

SEFI ANNUAL REPORT 2019-2020

Complexity is the new normality



Brussels, September 2020

SEFI is the largest network of higher engineering education institutions (HEIs) and engineering stakeholders in Europe. As an international NGO created in 1973. SEFI contributes to the development and improvement of Higher Engineering Education (HEE) in Europe, promotes information about HEE and improves communication between teachers, researchers and students, reinforces the university-business cooperation and encourages the European dimension in higher engineering education. SEFI is an international Forum composed of HEIs, academic staff and teachers, students, related associations and companies in 41 countries.

Our activities: Annual Conferences, Ad hoc seminars/workshops organised by our working groups, councils and ad hoc committees, organisation of the European Conventions for Engineering Deans, Scientific publications (including the European Journal of Engineering Education), European cooperation projects, position papers, cooperation with other major European associations and international bodies such as the European Commission, the UNESCO, the Council of Europe or the OECD. SEFI also participated in the creation of several organisations such as ENAEE, IFEEES, EuroPace, IACEE and IIDEA.

Annual Report 2019-2020

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EDITORIAL

Complexity ... For sure!

Our 2019 conference theme, “Complexity is the new Normality”, has, unfortunately, been predictive. Since then, everyone’s life on Earth has drastically changed, due to the Covid-19 pandemic. More than 800000 people worldwide lost their lives and more than 25 million are infected. We all have to admit that we never had ever thought this could happen in our “modern” world, forcing all of us to rapidly adapt to this exceptionally worrying and stressing environment. It has also led us to adapt in order to pursue our mission, by adopting new ways of teaching and learning.

Nonetheless, and even if for us all, engaged in an organisation like SEFI, events of all kinds constitute our usual way of working, the new complex environment imposed by the pandemic did not affect too much our operations: SEFI has remained active in several fields. We started the year with the splendidly organised conference in Budapest, where 400 colleagues had the chance – and we now realise that it really was a chance – to meet face to face. The event was as traditionally an occasion for our community to recognise the praiseworthy services from several eminent personalities who received the SEFI awards. The General Assembly was the occasion of the transfer of powers from Profs. Murphy to Berbers, who started her presidency with her well-known energy. Our SIGs were quite active as well, and the EJEE continued to be quite successful. We published a series of new publications and should soon finalise the Joint SEFI-ASEE Statement of Philosophy on EU-US credit evaluation. We have also been active in several EU projects and supported a series of new applications last spring. We supported the University Alliance statement in the context of the campaign “Seize our future” and the First UNESCO World Engineering Day (WED) launched on 4 March 2020.

I would like to thank our members for their efforts in remaining supportive towards our Society, as well as our colleagues from University Carlos III of Madrid, organisers of our 2020 Deans convention, postponed to 2021.

As this will for sure constitute THE new SEFI challenge of the year, we shall have soon our first on-line annual conference which will be possible only thanks to the fantastic flexibility of our Dutch colleagues. The theme of “Engaging engineering education” seems to be, once again, more than relevant!

In 2021 we will have annual conferences in Berlin and in 2022 in Barcelona! Mark your agendas, hoping we will go back to a certain normality by that time!



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MESSAGE OF THE PRESIDENT

Welcome to the SEFI 2019-2020 annual report. Like other years, this report summarizes activities and accomplishments of our Special Interest Groups (formally called Working Groups), our members, and our recurring activities.

2019-2020 is a special year because of the COVID19 crisis. This crisis has changed our lives and our education systems. As new waves of infection are emerging in many places, it is clear that the COVID19 crisis is not over. Uncertainty about the future causes distress and creates unrest. What will the next academic year look like? Will we be able to teach and mentor our students? Luckily, as engineers, we do not shy away from problems but turn to solutions and focus on continuous improvement and quality assurance. As we have already adapted our education strategies to this novel pandemic situation, I am convinced we will continue to learn from this experience and provide competitive, state-of-the-art education to our students, also in 2020-2021!

SEFI looks back to a great conference in Budapest in 2019, well-organised and with a plethora of stimulating presentations. The conference attracted over 400 participants! The theme, Varietas delectate – complexity is the new normality, successfully addressed current challenges in Engineering Education. Our coming conference will be a different experience. Because of the COVID19 crisis, it will be full online! The team in Twente is putting in a lot of effort to support this online conference, which will even include some online social events. The theme, Engaging Engineering Education, is extremely relevant: we want to fully engage our students in our educational endeavors. The conference organizers have received 182 papers and workshop proposals from which they have constructed a great conference programme. An adjusted timetable and technology support will be arranged to make this online conference a good experience for all. We expect our novel format to give opportunities for new engineering educators to get to know the SEFI community through online participation.

The SEFI 2021 conference is taking shape as well. This conference will be organised by TU Berlin, and the theme will be “Blended Learning in Engineering Education: What will be the New Normal?”. The SEFI 2022 conference will be organized by UPC in Barcelona. SEFI has successfully launched the, in partnership with GECD, Global Virtual Internship Program. Engineering students at member institutions of both organizations can now benefit from the valuable opportunities offered by our corporate and university members. Please have a look at our website for more information. In our annual report, we always look back on our European Convention of Engineering Deans. This year, this meeting was first postponed, and later canceled. But no need to worry: it is now planned for the spring of 2021!

I am looking forward to meeting you – virtually – during the annual conference, and I thank you for supporting SEFI today and in the future!



Yolande Berbers
SEFI President 2019-2021

SEFI ANNUAL CONFERENCE 2019



VARIETAS DELECTAT – COMPLEXITY IS THE NEW NORMALITY.

Industry 4.0 and Diversity in Engineering Education

15-19 September 2019 - Budapest. HU

SEFI Annual Conference 2019 was organised by the Budapest University of Technology and Economics (BME). The beautiful venue and the attractive programme brought together almost 400 participants from Europe and overseas.

