Development), London South Bank University; Prof. José Luis Encarnacao, Founding Director – Fraunhofer Institute for Computer Graphics Research; Professor Ricardo Martínez-Botas (Head of the Thermofluids Division at Imperial College London); Prof Calie Pistorius, Vice-Chancellor of the University of Hull; Prof Simon Marginson, Professor of International Higher Education, UCL Institute of Education; Dr Ruth Graham, Engineering Education Consultation; Professor Maria Knutson Wedel, Vice president for undergraduate and master's education, Chalmers University of Technology. SEFI Deans Council, chaired by Dr. Mike Murphy (DIT) was deeply involved in the programme and event's organization together with Prof. Manfred Hampe and Prof. Luis Manuel Sanchez Ruiz .

The next ECED will be held on 3-4 April 2017, in Munich-DE , on the invitation of Prof. Dr. Gerhard Müller, Technical University of Munich, member of SEFI Deans Council.

Cooperation with Russia

The Network International Conference "Interdisciplinarity in Engineering Education: Global Trends and Management Concepts Synergy" was held from May to July 2016 at Russian and Kazakh technical universities (Saint Petersburg, Moscow, Ust-Kamenogorsk, Kazan, Tomsk, and the final sessions in Irkutsk). It was initiated by the Association for Engineering Education of Russia, which was the main organizer, and the Kazan National Research Technological University. Besides Russian institutions, SEFI, IGIP and IFEES were also among the organisers. Altogether, more than 300 people from Russian and foreign universities (USA, Hungary, Czech Republic, Spain, Portugal, Republic of Kazakhstan, Peoples Republic of China) participated in the Conference.

The Baikal Lake

The final sessions, which took place at the premises of the Irkutsk National Research Technical University (INRTU) on

11-13 July 2016, were the most important and representative parts of the whole event. The space was also given to the presentations of the international engineering education societies including SEFI, which was represented by the member our Board of Directors Ladislav Musílek. The third day of the conference with round tables and closing was transposed from Irkutsk to the Baikal Lake on board of the "Babushkin" cruise ship.

Prof. Yuri P. Pokholkov, President of AEER (centre) and Prof. Alexander A. Afanasiev, Acting Rector of INRTU (right) during the opening of the conference.

The programme was divided into four sessions: Global trends and policy-making in organization of interdisciplinary scientific and educational projects and teams; Cooperation of industrial companies and universities for interdisciplinary projects development; Students and teachers in interdisciplinary projects and teams; Interdisciplinary projects in the field of resource efficiency and sustainable development (including projects on Lake Baikal preservation). The programme was further supplemented by the expert training seminar "Managing university environment for interdisciplinary projects implementation: conditions, grants, consortium partnerships".

The discussion resulted in determination of key development areas for higher education institutions and industry collaboration to train specialists ready to work in interdisciplinary teams and projects, identification of the means for management process improvement of interdisciplinary training and specification of the stakeholders to whom the recommendations have to be addressed (for details see http://aeer.ru/en/irk_res_2016.htm).

As the participant of these final sessions, I highly appreciated the lively working atmosphere at the conference, interesting papers and discussions, and its contribution to mutual contacts between technical universities. As traditionally, the President of AEER Prof. Yuri P. Pokholkov and his collaborators prepared the very successful meeting with rich professional and social programme, and we are pleased that SEFI took part.

Prof. Ladislav Musilek
Czech Technical University in Prague
Member of the SEFI BoD 2010-2016

Capacity building

IIDEA is a leadership training institute focused on establishing a global network of engineering faculty development programs to disseminate learning about the transformation of engineering education worldwide. IIDEA aims to provide all the engineering education associations, institutions and other engineering education stakeholders a clearing house of high caliber and world-class engineering faculty leadership training workshops/courses/seminars, helping to broker the offering of these around the world. IIDEA is a joint initiative of IFEES and SEFI whose leadership recognized the need to create a central place where engineering education institutions could come to search for capacity building opportunities.

The Participants of the 2016 IIDEA workshop.

SEFI representative Prof. G. Langie (left) with Dr. L. Morell, co-founder of IIDEA and workshop participants

This year again, a very successful workshop was held at Tsinghua University, organized by SEFI and IFEES on "Engineering Pedagogical Education for Teacher Development" (Day I) and "Global competencies, integrating ethics in the engineering curriculum" (Day II).The workshop, organized on 12-13 July, was attended by 120 participants from 35 universities in China, including 20 PhD students. Younger faculty members indeed attended the workshop this year and actively participated in the different sessions. Actually 76 participants, 69% of faculty members, came from the 985/211 project universities (top groups in China). Plenary sessions were given by Prof. Hanno Hortch, TU

2015-2016 Highlights

Dresden, on "The New pedagogic needs of EE ; The IGIP Ing.Paed. Prototype Curriculum", Prof. Greet Langie, KU Leuven / SEFI representative, on "The First year engineering students – orientation and retention", Prof. Harold Sjursen, NYU Polytechnic on "Integrating ethics across engineering curricula" as well as workshops sessions animated by the above mentioned panelists as well as Dr. Lueny Morell, InnovaHiEd, Prof. Eduardo Vendrell, UP Valencia/EQANIE, and Dr. Michael Auer (IFEES President-Elect).

We thank them all for their excellent collaboration and contribution to this 2016 workshop. We hereby would like to thank the authorities of Tsinghua Universities and local organisers in the persons of Prof. Yang, the Vice President and Provost of Tsinghua, Prof. Wu Guokai, the Deputy Director General of Chinese Academy of Engineering and Prof. Yu, as well as the whole Tsinghua CEE team and especially to Dr. Weifeng Qiao.

Workshop and Tsinghua University leaders meeting prior to the 2016 IIDEA workshop.

A 2017 IIDEA workshop is already under discussion and we hope that other workshops will also take place during the year in different universities all over the world. For further information about IIDEA, please visit www.iideainstitute.org

On the matter of Capacity Building, we are pleased to announce that the Board of Directors of SEFI meeting in Munich in May 2016, has decided on the creation of a Task Force on Capacity Building chaired by Prof. Martin Vigild –DTU.

Engineering Skills

Following our discussions and activies relating to Engineering Skills in 2014 and 2015, a first position paper was published in September 2015 followed by an updated version published in April 2016, under the lead of Dr. M. Murphy, Prof. K. Hawwash, Prof. M. Vigild and Mr. X Fouger. It is available on www.sefi.be

The SEFI Working Group on Engineering Skills chaired by Past President Prof. Kamel Hawwash (University of Birmingham, UK) is working on a more elaborated document.

SEFI Debate 2016

Participants of the SEFI Debate 2016

On March 3rd 2016 was held the second SEFI Debate in the premises of the European Parliament, hosted by MEP Nikos Androulakis, from the Group of the Progressive Alliance of Socialists and Democrats.

The event was open by SEFI Vice-President Antonia Moropoulou, who gave an extensive introduction on matters at hand and on the current parties opinion on the matter of skills in the labour market in Europe and beyond. SEFI's position was presented by SEFI President Martin Vigild, offering an overview of both the accomplished work and the collective work still at end to deepen and enrich SEFI's view on Engineering Skills.

A keynote was delivered via video by Mrs. Claudia Costin, World Bank Group, Senior Director of the Education Global Practice, followed by a panel of industry representatives composed by Mr. Fokion Tasoulas, Titan Cement Co, Group Engineering & Technology, Executive Director, Mr. Emmanuel Forest, President of European Construction Technology Platform, Vice President of Bouygues Group and Mr. Xavier Fouger, Dassault Systemes, Global Academia Senior Director Programs. After an exchange of views the discussion was opened with the audience who gladly contributed to the exchange of ideas.

A full report prepared by our rapporteur Prof. Pieter de Vries, (TU Delft) is available on www.sefi.be

SEFI in Europe and in the World

We participated in or organised the following events [1]

October 2015
Queeca Launch the Central Asian Federation of EE societies, Khujand, Tajikistan
SEFI Steering Committee meeting, Brussels, Belgium
WFEO World Congress on Engineering Education Beirut, Lebanon

November 2015
ENQA Conference, Paris, France
XXI BEST Presidents Meeting, Brussels, Belgium
Norwegian Council for Engineering Education, Tromso, Norway
SEFI Board of Directors Meeting, Brussels, Belgium
ENAEE General Assembly and AC meeting, Brussels, Belgium
Kick off of the Project STELA, Leuven, Belgium
International Forum on Engineering Education, Tsinghua University Beijing, China
Global Engineering Deans Council, Adelaide, Australia

December 2015
Meeting of the Organising Committee of the SEFI 2016 Conference
SEFI Steering Committee Meeting

January 2016
3rd International conference on transformations in engineering, Pune, India

February 2016
QUEECA Tempus Editorial Meeting and Project meeting, Bochum, Germany
SEFI Steering Committee Meeting

March 2016
SEFI EU Debate "Labour Market Needs and Engineering Skills" hosted by the European Parliament, Brussels, Belgium
Granta Design 7th North American Materials Education Symposium, Berkeley, USA

April 2016
SEFI Steering Committee
Granta Design 8th Materials Education Symposium, Cambridge
8th European Convention for Engineering Deans (ECED) London, United Kingdom

May 2016
15th IACEE World Conference on Continuing Engineering Education Porto, Portugal
SEFI Board of Directors hosted by Mathworks Munich, Germany
Annual Conference of the Euro-Mediterranean Universities Network TETHYS, Cadiz, Spain

June 2016
SEFI Steering Committee Meeting, Brussels, Belgium
123rd ASEE Annual Conference preceded by the ASEE International Forum, New Orleans, USA
18th SEFI Mathematics Working Group Seminar, Gothenburg, Sweden

July 2016
BEST EoE Copenhagen, Denmark
8th International Symposium in Project approaches in Engineering Education and 4th Active Learning in Engineering Education, Guimaraes, Portugal
AEER Network International Conference Interdisciplinarity in Engineering Education: Global Trends and Management Concepts, Irkutsk, Russia
SEFI-IFEES IIDEA Workshop on Engineering Pedagogical Education for Teacher development and Global Competencies, Tsinghua University, Beijing, China
BEST EoE Gliwice, Poland
13th Latin American and Caribbean Consortium of Engineering Institutions (LACCEI) Conference, Santo Domingo, Dominican Republic

Coming up…

September 2016
ITHET International conference, Istanbul, Turkey
Global Challenges in Engineering Education Workshop, London, United Kingdom
44th SEFI Annual Conference, Tampere, Finland
IGIP/ICL2016 International Conference, Belfast, United Kingdom

1 We hereby apologies for any possible omission

Cooperation and Projects

Cooperation

IIDEA (International Institute for the Development of Engineering Academics)

Secretariats are still based in USA (H. Hoyer for IFEES) and in Europe (F. Côme for Europe). This year, the co-directors Erik de Graaff and Jennifer Deboer resigned from their position. Discussions bringing together the IFEES and SEFI Presidents and SGs are ongoing in order to rethink IIDEA's top management. This year also, F. Côme together with M. Auer (IFEES President-Elect) organised the very successful 2016 IIDEA workshop as reported earlier.

ASEE (American Society for Engineering Education)

F. Côme attended that ASEE Conference in New Orleans on 25-29 June, preceded by the International Forum on the 24. Other members of the "SEFI delegation" were Joao Rocha and Manfred Hampe, both members of the BOD. Other members such as X. Fouger and JC Quadrado were there too representing their own company/institution.

A Memorandum of Understanding has been signed in New Orleans, offering a frame for the relations between SEFI and ASEE for the next two years.

IFEES (International Federation of Engineering Education Societies)

Last September, in the context of the IFEES GA held in WEEF 2015 in Florence, F. Côme was elected for a second mandate in the Executive Committee of IFEES and was appointed as IFEES First Vice-President. Cooperation with IFEES is going on through the year and notably in the context of our joint activity, IIDEA (see above). F. Côme also attended the IFEES meeting organized in conjunction with the ASEE Conference in New Orleans last June.

Prof. Hawwash, on the invitation of IGIP, Prof. Vigild and Dr. Murphy, also participated in the WEEF 2015, notably to our joint EEDC/GEDC session and round table on attractiveness

GEDC (Global Engineering Deans Council)

Cooperation with GEDC was reinforced in the context of WEEF 2015 (see above) where SEFI/EEDC organised a joint workshop and round table on "Attractiveness of EE". Some of the SEFI members attended the GEDC conference held in Adelaide in November.

CESAER (Conference of European Schools for Advanced Engineering Education and Research)

Cooperation with CESAER has been enhanced with the organisation of the 8th ECED in London as mentioned earlier in this report. A possible Memorandum of Understanding relating to future ECEDs is under discussion.

EUA (European University Association)

There continues to be good cooperation, fostered by regular contacts between HQs. SEFI is an associate member of EUA.

BEST (Board of European Students in Technology)

Our Head office met on several occasions the BEST leaders. Prof. Rutkowski from Silesian TU and Prof. Vigild from the Technical university of Denmark, DTU, had the pleasure to help organise the two only and prestigious BEST Events on Education, which were held in Denmark and in Gliwice (July 2016).

ENAEE (European Network for Accreditation of Engineering Education)

Françoise Côme finished her three-year mandate in ENAEE Administrative Council (AC) and Vice presidency last November, and Anne-Marie Jolly, in her capacity of Chair of the SEFI WG on Quality assurance and accreditation has been elected in the ENAEE AC for two years.

IACEE (International Association for Continuing Engineering Education)

On the occasion of the international conference of the IACEE held in Porto last May, Bente Norgaard, chair of SEFI WG on CEE - LL, from Aalborg University, has been appointed as representative of SEFI in the IACEE Board and VP. Further cooperation with IACEE is on our agenda for the coming months.

FEANI (European Federation of National Engineering Associations)

Permanent contacts are maintained between the HQ of FEANI and SEFI and a meeting bringing together our respective Presidents and General Secretaries should be planned for the autumn.