DOCTORAL SYMPOSIUM

The programme started already on Sunday, 15 September, with the second edition of Doctoral Symposium for PhD candidates in engineering education research. This whole-day event was an opportunity for the doctoral students to explore and develop research interests in an interdisciplinary workshop, under the guidance of a number of well-known senior scholars within the Engineering Education Research (EER) field. During the Doctoral Symposium, the participants shared their current dissertation work with others and received feedback.

CONFERENCE PROGRAMME

Keynote speakers this year included EU Commissioner **Tibor Navracsics** (HU); Mrs **Valeria Csepe**, President of the Hungarian Higher Education Accreditation Committee (HU) who presented her engaging speech *Humans under evolutionary pressure in time of the fourth industrial revolution*; **Prof**

135 Concept Papers

33 workshops

61

Research papers

4 keynotes

Jian Lin, Deputy Director of the Center for Engineering Education, Tsinghua University (PRC) – a cutting-edge Chinese engineering university, presented to the full hall of BME the Chinese engineering education strategy in his speech titled *Facing the Future: New Engineering Disciplines Construction in China*, and Mr **Xavier Kes-telyn**, Vice-President for Academic and Student Affairs, School of Engineering, Arts et Métiers ParisTech (FR) who introduced a hands-on approach to education in his presentation *Responding the challenges of the Industry of the Future in a unique ecosystem?*

The industry-academia cooperation session was presented by two students

Antonia Nanau and **Senne Meeusen** from our partner organisation BEST (Board of European Students of Technology) and was focused on the expectations from students in the industry-academia relationship.

The social programme included a Gala dinner boat trip up and down the Danube river and a guided tour in Budapest and to the university's reactor.

SEFI would like to sincerely thank the local organising committee with the Vice-rector Balazs Vince Nagy, Mrs Aniko Kalman, Mrs Adrienne Fuzesi, Mrs Dora Fekete and Ms Linda Citterio for an excellent coordination of this remarkable event.

BEST PAPERS

There were four categories of best papers and these were the winning papers per category.

- **Best Research Paper Award**
Sjoerd Peters, Stephan Corporaal, Milan Wolffgramm, Kristy McGovern:
Preparing Technicians for the 4th Industrial Revolution.
- **Best Poster Paper Award**
Adriaan Schelling and Jesper Molin:
Umbrella Courses at a BEng programme in Civil Engineering
- **Best Student Paper Award**
Mariana Leandro Cruz, Darren Carthy, Sofie Craps:
Communication Activity Implementation over 3 Engineering Universities: Values and Challenges
- **Best Concept Paper Award**
Gyula Zilahy and Agnes Zsoka:
Innovative methods of teaching Sustainable Development.

SEFI LEONARDO DA VINCI MEDAL

The Leonardo da Vinci Medal is awarded once a year to a living person who has made an outstanding contribution of international significance to engineering education. This year, SEFI awarded the medal to the former EU Commissioner for Education, Culture, Youth and Sport, Mr **Tibor Navracsics**.

In the years of Mr. Navracsics Commissioner activities, did Education and Culture move to the top of the political agenda, supporting and acknowledging the key policy initiatives aimed at providing high quality, inclusive and future-oriented education, improving key competences and digital skills and promoting common values.

The major achievements, EU policy and activity initiatives and implemented actions, earmarks and milestones during the years of Tibor Navracsics Commissioner's service have been:

- Support the development of the Erasmus+ Programme
- Promote innovation and exchange of knowledge with initiatives such as the Digital Education Action Plan and the Strategic Framework for cooperation in Education and Training
- Promote the advancement of the European Degree Programme in order to build a European Education Area
- Strengthen the social cohesion and civic participation by several initiatives such as the European Solidarity Corps



SEFI FRANCESCO MAFFIOLI AWARD

The SEFI Francesco Maffioli Award is given by to individual teachers, or a team of teachers, of higher engineering education institutions members of SEFI, in recognition of open-minded development of curriculum, learning environments or tools, novel didactics, methods or systems in engineering studies.

This year the Maffioli committee selected Mr **André Baier**, lecturer at TU Berlin for *Blue Engineering Initiative*.

The [Blue Engineering Course](#) is a student-initiated course design that addresses the social and ecological responsibility of engineering. Its student-driven character is achieved through a set of over 150 building blocks, these are well-documented teaching/learning units which provide a broad variety of interactive methods to address the complexity of technology. All building blocks are freely available online, so that anyone may conduct them.

Each semester is divided into three parts so that the students gradually acquire the competences to co-conduct and co-develop the course:

- 1) Students get to know high quality building blocks conducted by a lecturer/student tutor;
- 2) Students conduct existing building blocks;
- 3) Students develop new building blocks, conduct them and document them for future use.



John Mitchell, André Baier, Mike Murphy

3) Students develop new building blocks, conduct them and document them for future use.

The design of the Blue Engineering Course has been implemented as a compulsory elective course at TU Berlin since 2011. Here, over 1000 students participated in 16 consecutive semesters. Due to the modular course design, it is also successfully adapted and implemented at 6 other universities in Germany, including TU Hamburg, UaS Düsseldorf and TU Dresden.

The mixed methods evaluation of the course shows a significant increase of competences related to an engineering education for sustainable development.



SEFI FELLOWSHIPS 2019



Prof Anne-Marie Jolly

Anne-Marie Jolly is a French engineer, former professor and director at Polytech Orleans, and current vice president of the french engineering school accreditation – CTI. Anne-Marie has been a long-standing member of SEFI, board of directors member between 2009-17, and leader of the our initiatives on Sustainability as well as Quality and Accreditation. Thanks to her reputation in the French engineering education circles, she has been a vital element to development of SEFI membership in France, and SEFI-French relations in general and also with the European Network for Accreditation of Engineering Education. Anne-Marie is a tireless promoter of engineering being a profession for women and herself serves as a role-model to her students and numerous female engineers (not only) from SEFI.