WFEO (World Federation of Engineering Organisations)

Prof. Hawwash represented us at the WFEO World congress on EE held in Beirut last October and delivered a presentation on "Developing engineering skills: An ongoing debate". Close contacts are also maintained between our respective HQs with occasional meetings in Paris.

IGIP (International Society for Engineering Pedagogy)

Contacts with IGIP are regular and friendly. Efforts in promoting cooperation through our WGs (CD) should still be encouraged. Discussion about a possible joint conference will be started in the autumn. SEFI shall be represented by its Secretary general at the IGIP 2016 Conference to be held in Belfast. A Memorandum of Understanding has been signed during the WEEF 2015 between K. Hawwash, SEFI President 2013-2015, and IGIP President, M. Auer.

RAEE (Russian Association for Engineering Education)

As reported before, we supported the organisation of the conference organized by Tomsk TU with other Russian universities also in cooperation with IGIP and IFEES in Baikal Lake last July. Our representative, with keynote, was Prof. Musilek from our Board of Directors.

Cooperation with China and the University of Tsinghua

Last November, our Secretary General was invited to deliver a plenary presentation on "Engineering Education towards 2020: A European Perspective" in the context of the Global conference organised by our Tsinghua colleagues. UNESCO, IFEES, GEDC were also amongst the invited speakers.

Detailed reports on all the mentioned events and cooperation can be found in our newsletters.

Projects

Co-funded by the Erasmus+ Programme of the European Union

EPICES - European Platform for Innovation and Collaboration between Engineer Students

The purpose of EPICES is to develop a European collaboration on a distance project-based learning framework and method, based on already existing and still developing technical platforms, i.e. collaborative and engineering tools. A special focus will be made on teachers' role and students' coaching, from the analysis of what a coach should be in project based learning to training packages for teachers and development of assessment methods. The project is coordinated by SUPMECA (FR)

ReadySTEMgo - Early identification of STEM readiness and targeted academic interventions

The project aims to improve the retention rates of higher education STEM programs by focusing on the academic readiness of incoming STEM-students. It will identify among incoming STEM students those that are at high risk of dropout and may thus need additional support and we will support those students with the help of intervention programs in the early phase of their studies. The project is coordinated by KU Leuven (BE)

STELA - Successful transition for secondary to higher education using learning analytics

The project addresses the ERASMUS + main priority to raising the quality of education through the use of learning analytics and learning semantics (Priority 2).To this end the project will develop, test, and assess a learning analytics approach that focuses on providing formative and summative feedback to students in the transition. The project is coordinated by KU Leuven (BE)

QUEECA - Quality of Engineering Education in Central Asia: The project held its final Conference in Tashkent, Uzbekistan on April 7 2016. We would like to thank the project Management team, namely Elisa Guberti and Prof. Claudio Borri from the University of Florence, and all the partners for these four years of intensive and fruitful cooperation.

We give our thanks to all the coordinating projects teams

Our Working Groups

Quality Assurance and Accreditation

The SEFI Working Group Quality Assurance and Accreditation followed with great interest the evolution of standards on quality assurance in Europe, and WG members were consulted on the new standards (ENAEE EAFGS).

Members have also been consulted on transnational accreditation which is a really important challenge for each country. ENAEE has notably initiated a work with International Engineering Alliance to better understand professional skills of engineers. This work also allowed us to better understand the links between the different standards of quality assurance (Washington accords).

As educators we cannot ignore what happens to our graduates, and one important challenge for SEFI is international mobility; especially in a context of unbalanced regulations of the engineering profession in European Countries. A first draft has also been prepared by ECEC (European Council of Engineers Chambers) on "Common Training Principles for Engineers". The WG will follow the evolution of this project and inform SEFI members about its achievements.

Prof. Anne-Marie Jolly
Polytech Orléans/CTI
Chair SEFI WG QAA

Gender and Diversity in Engineering Education

The working group is in touch with several programmes and projects along the question of Women in Science (www.genderinscience.org), with the European Centre for Women and Technology (ECWT) (www.womenandtechnology.eu), a network of female engineers, working together with NSF and US universities genderedinnovations.stanford.edu and links are maintained with the Network Gender&STEM (www.genderandstem.com).

Our last meeting was at the SEFI Annual Conference in Orléans 2015, where several activities were discussed and planned for the upcoming year. In particular the elaboration of a possible SEFI Diversity statement as suggested by then SEFI President K. Hawwash, taking into account the work on Diversity realised by ASEE, but answering to the situation in Europe.

Planning had started also on a special issue in the European Journal for Engineering Education (EJEE) on Inclusive Engineering and Learning Environment. The call for the special issue on inclusive learning environments was published at the beginning of 2016.

In addition to the annual meeting at the 2016 conference we will have an open workshop for experimenting with diversity sensitivity in engineering development and design. This is because we think that our members are more interested in face to face communication and experience exchange. We planned a workshop to widen the focus from gender and diversity counting (how to bring more people into Engineering Education) to integration of gender and diversity in Engineering Education. We will trial methods for sensitizing participants (and students) for more diversity thinking in engineering development and design on the example of automobile development.

Dr. Susanne Ihsen
Technical University Münich
WG Chair GD

Dr. Kacey Beddoes
Oregon State University
WG Deputy Chair

Mathematics and Engineering Education

Annual meeting of MWG Steering committee was held on December 12-13, 2015, at the Faculty of Electrical Engineering, Czech Technical University in Prague. During this meeting, we have discussed essential issues about the upcoming biannual seminar 18th SEFI MWG Seminar on Mathematics in Engineering Education that was held at Chalmers University of Technology in Gothenburg, Sweden, June 27- 29, 2016. Proceedings are available at the conference webpage www.math.chalmers.se/SEFIMWG2016.

The overarching theme of the seminar was the concept of mathematical competencies. This included in particular the following issues: Transition to higher education for traditional and adult learners; Learning mathematics through project work; Mathematical competencies in web-based learning scenarios; Using technology to improve mathematics education.

The seminar was a very successful event and reports on the outcomes of the discussion groups held during the event with feedback from participants and Proceedings of the seminar are available at the MWG

webpage sefi.htw-aalen.de.

Furthermore, members of the MWG Steering committee contributed actively to the reviews of abstracts submitted to the SEFI 2016 conference held in September in Tampere. Attendance of Steering committee members at various conferences in the years 2015-2016 can also be mentioned: WEEF (World Engineering Education Forum) in Florence, September 2015; APLIMAT conference on Applied Mathematics in Bratislava, Slovakia, February 2016; CPS Conference on Teaching Mathematics, Nový Jičín, Czech Republic, June 2016.
Next December the WG Steering Committee will discuss the feedback from the 18th seminar, and schedule the structure and plans for the 19th Seminar of the Mathematics Working Group in Coimbra in June 2018. The group intends to foster discussion and provide orientation and supportive material for the steady and balanced mathematical education of engineers in Europe. These aims are in line with the most important goals of SEFI regarding engineering education in general, which are applied by the WG to the field of mathematics education in particular.