Prof José Carlos Quadrado

Jose Carlos Quadrado is professor at the Porto Polytechnic Institute where he is also the Vice-president for Internationalisation. Past-President of the Latin American and Caribbean Consortium of Engineering Institutions (LACCEI), of the International Federation of Engineering Education Societies (IFEES), and of the Ibero-American Engineering Education Association (ASIBEI), Jose Carlos is also a past-Vice President of SEFI and organiser of the visionary SEFI conference in Lisbon. Current Vice-President of the European Network for Accreditation of Engineering Education (ENAAE), he has been actively supporting the development of new accreditation agencies in Central Asia, Africa, Middle East and Latin America. He is also a Kazakhstan Society of Engineering Education (KazSEE) accreditation board member.



Prof Erik de Graaff

Erik de Graaf is a professor at the Aalborg Centre for PBL in Engineering, Science and Sustainability. He is a leading person in the European field of Engineering Education Research. Within SEFI, Erik held the office of vice president, chairs of the Curriculum Development working group and a convener of the 2009 Annual Conference in Aalborg. Most importantly, Erik was an outstanding editor in chief of the European Journal for Engineering Education. When he started in 2008, it was hard to get sufficient papers to fill the journal issues, however during his editorship, the interest to publish in the journal has grown – today the acceptance rate is only about 20%, which is fundamentally a positive indicator both for the journal and for engineering education.

GENERAL ASSEMBLY 2019

SEFI General Assembly held on 17/09 in Budapest elected the new officers and board members.

New president

Prof Yolande Berbers from KU Leuven in Belgium was elected as the new president of SEFI. Prof Berbers is a full professor in the area of computer systems research and a former Vice dean for education at the Faculty of Engineering Science at the KU Leuven. She officially replaced the outgoing SEFI president, **Prof Mike Murphy** from TU Dublin on 1 October 2019.

New Vice President

Prof Hannu-Matti Jarvinen from Tampere University in Finland became the new vice president and join Prof Luis Sanchez in this position.

New Board of Directors members

Prof Greet Langie, KU Leuven, Belgium
Dr Gillian Saunders-Smiths, TU Delft, The Netherlands

Dr Jan van der Veen, Twente University, The Netherlands

Mr Antoine Lanthony, Supmeca Paris, France

Re-elected Board members:

Prof Seweryn Spalek, Silesian Technical University, Poland

Dr Neil Cooke, University of Birmingham, United Kingdom

Dr Fredrik Georgsson, Umea University, Sweden

New Special Interest Group Chairs

The general assembly was presented with the new working group chairs and co-chairs:

Dr Roland Tormey, EPFL Lausanne - co-chair of SIG on Ethics

Assist. Prof. Calvin Rans, TU Delft - chair of SIG on Open and Online Education

Dr Inês Direito, University College London – chair of SIG on Gender and Diversity

The complete list of board of directors and working group chairs is now updated [here](#).



SEFI 2020 Annual Conference

Engaging Engineering Education online event

4TU. CENTRE FOR
ENGINEERING EDUCATION

SEFI
ANNUAL CONFERENCE
20-24 September 2020
ENSCHDE | THE NETHERLANDS

SEFI ETHICS SIG WORKSHOP 2019

Meeting the Challenge of Engineering Ethics Education

12-13 December 2019 - Eindhoven, NL

SEFI SIG Engineering Ethics Education had its first workshop, under the organization of **Gunter Bombaerts** (TU Eindhoven). The aim of the event was to explore in a series of workshops some of the challenges faces by engineering ethics educators, to share best practices and brainstorm future strategies for action. Educators from different countries – ranging from Australia, Germany, The Netherlands, Switzerland, Sweden, Spain, Ireland, UK and US – got together to work together through these issues, with a strong online participation.

Participants raised questions whether ethics education needs to be more experiential, by taking into consideration the type of problems faced by engineers in their practice and the sort of professional identity we aim to help develop, as well as how to include in practice a broader conception of engineering.

On the first day, there were four sessions including a workshop on challenge-based learning (CBL) approach; brief presentations on research projects on engineering ethics education, taking place in the Netherlands, Ireland and U.S.; the second workshop on virtue-based approach to Engineering Ethics Education; and lastly a session that provided the TU Delft team

with an opportunity to gather the insights of a diverse group of educators regarding the challenges and successes they experience teaching ethics to engineering and design students.

The second day of the meeting incorporated three sessions. The first workshop explored issues regarding the assessment of students and evaluation of quality of ethics courses; the next workshop grounded the practices shared during these two days in the need for an evidence-informed (re)design of engineering ethics teaching. The focus of this workshop was on (a) exploring what is meant by ‘evidence’ in an engineering/STEM education context and (b) what psychometric tools exist for evaluating and comparing student outcomes across these interventions.

Some key conclusions of the workshop were (i) ethics educators must engage with evidence regarding learning (not just learning theories), (ii) the implications of the research evidence should be applied carefully to our practice taking into account the overall weight of evidence as well as particular circumstances and learning goals (i.e. practice should be informed by this research but not uncritically based on it), (iii) gathering



good evidence in real-world settings is extremely challenging, (iv) a number of psychometric tools which might facilitate evaluation and comparison exist, (v) many are focused on moral reasoning and judgement (e.g. DIT, ESIT) while fewer seem to address other important ethics goals (such as ethical sensitivity/awareness, and ethical courage/confidence or commitment), and (vi) there is a need for ethics specialists to collaborate with psychometric specialists with a view to developing appropriate assessment instruments that would better reflect the full range of ethic learning goals.

The SEFI Ethics in Engineering Education working group decided to try to organise a similar workshop on a regular basis, next to the SEFI annual meeting workgroup sessions.

2020 SEFI EVENTS POSTPONED DUE TO COVID-19

Multiple events planned for the spring and summer of 2020 had to be postponed due to the COVID-19 outbreak in Europe. We would like to thank all the involved organisers for their tireless work and flexibility.

These following events should take place in the spring and summer of 2021:

European Convention of Engineering Deans

May 2021 – Universidad Carlos III, Madrid (ES)

The 12th edition of the [SEFI European Convention of Engineering Deans – Shaping engineers for responsible impact](#). The main topic of this year tries to deal with one important issue we should address as Deans of Faculties of Engineering: How to prepare our students to work in a non-defined future, where boundary conditions are continuously changing and multiple stakeholders take part?

The aim of the Convention is to open and promote a fruitful dialogue. For that purpose, three main concepts are proposed: *Peace engineering*; *Transdisciplinarity*; *Agile Methodologies*.



The 20th SEFI MWG Seminar on Mathematics in Engineering Education

June 2021 – University of Agder, Kristiansand (NO)

The main topics of the seminar will be the following ones: *Mathematical competencies in didactical research*; *How to assess competencies*; *The goal of teaching*.

Keynote speakers will include: **Simon Goodchild**, MatRIC – University of Agder; **Michael Rygaard Hansen**, University of Agder as well as an inspirational keynote “*Visualizing Mathematical Spaces*” by **Roger Antonsen**, University of Oslo.



SEFI Summer School for PhD students Engineering Education Research

Summer 2021 - KU Leuven, Leuven (BE)

The SEFI Doctoral Summer School provides an opportunity for PhD research students engaged in engineering education research (EER) to learn from experts and their peers. Students will participate in workshops led by experts, centered around aspects of research in EER such as: *What makes EER so special?*; *Quantitative and Qualitative Research Methods Data collection and data analysis*; Participants will have the opportunity to engage with the engineering education community and to present their current research and receive feedback from other students and experts.



SEFI PUBLICATIONS 2019-2020



EUROPEAN JOURNAL OF ENGINEERING EDUCATION

Submissions

During the academic year 2019/20, submissions to the European Journal of Engineering Education increased significantly. As we publish about 60 manuscripts per year, the acceptance rate is now below 20%.

Academic year	15/16	16/17	17/18	18/19	19/20
Submitted manuscripts - regular	197	218	212	228	274
Submitted manuscripts - to special issues	65	74	56	2	35
Total submitted manuscripts	262	292	268	230	309

Submissions to the European Journal of Engineering Education (excluding submissions of revised manuscripts).

Special issues

The special issue “Early Career Engineers and the Development of Engineering Expertise”, received a rich harvest of abstracts. Guest editors Jeffrey Buckley, Christine Winberg and James Trevelyan have invited select contributions for full manuscript submissions during autumn 2020.

with editors of Journal of Engineering Education and IEEE Transactions on Education. At REES2019 (Research in Engineering Education Symposium),

a similar team of editors gave the workshop “Unpacking the Writing and Publishing Process for Engineering Education Researchers”.

A new call for papers was published in February 2020: “Online Laboratories in Higher Engineering Education: Solutions, Challenges, and Future Directions from a Pedagogical Perspective”. Guest editors are Dominik May, University of Georgia (USA); Claudius Terkowsky, TU Dortmund; David Boehringer, University of Stuttgart; Valerie Varney, TH Cologne. The deadline has been prolonged until October 2020 in response to the pandemic, which created both challenges and new relevant experiences.

News in the editorial team

New Associate Editors



Dr Scott Daniel is Senior Lecturer in Humanitarian Engineering at the University of Technology Sydney. A former high school mathematics and science teacher, he obtained his PhD in engineering education from Swinburne University of Technology in Melbourne. His research interests include humanitarian engineering, physics education, and engineering education.



Dr Fiona Saunders is Faculty Head of Education in the Faculty of Science and Engineering at Manchester Metropolitan University and Reader in Engineering Project Management. Her educational research interests centre on technology enhanced teaching and learning, innovative assessment, student engagement and employability. She is a Principal Fellow of the Higher Education Academy (PFHEA) and a Chartered Engineer (MIET).

Workshops

At the SEFI2019 conference, the editors of EJEE led the workshop “Reviewing for Engineering Education Journals” together

Editorial board

The journal extends heartfelt thanks to the following former members for their support and efforts in the past:

M. F. Letelier; L. Madsen; T. Marjoram; T. Rossi; A. Subic; I. Tiginyanu.

We welcome the following new members in the Editorial Board:

Sivachandran Chandrasekaran, Swinburne University of Technology, AU
Mike Klassen, University of Toronto, CA
Helene Leong, Singapore Polytechnic, SIN
Nicoleta Maynard, Monash University, AU
Mike Murphy, TU Dublin, IE

Acknowledgements

On behalf of the journal, we thank the reviewers, who so generously contribute their expertise to help our decision-making and support the improvement of manuscripts. We thank the authors whose high calibre work is what makes the journal. We also gratefully acknowledge invaluable support from SEFI and Taylor & Francis.

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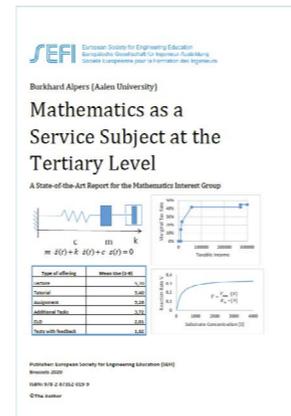
MATHEMATICS AS A SERVICE SUBJECT AT THE TERTIARY LEVEL

A State of the Art Report for the SEFI Mathematics Interest Group

Burkhard Alpers (Aalen University)

Since after the issuing of the curriculum document “A Framework for Mathematics Curricula in Engineering Education” in 2013, many new and deeper results have appeared in many conference proceedings and journal papers it seems adequate to provide a structured summary such that the community gets a quick, structured overview with pointers for further reading. This overview takes a broader perspective in that it tries to

capture service mathematics in general although it is fair to state that mathematics in engineering education forms still the centre. It comprises on the one hand information on the historical development of the field and its major players, and on the other hand a brief account of important themes and corresponding results. There is only occasionally an overlap with the curriculum document such that it is recommended to read the latter first



and then the present survey for being informed of the most recent results. The current report is certainly euro-centric but it is hoped that it will inspire reports from other regions of the world.