Prof. Daniela Velichova
Slovak University of Technology
Chair SEFI MWG

Sustainability in Engineering Education

At the SEFI conference 2015, the workgroup chair J.E. Holgaard presented the outset and possible response strategies to change engineering education to be about, for and as sustainability. One of the points stated was that engineering education for sustainability cannot be outsources to sustainability experts – we as engineers, as engineering educators and as engineering communities have to take on the challenge to translate, integrate and embed sustainability into engineering education. This WG is open to everybody from the SEFI community who wants to make an effort in making this happen.
Based on the last SEFI conference, the intention was to set up a row of webinars about education for sustainability. However, through discussions among WG members and a screening of already existing offers, it was decided to initiate comparative ESD studies, see for example the study comparing strategies for education for sustainable development in a Danish and Australian perspective by Holgaard et al, Journal of Cleaner Production, Volume 112, Part 4, pp. 3474-3491, Jan. 2016.
In spring 2016, the position paper for the working group was revised and it was clarified that the WG will work to support education of engineers who are aware of the complexity of the sustainability challenge and are capable of comprehensive decision-making and action to develop more sustainable sound technological solutions. The mission is to make use of the synergy of different institutional perspectives to accelerate the diffusion and development of sustainability in engineering education in Europe.

The action plan for 2016-2017 focuses on establishing on-going cross-institutional projects to be outlined on a workshop at the SEFI conference 2016 with the goal of presenting the first comparable results in cross-institutional papers at the SEFI conference in 2017 addressing the theme: Excellence for Sustainable Development.

Dr. Jette Holgaard
Aalborg University
Chair SEFI WG SEE

Ethics in Engineering Education

An objective in last year's annual report included: "… consideration will be given to an effective mechanism / site for the wider dissemination of teaching resources such as the above. Consideration will also be given to some rationalisation / merging / restructuring of the WG so as to better reflect the broader interests of SEFI members. This has been especially prompted by the very low submission of papers under the theme of Engineering Ethics for the SEFI 2014 Annual Conference."
Communication with members of the Ethics WG indicated little motivation / interest in the compilation of teaching resources. Alternatively, electronic booklets have been continued to be circulated, and lecture materials and other resources shared on an ad hoc basis when requested (e.g. requests from the Universities of Aston and Cambridge in the UK, and the University of Frankfurt and Juelich Forschungszentrum in Germany). Ethics related material is also now being delivered to PhD students as part of a series of workshops for a wide group of students from institutions under the Helmholtz Association Research

Schools (including the previously mentioned two German Universities). The role of SEFI has also been promoted in such sessions, typically involving workshops to over 200 students per annum.

As part of a strategy for more general engagement with ethics, a workshop is being run in Tampere in the area of Pedagogic Frailty, i.e. a concept that describes the factors that may inhibit teaching development within a university environment. The topic obviously has strong undertones of ethics and values that are particularly pertinent to teaching and research staff, and indeed university management.

Dr. Esat Alpay
University of Surrey
Chair SEFI WG on EEE

Engineering Education Research

In Orleans the Working Group took the first steps towards creating its new action plan that will act as the focus for its ongoing work. Engineering Education Research (EER) is now well established as one of the major tracks at the Annual Conference and the working group plans will explore ways to further strengthen this area of activity within the SEFI family. We hope that with the Scopus listing of the conference papers, the desire to share EER work at the Annual Conference will only increase and facilitate the growth of the community.

The initial actions are to consolidate the existing Working Group activity associated with the Annual Conference and then look to for opportunities to meet / do work / arrange events between the conferences. The existing global EER landscape has much activity taking place and so the challenge will be for us to complement what is already happening and offer opportunities for our colleagues in Europe to come together and participate more easily.

As discussed in previous reports, there is significant mobility amongst many of the EER community in Europe as a consequence of existing relationships (often formed through SEFI), events and projects. This is happening a lot of the time and, although it is not recorded, it is certainly a major contributor to the health of the community. This year along with the national events such as the Nordic Network Meeting (Turku), the European CDIO Meeting (Delft) and the UK and Ireland Symposium (Cambridge) amongst others, the Annual CDIO Conference was this year held in Turku, Finland. There was a strong SEFI presence at each of these events.

The EER Workshop in Orleans was focused on the subject of global collaboration in EER. This subject was deemed sufficiently topical that with the help of the Panel Members who participated in the event, the Board is taking forward the preparation of a Position Paper on the subject. In a similar vein, Jonte Bernhard (Linköping University) and myself have been working the Special Issue of EJEE focused on EER in Europe which will come together in the next 6 months or so.

As our next Annual Conference in Tampere approaches, I expect to see even more EER activity in terms of papers, workshops and networking activity. We are at the dawn of a new era, one that I hope will be both enjoyable and productive. Combined with the wider activity to revitalise the working groups more generally, the visibility and activity will further enhance the role of SEFI in the global Engineering Education community.

Prof. Robin Clark
Aston University
Chair SEFI WG EER

Curriculum Development

We are at an important moment for society in general, and for European society in particular. It is time to look back and realize that 15 years ago we should have taken certain precautions regarding development in Engineering. Precautions for incredible and uncontrolled growth that are taking materials, Internet of things, design engineering, industrial electronics, and ultimately all professions and the labor market for which we are currently preparing our students.

That is why, curriculum development and in particular curriculum development in engineering, are becoming increasingly important, and at the same time more accurate. We need not only to be updated, but also think about the future day, think about the growth capacity and association of our teaching elements if we want them to be useful within 3, 4, or 5 years.

Therefore, in the CDWG, we discuss, bring, study, and share, all new and important certifications and findings to be included in our academic plans, in our subjects, in our laboratory practices, or as innovation activity for

any of our classes.
Some items to note this year have for example been the publication of some 2015 jobs in the TICAI, ICT for Learning, apprenticeship Engineering Edited by: Manuel G. Gericota (Chapter Português da Sociedade de Educação do IEEE) Juan Manuel Santos Gago (Spanish Chapter of the IEEE Education Society), and especially the international meeting on curriculum development held at the University of Cádiz in late May. In the latter, professionals from Finland, Germany, France, Jordan, Lebanon, and the Netherlands, presented the latest developments, both in educational planning, and teaching tools.

Prof. Dr. Carlos Rioja del Rio
University of Cádiz
Chair SEFI WG CD

Physics and Engineering Education

The SEFI Working Group on Physics and Engineering Education assembles physicists who teach physics to engineering students. They encounter similar problems irrespective of the country and the weight, the generality and the applicability of the course they are responsible for.

The main action of the PWG is to organize a conference "Physics Teaching in Engineering Education (PTEE)" for every two or three years. The next event will be PTEE 2017 in Zilina Slovakia, on May 18th – 19th 2017, hosted by University of Zilina. Special thanks for the local organizers to build the upcoming event, the PWG actively works to support the local staff. The conference theme will be "Challenges and solutions for effective teaching", which covers mainly the practical hands-on challenges that physics teachers in EE encounter in their practical everyday work. I warmly welcome you all to participate. More information is found on www.sefiphysics.be.

Three of the members of the working group are working together in framework of the Erasmus+ Strategic Partnership ReadySTEMgo (in collaboration with SEFI as the main networking partner). This project aims to improve the retention rates of higher education STEM programs by focusing on the academic readiness of incoming STEMstudents.