ASEE-SEFI JOINT PAPER ON DIVERSITY, EQUITY AND INCLUSION

A Call and a Pledge for Action

As representatives of Engineering Education in Europe and North America, SEFI and ASEE align their diversity in engineering education initiatives in a Joint Statement on Diversity Equity and Inclusion. This paper was written by members of both Societies under the coordination of **Susan E. Walden** (ASEE) and **Ines Direito** (SEFI) and calls for active promotion of diversity in engineering, particularly supporting those who have been continuously disadvantaged, and also ensure that all individuals are provided with equal opportunity to access, pursue, and advance in engineering careers. It is concluded by the following Pledge for action:

“
As a member of a global engineering community, I pledge to celebrate diversity, create opportunities, and actively support inclusive environments, in which all my students, colleagues, and members of the wider society are welcomed, respected, and valued. I acknowledge that a path with no examination, reflection, and action perpetuates an inequitable status quo. I commit to work collaboratively with all engineering community members and stakeholders to disrupt systemic exclusion and to create a culture where all will thrive.

THE LEUVEN LESSON - CROSSING BORDERS

The Leuven Lessons has resulted from the 2019 European Convention for Engineering Deans. Its theme was crossing borders, these borders principally being the membrane between the university and industry. Crossing borders was used as a mechanism to examine issues associated with developing meaningful student business experiences; examining the purpose of the engineering academic

PhD, and the advantages and difficulties with mobility of academic staff into industry, and industry staff into academia. It also briefly examined issues associated with evolution and co-creation of the engineering curriculum. On each of these topics guidelines are provided as an aide to the department and the university to successfully explore these complex matters.



SEFI SPECIAL INTEREST GROUPS



GENDER AND DIVERSITY

In the past year, the group has cooperated with its counterpart from the American Society for Engineering Education and wrote the [ASEE & SEFI Joint Statement on Diversity, Equity, and Inclusion](#) that was officially launched in May by both organisations.

The publication was followed up by two meetings with the global engineering

education community in June: ASEE CDEI webinar “How can we use this statement as a springboard to launch more disruptive and intentional change?” and EER Meet-up “ASEE & SEFI Joint Statement on Diversity, Equity, and Inclusion: A Call and Pledge for Action”.

For this year’s Annual Conference, we’ve partnered up with the SIG on EE Re-

search to deliver a workshop on “Diversity and Inclusion Research in Engineering Education: What has changed in the last 10 years?”

Chair

Ines Direito

University College London

ETHICS

In the last year, the group started publishing a regular newsletter which is distributed to the SEFI community. The newsletter includes a feature article on cutting edge engineering ethics research or practice issues, as well as a digest of recent research and upcoming deadlines. Feature articles include: “[The dynamic world of digital ethics](#)”, and “[Teaching Engineering Ethics during COVID-19](#)” and “[Layered case](#)

[studies in developing ethical reasoning](#)”.

An engineering ethics winter school was hosted by Gunter Bombaerts at TU Eindhoven on 12-13th December 2019. The aim of the event was to explore in a series of workshops some of the challenges faced by engineering ethics educators, to share best practices and brainstorm future strategies for action. Educators from

different countries – ranging from Australia, Germany, The Netherlands, Switzerland, Sweden, Spain, Ireland, UK and US – participated either in person or online. A report on the workshop and its outcomes is available on the SEFI website here.

Chair

Roland Tormey

EPFL Lausanne

MATHEMATICS

Mathematics interest group is the coordinator and scientific guarantor of the 20th SEFI-MWG European Seminar on Mathematics in Engineering Education. This year’s edition has been postponed

for 2021 due to the COVID crisis. It will be jointly organised by the University of Agder and the MaTRIC centre of excellence in Kristiansand, Norway. Steering committee of Mathematics interest group had their

annual meeting organized by in November in Bratislava.

Chair

Daniela Velichova

STU Bratislava

PHYSICS

The SEFI SIG on Physics assembles physicists who teach physics to engineering students that are often at the beginning of their engineering studies. Physics teachers encounter similar problems irrespective of the country and

the applicability of the courses they are responsible for. The main SIG activity is to organize a conference “Physics Teaching in Engineering Education (PTEE)” every two or three years. The next event will be in Tampere, Finland on May 2022. More

info will be at www.sefiphysics.be

Chair
Juho Tiili

Tampere University of Applied Sciences

OPEN AND ONLINE EDUCATION

The SEFI special interest group (SIG) on Open & Online Education is focused on the utilization of open and online educational resources and tools to remove barriers to learning in engineering education. Over the past year, the SIG has continued to try and grow their online education

communication platform O2Enexus.com. This informal communication platform aims to engage SEFI members and the greater engineering education community to share ideas and resources regarding open and online education. In the upcoming online SEFI Annual Conference, the

SIG organises a workshop to reflect on the lessons learned from the emergency online education measures during the Covid-19 pandemic.

Chair
Calvin Rans
TU Delft

ATTRACTIVENESS OF ENGINEERING EDUCATION

The group has two on-going activities: ERASMUS project ASTEP2030 aiming to find out the attracting factors for students and to modify the education to a more attractive form to meet to the needs this project will continue for a year and half.

Members of the group are also preparing a new book about different aspects of Attractiveness of Engineering as a profession and as a field of study. The call for interests to participate in writing the book was sent in 2019, and the call for chap-

ters will be published soon in 2020. The book is planned to be released in 2021.

Chair
Katriina Schrey-Nienemma
Aalto University

ENGINEERING SKILLS

The SEFI SIG on Skills meets regularly at SEFI annual conferences and held a meeting at the conference in Budapest. These meetings bring together likemind-

ed scholars who want to discuss the latest developments and research in the field. Another meeting is planned for the virtual SEFI Annual Conference in September.

Chair
Kamel Hawwash
Birmingham University

CONTINUING ENGINEERING EDUCATION & LIFELONG LEARNING

The SIG on Continuing Engineering Education and Lifelong Learning is another group involved in the A-STEP 2030 project. Furthermore, the group chair, Bente Norgaard arranged a knowledge sharing session at the Copenhagen Campus of Aalborg University on 9-10 January 2020.