We will identify among incoming STEM students those that are at high risk of dropout and may thus need additional support and we will support those students with the help of intervention programs in the early phase of their studies. To achieve the above goal three different objectives will be realized: We will identify the key STEM skills. And once these are characterized, existing diagnostic tests are selected and their predictive power will be gauged in order to identify with high validity the at-risk students in need of extra support. Finally, we will investigate which intervention tools can support these at-risk students and we will measure the effectiveness of current remediation programs.

Mr. Juho Tiili, MSc
Tampere University of Applied Sciences
Chair SEFI WG PEE

Open and online Engineering Education

Online Education has recently been qualified as 'A Catalyst for Higher Education Reforms' by a study of Willcox, et al. (MIT, 2016). The report confirms that online education is a driving force for innovation in Engineering Education.
What has been observed is that an increasing number of organizations start to experiment with different models of open and online education and align their educational policies accordingly. With the emergence of online education and especially with MOOCs and new supporting learning technologies, current educational models are under pressure and seriously start to change the scope of HE.
The WG aims to put this issue on the agenda and address the current trends and the questions that surface with the emerging importance of online education.
Activities developed in the year 2015-2016 are the following:
2015 Orleans (France)
During this conference the WG organized an Open Workshop on ''Curriculum Development at a time of Open and Online Education'. The goal of the joint workshop with the 'WG Curriculum Development' was to develop a broader understanding of the consequences Open and Online Education have for Curriculum Development and vice versa and how this works out in practice. The aim of the workshop was to stay as close as possible to the insights of practical experiences of the participants and use their contribution to sharpen

the group discussion in the second half of the workshop.
Paper presentations in collaboration with the WG Gender and Diversity (S. Ihsen) on the subject: 'Gender and Diversity in Engineering MOOCs: A first Appraisal.' And a paper on 'The Value of Engineering MOOCs from a Learner's Perspective'.

2016 Cadiz (Spain)
An Online Presentation at the annual conference and governing board of the universities network Tethys in Cadiz at May 23t/24th 2016. The Téthys Network represents 76 universities from 17 countries in the Mediterranean Basin.
Theme of the conference, which was organized a.o. by the SEFI WG Curriculum Development, was on 'Curriculum Development for Open and Smart Universities'. Our presentation was entitled 'Towards *an Open and Smart University'* with a focus on how TU Delft is trying to make it work.

2016 Tampere (Finland)
The WG organizes a satellite event which is a 6 hour workshop on 'How to make online learning?' with the emphasis on MOOC development and it will include a 'SEFI-certificate'. It is an initiative of the WG in close collaboration with TU Delft (Netherlands) and MIT (USA). Details of the workshop are available online.
To be mentioned as well are the collaborative event with the WG Curriculum Development as an Open Workshop on curriculum development and open education. The main purpose is to organize exchange and collaboration between the participants, and a paper presentation on 'Who is the learner of the Engineering MOOC

SEFI Debate 2016
The WG was involved in the organization of the SEFI Debate 2016 on the subject "Labour Market Needs and Engineering Skills". The debate took place at the premises of the European Parliament in Brussels. A concept report on the debate has been issued by the WG on 16.05.2016.

We will of course continue working together with other WG (like 'Curriculum development, Gender and Diversity), and look for opportunities to organize intermediate 'events' (workshop, seminars, and other). To support the communication and exchange between the WG and SEFI members, we continued using: The Scoop facility as a news source curated by the WG http://www.scoop.it/t/learning4life on Open Education issues related to Engineering Education and the Twitter account #pieter50twit to stay equally on top of what is happening!

Prof. Pieter de Vries
TU Delft
Chair SEFI WG OOEE

Attractiveness of Engineering Education

The working group has started to collect a new list of members and build connections with other SEFI Working Groups, CDIO network and IACEE, as attractiveness is an issue covering the whole lifetime from pre-university, university and careers having several directions of professional development. Furthermore different pedagogical models and quality issues play an important part in building attractiveness.

Work to identify and discuss the new WG agenda will continue. The aim is to create an active network for such discussions and from which members can find partners for potential project applications. The WG has not let drop any of the suggestions of issues to cover. New additions will be welcomed additionally to the following ones currently covered in this working group:
What makes engineering education attractive?: easiness, not much reading/difficultness, challenges; appreciation of the profession, high income; possibilities to solve the most difficult human challenges; save the world; possibilities of changing career.
What is happening before the university level?: the role of teaching; STEM versus other subjects; gender attitudes; attractiveness examples from real life.
What happens in the university?: curricula; teaching and learning; diversity; university as a community; restrictions of study, tuition fees.
How continuing engineering education could be attractive?: should an engineer work in engineering field?; how to keep the market value.

We are open to discuss this list - hoping to develop a vibrant network around attractiveness.

Prof. Katriina Schrey-Niemenmaa
Metropolia University
Chair SEFI WG AEE

Continuing Engineering Education and Lifelong Learning

In May 2016 the Working Group organized a meeting during the International Association for Continuing Engineering Education (IACEE) Conference in Porto, Portugal. During the meeting the Working Group initiated discussions on future activities and possible cross collaboration such as with the SEFI WG on Attractiveness and IACEE. Participants exchanges on the WG history and previous practices, information on the WG was also circulated prompting also participants to join SEFI 2016 Annual Conference in Tampere.
In Tampere paper presented in the sub-theme on Continuing Engineering Education and Lifelong Learning will be invited to join the meeting on Wednesday 14th of September from 2 – 3 pm.
During this meeting attendees will participate to the discussions and draw up the new agenda of the SEFI WG on CEE and LLL - targeting on issues in which the members are interested in discussing and willing to put more work into. The agenda should contain both short and long-term actions, which appeals to and involves various members in different parts - the aim is to emulate the working group members participation.

Dr. Bente Norgard
Aalborg University
Chair SEFI WG CEE—LLL

Signature of the SEFI-IGIP MoU during WEEF 2015 (from left to right, IGIP Vice-President A. Zafoschnig, IGIP President M. Auer, SEFI President 2013-2015 K. Hawwash and SEFI Secretary General F. Côme)

Signature of the SEFI-ASEE MoU during ASEE 2016 (ASEE President J. Rencis and F. Côme)

International speakers and Tsinghua University Leadership during the Global Conference organised in Tsinghua University in November 2015.

From our corporate partners

Solving the Deployment Problem of Problem Based Learning

Academic Transformation too can be Digitally Enabled

Xavier Fouger—Dassault Systèmes, Senior Director Global Academia Programs

The daily life of an engineer is about solving problems with no predefined solution. This requires producing relevant context intelligence, mobilizing knowledge and input that are usually not immediately available, modeling and validating an innovative solution and assembling the constituents of its implementation.
With the legitimate goal of developing the capabilities, aptitudes and attitudes to perform such activity, Problem Based Learning (PBL) is not naturally favored by traditional educational processes and organizations. Its deployment may require profound changes in the DNA of our engineering education systems. If problem solving is the core activity of industry, one can imagine that businesses have developed various instruments over time, to make it happen as efficiently as possible. Among such instruments is the use of digital tools and practices to enable problem solving in a collaborative manner and across the various disciplines involved throughout the value chain. Why would educators not consider such tools and practices to facilitate, among other transformative instruments, to facilitate their own PBL transition?

Industry evolution towards experiential innovation

Competitive pressures and the need for many national industries to focus on high value productions have driven a fundamental shift in innovation towards the creation of products, services and, increasingly, a combination of both to provide prospective consumers with a distinctive experience of use. Over the last decade, in a constant dialog with various industries, Dassault Systèmes has literally reinvented its product line to make it a platform for the collaborative engineering of experiences, not just products; the 3DEXPERIENCE platform. This translated into a broad set of applications that connect the context where innovation has to happen and the future solution to be engineered. Such platform provides a comprehensive communication and modeling environment in which various dispersed stakeholders, including the future final user, operate as an intelligent crowd to initiate and enrich innovative solutions. Results, produced on the cloud, take the form of a high fidelity computer image of such solution. Macro processes to get there can be classified in three broad categories:

INSPIRE: Determine and analyze the global, socio-technical, economical and environmental context of the problem to solve. This includes semantic search, dashboarding and alerts about the relevant activity on the worldwide web or on private data sources. It provides a comprehensive, dynamic, multi-source, multi-dimensional, multi-media ideation stimulus to all project members.

INNOVATE: In conjunction with relevant sources of inspiration, collectively produce ideas, model them in any digital form (text, pictures, videos, animations) and, by sharing them instantly with possibly dispersed team members, converge toward a preferred solution concept. Unlike traditional brainstorming settings, this instrument is i) dispersed in various locations, ii) persistent: formulated ideas remain modeled in the system for potential later consideration even if deselected and iii) connected to the elements of context that inspired individual ideas, the dynamic evolution of those element being potentially additional stimuli to enrich the targeted solution.

CREATE: The targeted solution and its possible variations being formulated, it now needs to be technically defined for all stages of its subsequent lifecycle. This reflects the more traditional activities of product and process engineering, strongly augmented by collaborative capabilities and multi-disciplinary models of a future product and its use cases. Formal processes for technical and social collaboration support this work and the resulting computer model reflects the function, the 3D appearance and the multi-physics behaviors

of the solution. Interdependences with the inspiration context and with the ideation history are maintained for continuous tradeoffs.

Turning a problem solving platform into a digital framework for problem-based learning.

Enabling students to experience innovation activities along these macro-processes with the tools and practices involved, is the very purpose of a learning project. This is why Dassault Systèmes Learning Lab has developed a customization of the 3DEXPERIENCE platform to produce an integrated ePBL framework that replicates these macro-processes with two specific educational additions: INSPIRE, LEARN, INNOVATE, CREATE, E*VALUATE. ("ILICE")*

The LEARN section is the digital window on formal and informal learning resources including internal and external learning material, community based and peer learning, learning paths monitoring, and self-training on operating the entire framework.

The EVALUATE section provides instruments for students and educators to individually and collectively monitor learning activities and to assess their applications in the project work by associating each project deliverable to its author or group of authors.

LEARN and EVALUATE, can happen anytime during the project, in a non-co-located manner. Data produced during these macro-processes can keep track whenever relevant, with the associated elements of the INSPIRE, INNOVATE and CREATE environments. Persistent project memory also makes the framework an appropriate instrument of multi-year projects to experience practices of continuous improvement and impact control of team turnover.

Instant activation

While initially inspired by PBL and CDIO, the ILICE framework can accommodate with any project based methodology. It is currently being used in several ongoing projects in higher and secondary education, in single classrooms and internationally dispersed partnering institutions as well. Fully customizable by educators the framework can be activated by any user of the 3DEXPERIENCE platform and is provided upon simple request at: http://academy.3ds.com/lab/

Discover ILICE on video

GRANTA MATERIAL INTELLIGENCE

8th International Materials Education Symposium

Materials Education SYMPOSIA 2016

Overview by Mike Ashby (University of Cambridge and Granta Design)
Chair of Symposia Academic Advisory Committee

The 8th International Symposium was terrific! It came just three weeks after the 7th North American Materials Education Symposium, hosted by the Department of Materials Science and Engineering at UC Berkeley, which was an exceptionally stimulating forum for sharing recent ideas and experiences. The International Symposium too was the biggest and, to my mind, the most diverse and far-reaching thus far.

***Zoe Barber** (Cambridge) introduces the speakers*

The Symposia have three main aims:

Share ideas, innovations, experiences, successes and failures

Provoke productive discussion around these issues

Expand the links that form such a key feature of the Materials Community

Clare College, Cambridge, was the venue for the third successive year and talks included Engaging student interest, Materials and design, Bio-engineering, Pedagogy, and Broadening horizons.

Feedback was overwhelmingly positive – everyone who completed a feedback form said they would recommend the symposium to their colleagues, and almost all hope to return next year.

I am particularly grateful for the help of the Symposia Academic Advisory Committee and support and encouragement received from SEFI, FEMS, IFEES, ASM International, TMS and colleagues at The University of Cambridge.

Courses, posters, networking and social program

Suggestions and feedback from participants at the 2015 Symposium led to many new side events being added to the Symposium program in 2016. There was a CES EduPack course (led by Mike Ashby and Claes Fredriksson) and workshops on E-learning (led by Mark Endean from the Open University), Sustainable development (led by Mike Ashby and Tatiana Vakhitova) and Advanced materials selection with CES Selector (led by Charlie Bream). In light of the positive feedback received we will run additional courses and workshops in 2017.


Mark Endean opens the e-learning workshop


Group photograph after the MS&M department tour

Thirty-one poster presenters each had 60 seconds to make their pitch during the 'poster teaser' session on the Symposium's first morning. This provoked lively discussions and networking over the two days. Views and ideas were also shared over social media and displayed on the 'Twitter wall'.

The Presenters' Dinner at Clare College

The Social Program offered the opportunity to meet existing friends and make new ones. The candlelit Presenters' Dinner at Clare College (founded in 1326) and the Symposium Dinner held in Peterhouse (founded in 1284) brought together the growing Symposium community.

Final words by Marc Fry (Granta Design)
Secretary of Symposia Academic Advisory Committee

I would like to thank all 133 participants and Granta Design colleagues for making this event a fantastic success, with two days of thought-provoking discussion and fun. We greatly value the ongoing input and suggestions from the Symposium community which helps us identify new directions and develop the events further. We now look forward to continuing to work with the Symposium Academic Advisory Committee and local hosts towards future Symposia.