Some of the topics we discussed were: Status quo of Lifelong Learning in different countries; Work-based Learning and professional practices; Lifelong Learning awareness and the role of innovation transfer from academia; Drivers and barriers for professional development:

the role of SME/university relationships in innovation-related activities; and more.

Chair
Bente Norgaard
Aalborg University

ENGINEERING EDUCATION RESEARCH

Further to organising widely popular workshops at the SEFI Annual Conference where the audience of 59 participants collaboratively explored 17 papers to find the factors that contribute to

the citability of engineering education papers; the EER group organised the Doctoral Symposium that was attended by 15 doctoral students and 14 experienced supervisors. The next doctoral

symposium will take place at the 2020 2020 Annual Conference.

Chair
Tinne de Laet
KU Leuven

SUSTAINABILITY

The SEFI SIG on Sustainability meets regularly at SEFI annual conferences and held a meeting at the conference in Budapest. The group plans a workshop-style

meeting for the upcoming one, in order to help build group membership. This SIG aims to promote awareness of UN SDGs and their mission is integrating/progressing

SDG in Engineering Education.

Chair
Jordi Segalas
Universitat Politecnica de Barcelona

CURRICULUM DEVELOPMENT

The field of the Curriculum Development connects to most other SIGs within SEFI and over the year the topics of interest for the CD-SIG has constantly grown. To avoid overlap and interface efficiently to

other SIG, it is important to clearly define what we mean by curriculum development. If you feel it would be interesting to participate in this re-shaping of the SIG, you may participate in the group meet-

ing that will take place as a part of SEFI virtual annual conference.

Chair
Carlos Rioja del Rio
Cadiz University

SEFI EUROPEAN PROJECTS 2019-2020



A-STEP 2030 PROJECT

The Erasmus+ project A-STEP 2030 (Attracting diverse Talent to the Engineering Profession 2030) has started at September 2018 with the participation of ENSTA Bretagne (project coordinator), TU Dublin, Aalborg University, Metropolia University of Applied Sciences, BEST, Universum Global, SEFI and nine associated partners. The main objective of the project is to develop a new and innovative curriculum to teach appropriate skills and competencies for a sustainable future and to

encourage young people to be enthused about an engineering career. At the first semester of 2019, a qualitative study was conducted by the realisation of 12 focus groups with engineering students, teachers and employers in four European countries with the leadership of TU Dublin. This first explorative study investigated skills and competencies needed to engineers for meeting SDGs. The second semester of the year, an extensive quantitative survey was carried

A-STEP 2030

out with the aim of investigating students' career preferences and perspective in six European countries by the leadership of Universum and Metropolia University of Applied Sciences. The results of these studies were disseminated at numerous national and international events and conferences.

www.astep2030.eu

PREFER PROJECT

The PREFER project aims to reduce the skills mismatch in the field of engineering. Young engineering graduates often display a lack of self-awareness of who they are as an engineer. The PREFER project aims to help engineering students/graduates with identifying their strengths and weaknesses. Additionally, we want to provide them with opportunities and to actively explore the wide variety of engineering roles in the labor market. The PREFER Project was successfully

finished at the end of 2019 and its closing event on 4th February brought about 120 participants - students, teachers, researchers, industry professionals and educational developers - to Leuven in Belgium. The presenters took us through the development process, stakeholder-specific perspectives and introduced the practical implication final outcome of this project. The project has indicated main roles and key competences for early-career engineers; tests for students

PREFER

to find what their own roles could be; and plug-and-play curriculum elements in order to train specific professional skills based on the students' test results - this simple model is fully transferable to the contexts of other engineering education institutions and both students and employers find it very beneficial.

www.preferproject.eu

CREATIVE ENGINEERING EDUCATION - EBCC MODEL

As a part of Education, Business and Community Cooperation Model for a Creative European Engineering Education project, we have specified and analyzed the relevance of the skills for engineering education that are based on the convergence of project/problem-based learning, engineering and product design using rapid prototyping and computer-aided design methods.

The last year of the project is dedicated to testing and finalizing the developed manual. More than 10 student teams

were created in Latvia, France and Greece, which carried out community and industry driven projects as part of study courses in engineering education programs (systems engineering, materials science, mechatronics, design, mechanical engineering). Student feedback on the use of such teaching methods shows a positive assessment of up to 83% of participants.

The 5th transnational meeting on the project was organised in Latvia, where all partners discussed the testing process



and the overall project results, made recommendations for improving the created model of partnership between community and university, discussed options for future cooperation.

www.sefi.be/activities/eu-projects/ebcc/

NEW EU PROJECT APPLICATIONS

[European Engineering Education of the Future](#) (European University initiative): Contractor TU Munich - project accepted - [press release](#)

[Engineers for Europe](#) - E4E (ERASMUS Knowledge Alliance project): Contractor FEANI

[Research Organisations and Universities for Gender Equality](#) - ROUGE (Horizon 2020:): Contractor TU Dublin

[Transformative pedagogy](#) (ERASMUS Strategic partnership): Contractor University of Cergy

[Implementing EU best practices of blended learning into three-cycle engineering education in Russia and Nepal](#) RUNED3 (Erasmus+ 2020 call, Key Action 2: Capacity building in higher education): Coordinator University of Cadiz

[ENHANCE](#) (an alliance of seven leading European Universities with a focus on science and engineering): Coordinator TU Berlin

[Cooperative Interdisciplinary Teacher Education Model for Coaching Integrated STEM](#) CiSTEM² (ERASMUS+ Call 2020 – K203 – Strategic Partnerships for Higher Education supporting innovation): Coordinator KU Leuven

Need to adapt your approach for distance learning?