I am delighted to confirm the following dates, locations and themes:

- 2nd Asian Materials Education Symposium
  December 8-9, 2016, National University of Singapore
  Theme: Materials and Sustainable Development Education
  Poster abstract deadline: September 30, 2016
- 9th International Materials Education Symposium
  April 6-7, 2017, University of Cambridge, UK
  Theme: Education and Industry
  Talk abstract deadline: September 30, 2016
- 8th North American Materials Education Symposium
  August 24-25, 2017, Massachusetts Institute of Technology, USA
  Theme: Materials Education Innovation. Sub-themes: Engaging students; Online Education; and the "Maker" Movement
  Talk abstract deadline: January 31, 2017

Finally, I would like to invite you to submit an abstract for these events. For further background, please visit www.materials-education.com You are also very welcome to contact the Granta Design Education Team if you have any questions or require further information at education.team@grantadesign.com

www.grantadesign.com/education

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USER STORY

Mondragon University Students Build Practical Engineering Skills Through Project-Based Learning

University of Mondragon faculty member working with students in the lab.

The Challenge

Prepare students to meet industry need for engineers with practical skills and experience

The Solution

Provide campus-wide access to MATLAB and Simulink to support project-based learning

The Results

- Low-cost, practical projects supported
- Student engagement increased with ability to use tools anywhere, anytime
- Positive industry feedback received

A principal goal of Mondragon University is to give students direct work experience right from the start of their studies. In support of this goal, the Faculty of Engineering has adopted a project-based learning approach in which student teams spend four to six weeks of each semester working on engineering projects. Beyond reinforcing class material, the projects enable students to develop skills in project leadership, negotiation, communication, and teamwork.

Mondragon University supports project-based learning by providing all students with anytime, anywhere access to MATLAB® and Simulink®.

"Campus-wide access to MATLAB and Simulink has enabled us to develop a practical and applied teaching methodology," says Carlos Garcia, general manager of the Faculty of Engineering at Mondragon University. "Within this model our students learn to use these tools to analyze, model, and simulate systems, so they know how a system will perform before they implement it."

The Challenge

Mondragon University recognized that a teaching methodology in which students worked in groups on real projects would produce graduates with many of the core skills required by industry.

While the engineering faculty viewed the adoption of project-based learning as a way to reorient the curriculum to industry needs, the transition to project-based learning presented challenges. First, faculty had to restructure their courses by reducing the number of lectures, introducing practical assignments, and allotting time for projects. Second, students needed the freedom to work on assignments and projects wherever and whenever they needed to, and not just in computer labs for a few hours at a time.

The Solution

Mondragon University acquired a Total Academic Headcount (TAH) license, providing all students and faculty with campus-wide access to MATLAB and Simulink and enabling the engineering faculty to integrate the tools throughout the curriculum.

First-year undergraduate engineering students begin using MATLAB and Simulink in programming and other core courses. In mathematics classes they use MATLAB, Symbolic Math Toolbox™, and the MuPAD engine to complete assignments on integrals, ordinary differential equations, and Fourier series.

In class assignments and final projects in their second year and beyond, the students use MATLAB and Simulink to model and simulate systems. For example, third-year electronics engineering students use Simulink to develop and verify a control system for a small mobile robot.

Graduate students use MATLAB and Simulink for Model-Based Design extensively. Students pursuing a master's degree in power electronics and energy, for example, design and implement an advanced control system for a vertical-axis wind turbine.

For this project, teams of four or five students use MATLAB to analyze and characterize the dynamics of a real turbine

MathWorks®

"Campus-wide access to MATLAB and Simulink enabled us to develop and implement an educational model founded on practical, project-based learning that helps students go from merely knowing engineering concepts to knowing how to apply them."

—Carlos García, Mondragon University

operating in the lab. Based on this analysis, they develop a full system model in Simulink that includes turbine, generator, rectifier, converter, and battery components.

Working in Simulink, the teams design and model a control system that uses maximum power point tracking algorithms to optimize power generation for various wind speeds.

After tuning and verifying their design through simulation, the teams use Simulink Coder™ to generate C code from their controller model and deploy it to dSPACE® hardware for real-time testing with the turbine.

The teams analyze and visualize the test results in MATLAB and refine their controller designs based on this analysis.

Doctoral students at the university use MATLAB and Simulink to analyze, model, and simulate cybernetic, telecommunications, and embedded systems in their research. Years of experience working in close collaboration with industry have demonstrated to the faculty that models tested and verified with MATLAB and Simulink accurately reproduce the behavior and performance of the final real product, facilitating validation processes and reducing their cost.

The Results

Low-cost, practical projects supported. "Simulation with Simulink is a valuable stepping stone between theory and implementation that saves considerable time and money, particularly when a project involves a turbine or other costly system hardware," García says.

Student engagement increased with ability to use tools anywhere, anytime. "With the TAH license, students have the flexibility to use MATLAB and Simulink on their own laptops at home or wherever they are, whenever they want to," notes García. "In surveys, students reported that this is an important advantage, as it enables them to delve more deeply into their work than would be possible otherwise."

Positive industry feedback received. "Many companies in our area have told us they are happy with the results of our move to project-based learning," says García. "Companies that use simulation already and companies looking to lower costs by introducing simulation recognize the benefits of hiring graduates who have practical experience with MATLAB and Simulink."

Industry

- Education

Application Areas

- Control systems

Capabilities

- Data analysis
- Mathematical modeling
- Algorithm development
- System design and simulation

Products Used

- MATLAB
- Simulink
- Simulink Coder
- Symbolic Math Toolbox

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The University of Sheffield partners with National Instruments to equip world-class engineering labs in The Diamond

The Diamond is the University of Sheffield's largest ever investment in teaching and learning and delivers multidisciplinary, practical, problem-based learning activities for students.

When developing its multidisciplinary engineering programme, the University of Sheffield partnered with National Instruments to help equip the new facilities.

Within the Diamond, the Electronics and Control Lab is equipped with the same industry-leading NI hardware and software technology used by companies around the world. NI believes that hands-on learning solidifies theoretical concepts and prepares students for industry or advanced research. Skills learned in the classroom, paired with platforms that scale to industry, prepare students to solve the grand challenges of tomorrow. Using NI's standardised platform within The Diamond gives students the flexibility to adapt and move experiments between laboratories, improving their problem-based learning skills, resulting in highly employable engineers.

Students working in the new fully equipped laboratories in The Diamond benefit from NI technology such as NI ELVIS, a multidisciplinary teaching platform that enables multiple labs to be taught using one device, together with NI myDAQ and myRIO, enabling students to measure and design complex systems away from the traditional lab bench. This is in addition to The University of Sheffield's existing campus-wide NI software license and the use of LabVIEW software and NI hardware to support teaching activities in faculties such as Automatic Control, Mechanical, Electronic, Chemical and Civil Engineering. The integration of these industrially-relevant technologies ensures that Sheffield University's students do not just learn engineering, they do engineering. The students will graduate with the practiced, transferable engineering skills required to innovate from day-one of their careers.