Learn how you can:

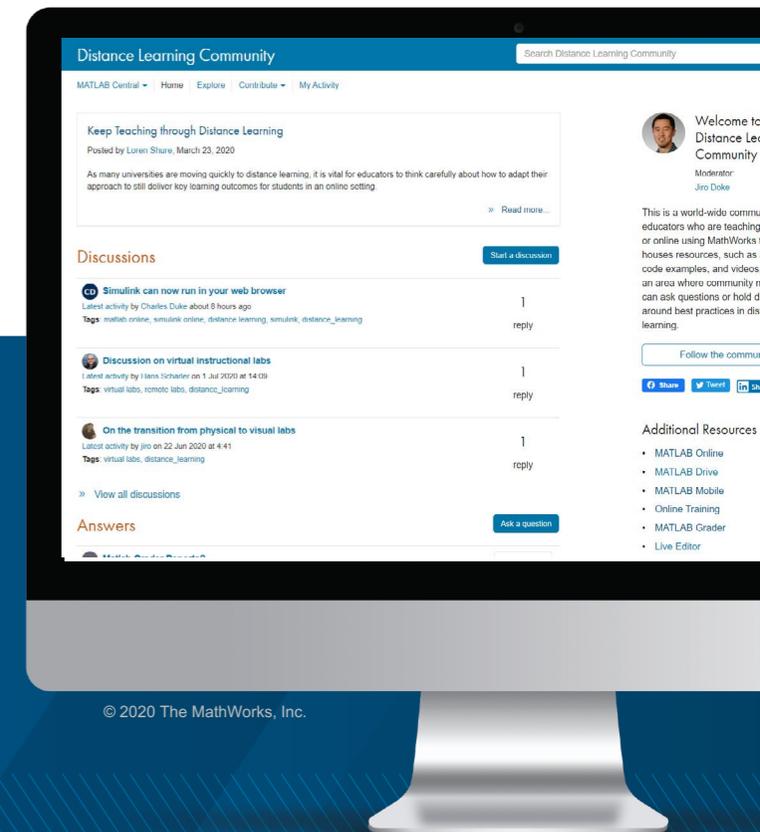
- Effectively deliver key learning outcomes for students in an online setting
- Overcome common challenges identified by educators worldwide
- Get resources to support distance learning

Read the blog: mathworks.com/distance-learning-blog



Distance Learning Community

Learn more:
mathworks.com/distance-learning

The logo for MATLAB & SIMULINK, featuring the word 'MATLAB' above '& SIMULINK' in a stylized font.

YES, EXPERIENTIAL LEARNING CAN BE VIRTUALIZED

Online “Social Doing”: future oriented, not just remedial.

In May 2020, as distant learning was established virtually overnight, students at dozens of U.S. universities filed lawsuits against their schools saying they’re not getting the caliber of education they were promised. Indeed, one could



name countless reasons why remote learning does not provide the quality of learning experience one can expect from co-located studies. Engineering students specifically expect their learning experience to provide opportunities for using lab equipment, operating industrial machines, making prototypes, testing material systems and interacting with peers. Engineering programs rightfully provide more and more experiential learning that gather all these types of activities in open-ended problem solving and the internship is the learning format that best anticipates and contextualizes the exercise of professional engineering.

Tasks based on listening, reading, talking and writing are routinely subject of virtualization for distant learning. Despite their formative value, more experiential activities such as project-based problem solving or internships are

rarely performed remotely. It is indeed generally understood that they require rich social interactions and use of material objects that cannot be virtualized.

That same month of May 2020, the national bureau of French engineering students (BNEI) published a survey of students as they were locked down and studied at home. Among 11,100 respondents, 67% of those who were interning had no choice but to do so from home, most of them, by listening, reading, talking and writing. Some however, in France and in other countries, could enjoy also the formative value of social doing.

These students were already routinely using the same platform that catalyzes the digital transformation of many employers, Dassault Systèmes’ 3DEXPERIENCE platform. For good reasons:

- **SOCIAL:** It brings human interactions into a digital engineering world to fuel the same collaborative dynamics young people experience on social networks. For companies, such capability unleashes the collective creative power of the workforce. For interns, it focuses social interactions towards technical problem solving, under the eyes of their academic and company supervisors who can monitor the collective process and the individual contributions as well.
- **DOING:** It brings sharable computer representations that are mathematically

Xavier Fouger, Dassault Systèmes

equivalent to the physical world and that behave identically in real time. Such “virtual twin” capabilities are central in many new practices of the industry of the future. They immerse the interning student in foundational methodologies they will have to deploy, thus providing highly demanded competences that are still difficult to find by employers in traditionally trained graduates.

For those students, virtual internship on the 3DEXPERIENCE platform provided more than a remedial response to forced isolation. It was an opportunity to experience their future working style, develop competences essential to their career success and arm their future employers with powerful competitive advantages.

Information and case studies on applying the 3DEXPERIENCE for educational innovation can be found at: <https://academy.3ds.com/en>

“Thanks to our expertise in using the 3DEXPERIENCE, my 100 students had an agile switch to distant learning when lock down was declared. Not only they kept working, but they also experienced a working context that nurtures the competences required for their employability in the industry of the future. We now want to include 900 students beyond mechanical & mechatronics engineering, in urban planning, health, design, earth sciences,....”

Professor Erwan Bouguennec
University of Rennes – July 2020

MATERIAL EDUCATION SYMPOSIA

10 years dedicated to materials engineering teaching



For over 10 years the Materials Education Symposia www.materials-education.com has helped nurture a community of educators, enthusiastic about sharing best practices in materials-related engineering teaching. Now more than ever these discussions are crucial and so, for the first time, the event is going online and is free for anyone to attend. Taking place on the 3rd September 2020, from 16:00 – 18:00 CET, key themes include online

teaching pedagogy; computational materials science; and team-based projects. For more information, please contact granta-education-team@ansys.com

Whilst universities search for a better understanding of what the ‘new normal’ may be, one thing remains consistent. Ansys GRANTA will continue to support educators across materials science, engineering, and design.

The latest release of EduPack saw several notable developments, most obviously a new name. Now GRANTA EduPack, the refreshed software includes two new product-centered databases (Medical Devices and Design); more advanced industrial tools (e.g. Engineering Solver and Find Similar); as well as enhanced links to simulation platforms. You can watch the launch webinar at the [Ansys Resource Library](#).