"We educate students to deliver real solutions to open ended problems. This enables our graduates to be capable researchers and effective engineers. Learning on state of the art, industry standard equipment such as our suite of *NI hardware helps them to be more flexible, employable and capable graduate engineers"*
Professor Stephen Beck, Head of Multidisciplinary Engineering Education, University of Sheffield

"Over the years, I've seen university students around the world solving complex problems by designing real engineering systems. I have seen, first-hand, the incredible things that can happen when a student combines their newly discovered engineering skills with the right system design tools. During my recent visit to The Diamond, I told Sheffield students that I was confident they would do great things, as they have access to cutting edge technologies in one of the finest engineering *facilities in the world."*

Dave Wilson, NI Vice President of Academic Product Marketing

The University of Sheffield is one outstanding example of National Instruments' commitment to providing hands-on tools and applicable, real-world experiences to students in engineering education that help them accelerate their

discovery rate, thus keeping up their motivation and inspiration to learn. Today's students and researchers must succeed in creating new system-based solutions that quickly deliver levels of functionality previously unseen. Building more complex systems faster implies an acceleration in engineering achievement.

Both students and researchers are working toward discovery. Researchers discover what no one knows, students discover what they don't know, but they're both discovering, making the rate of discovery what's truly important. Seen in this light, it's discovery that becomes a critical factor in the chain of engineering design that, if enabled and made efficient, will accelerate the rate at which our students and researchers can deliver the complex systems of the future.

The development tools that deliver better system information or data visibility accelerate iterative discovery. There are terms that describe the act of accessing and presenting the data and information of engineering systems and a standard one is "instrumentation" or "instrumenting". Today, however, instrumentation has evolved to the point where it has been virtualized and made widely available and almost infinitely scalable. The virtualization of instrumentation has allowed students and researchers to instantly view all of the areas of measurement, math, code, and output that they need to see in the form of graphs, meters, gages, dials, lights, and numbers that give understanding of the system. And because its virtual, that is, it is on a PC or tablet, it is nearly limitless in the number that can be applied to give full understanding of the system. It is this data access and visibility that allows students and researchers to discover at a rapid rate.

National's instrument commitment is to provide engineering teaching institutions with the tools that enable students to become the innovators of tomorrow.

ni.com/academic

SEFI priorities for 2015-2020 (*)

Attractiveness, in terms of engineering education in general, in making a major contribution to the attractiveness of *engineering to potential students at all levels, but also in terms of SEFI's attractiveness to both established and young* educators and researchers;

Education and Skills - Employability, in ensuring the best preparation of graduates for European and worldwide employers, whilst supporting the improvement of more coherent engineering education processes;

Capacity building, in reshaping engineering education and contributing to the development of guidelines facilitating the mobility of graduates and students (accreditation/quality assurance) in Europe and in the world;

Digital world - in taking into account the reality of a digital world where e-learning offers new possibilities and challenges, and where open and on-line learning and teaching may permanently change how engineering is taught and learned.

Engineering education as a research field is developing strongly in Europe. This is vital to underpin the development of new educational practices and technologies to support the continued development of engineering education. There is a need to influence policies to ensure that this important research subject is adequately funded through EU programmes.

(*) from the SEFI Orientation Paper approved by the 2014 General Assembly in Birmingham.

Our Publications

European Journal of Engineering Education

The European Journal of Engineering Education (EJEE), the Official Journal of SEFI, is published six times a year in print and electronic editions and provides an essential forum for dialogue between researchers and specialists in the field of engineering education. As one of the leading journals in engineering education EJEE includes both research articles as well as practice oriented papers. EJEE aims to publish papers that are of interest for engineering educators in Europe covering topics that are of interest world-wide and with authors from around the world well represented.

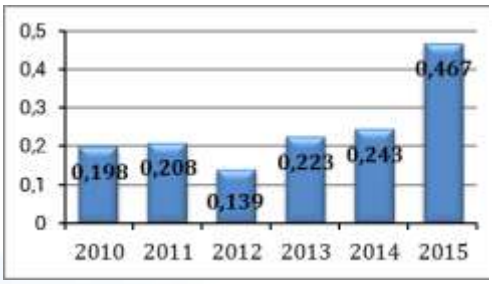
The statistics on EJEE from Manuscript Central reported here were kindly provided by Ian Challand from Taylor & Francis. Almost half of the submissions have a European first author (46% submitted, 47% accepted). During the past year the acceptance rate of papers from North America and Australia was relatively high, in contrast to those from Asia, Africa, South America and the Middle East (see figure 1. below). The acceptance rate varies markedly for the different geographical origins. As can be seen authors from Asia and South America find it hard to meet the demands of the EJEE reviewers. Also. European authors submitted by far the most papers to EJEE. However, with 21 % the success rate is not very high. Authors from Australia and North America clearly achieve a much higher highest acceptance rate, suggesting these authors are better in interpreting the criteria. Language proficiency could explain part of the differences. Evidently both most successful geographical areas have English as their mother language. However, a much more detailed analysis will be needed to determine the causes for the differences in the geographical distribution of paper acceptance.

Since 2015 EJEE features in Thomson Reuters new Emerging Sources Citation Index (ESCI). Articles in ESCI indexed journals will be included in an author's H-Index calculation, and also any analysis conducted on Web of Science data or related products such as InCites. Thomson Reuters does not report impact factors for journals included in this list. It is however possible to calculate an estimated impact factor by using data from the web of science. From 2010 till 2014 the estimated impact factor of EJEE ranges around 0.20. The figure for 2015 shows a marked increase at 0.47. These numbers are based on data from 2013-2014. We hope this positive trend continues, confirming our policy of strengthening the research published in EJEE without excluding practice-oriented reports.

Geographical distribution of submissions

Geographical distribution of Acceptances

Estimated Impact factor



EJEE uses the online submission and reviewing system Manuscript Central supported by the Taylor and Francis staff. The editorial office consists of Erik de Graaff as the editor-in-chief, until the beginning of 2016 supported by Dr. Aida Guerra. During the past year we have experienced serious problems in communication with authors and reviewers and in maintaining the document flow through the system. Yet at the end of this period it seems like the problems are under control and in fact the numbers already show an improvement compared to last year.

The past period the editorial committee was composed of the following persons: Erik de Graaff, Aalborg University, Denmark, editor-in-chief; Esat Alpay, University of Surrey, United Kingdom; Jonte Bernhard, Linköping University, Sweden; Anette Kolmos, Aalborg University, Denmark; Bill Williams, Instituto Politécnico de Setúbal, Portugal. We are now starting to prepare for the end of the term of the present Editor-in-Chief in 2018. The European Society for Engineering Education (SEFI) is looking for a new Editor-in-Chief for the European Journal of Engineering Education (EJEE). A committee has been appointed to direct the search. The editorial committee, represented in the committee by two members will support the transition process.

We express our thanks to the many people who make the appearance of the EJEE possible, in particular, our authors, our reviewers, the members of the editorial board and the staff at Taylor & Francis.

Prof. Erik de Graaff
EJEE Editor in Chief
Aalborg University

SEFI also publishes Annual Conference Proceedings, a monthly newsletter & press reviews, Position Paper, Annual ***Reports… All available on www.sefi.be***

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Annual Report 2015-2016
This publication is the official Annual Report of the European Society For Engineering Education.

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EUROPÄISCHE GESELLSCHAFT FÜR INGENIEURAUSBILDUNG

39, rue des Deux Eglises
1000 Brussels – Belgium
Tel : + 32 2 502 36 09
info@sefi.be
www.sefi.be

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