SEFI AS A PARTNER IN 2019-2020



GEDC-SEFI VIRTUAL INTERNSHIP PROGRAM

During the COVID-19 crisis, the Global Engineering Deans Council developed a new virtual internship programme for engineering students. SEFI has partnered with the GEDC to support the Global Virtual Internship Program, that is now available to the students of member institutions.

How does this work?

Universities and Corporate partners share the virtual internship opportunities on the online platform global-virtual-internships.com. GEDC / IFEEES / SEFI members receive a registration link to log in and upload internship opportunities relevant for undergraduate, graduate and PhD students. Participating universities will also receive a code to transmit to relevant

students to be able to log in, browse and apply for the opportunities provided. Students should apply directly to the host institution – details on how to apply should be provided along with the description of the internship opportunities.

Participating in the programme is one of the many benefits of GEDC / IFEEES / SEFI membership and is based on the principle of reciprocity – we encourage institutions to offer roughly as many internship opportunities for ‘incoming’ students, as the number of students they expect to ‘send out’.

Register here and please do not share this link with students – all registered universities will receive a unique



code for students to browse the opportunities. Once registered, to share the opportunities with your students: Login to the platform where you will be given a unique code for your university. Your students will need this code to access the opportunities, the code can be used multiple times, but is unique to your university so please do not share further.

For further information you may write to info@gedc-virtual-internships.com.

COOPERATION WITH THE EUROPEAN NETWORK FOR ACCREDITATION OF ENGINEERING EDUCATION

In 2019 the Administrative Council was renewed with as new President Damien Owens and two new Vice Presidents, José Carlos Quadrado and Birgül Tantekin-Ersolmaz. SEFI continues to be represented by the president, Yolande Berbers.

Efforts were spent to get the financial support or the EUR-ACE label targets. The rise of institution accreditation and the changes in national regulations

makes programme accreditation more often optional than mandatory. The new European Engineering Education Database (EEED) has been reviewed to serve the Agencies better.

The Label Committee worked on an update of several key instruments such as the EURACE Framework Standards and Guidelines (EASFG) and the Transnational Accreditation Guidelines to be followed by the Agencies.

Working group investigating the possibility to add EUR ACE accreditation to the institution accreditation. ENAEE will reconnect with the International Engineering Alliance looking for synergies and towards a Memorandum of Understanding that can lead to more consistent and lasting output. Hopefully, a new date for the next ENAEE Forum will be set as soon as COVID allows us safe travel again.



#EUINVESTINKNOWLEDGE

More than ever, the global Covid-19 pandemic has demonstrated the true value of excellent research, innovation and education. In the campaign “Seize our common future”, 15 associations representing more than 800 universities have called for an ambitious long-term EU budget for research, innovation and education to boost efforts to solve the manifold future challenges. Today, the same university associations unite and call on European leaders to step up investment in these areas, both in the Multiannual Financial Framework from 2021 to 2027 and Next Generation EU, and to commit to putting sufficient resources behind common ambitions.

Europe’s universities welcome the European Union’s approach to embark on a sustainable recovery path, supported by an ambitious and unprecedented effort to enhance the welfare and strengthen the economic base of the continent. At stake is our shared capacity to successfully tackle global challenges and become a frontrunner in addressing the green and digital transitions. Research, innovation and education are key building blocks to facilitate the European Union’s necessary progress towards sustainability and resilience. Errors made in the past should not be repeated: only long-term, holistic and collaborative approaches will help overcome multifaceted challenges. Universities across Europe restate their full commitment to contribute to these goals.

Thus, Europe’s universities stand disappointed and concerned by the limited budget proposed for the EU’s flagship programmes Horizon Europe and Erasmus+. The current proposal for Horizon Europe falls far too short of the 120 billion euros that the European Parliament and the university commu-

nity considered necessary even before Covid-19. A budget cut of more than 3% (compared to the 2018 Commission proposal) for vital instruments such as the Marie Skłodowska-Curie actions and the European Research Council would hamper efforts towards strategic resilience. Under Horizon 2020, this pillar has been central in enabling Europe to move forward in tackling the current pandemic and must therefore be reinforced. For Erasmus+, plans to double (European Commission) or triple (European Parliament) funding for the programme have not been met with a lower proposal of 24.6 billion euros (2018 prices). This is clearly insufficient to meet the new and ambitious policy objectives for the next programme, including support to both physical and virtual mobility and education for all.

Both Horizon Europe and Erasmus+ are investments in our future and in our youth. They will reinforce Europe’s capacities to face today’s challenges, and those yet to come. Such challenges may take various forms and solutions will require mobilising

various types of knowledge, citizens, and society.

To drive sustainability, Europe must invest in research and innovation. We urge the European institutions to (1) ensure that the funding programmes support science in all areas; (2) encourage and facilitate collaboration across disciplines and (3) foster timely association of interested non-EU countries to Horizon Europe. Finally, EU leaders must (4) recognise the long-term benefit of strengthening investigator-driven frontier research to achieve a proper balance of bottom-up and top-down approaches, throughout Horizon Europe. Europe’s universities recommend that the funds dedicated to research and innovation within Next Generation EU address holistically all challenges related to the coronavirus crisis through the same balanced approach.

Universities across Europe will contribute best to the common recovery and societal resilience if there are more synergies across research, innovation and education policies and funding programmes, and coordinated efforts

An initiative of



between funders at European, national and regional levels.

It is now important to reach an agreement in time so that the European Union can move forward and deliver on its ambitious objectives in 2021. It is also the member states’ duty to intensify efforts

in research, innovation and education, so that our societies and economies can benefit from an unprecedented momentum towards a sustainable recovery path. Therefore, we call for a commitment to new and reinforced targets for the proportion of GDP invested in research and innovation, both for public

and private funding.

We, universities of Europe, urge European leaders to step up investment in research, innovation and education to foster longterm strategic resilience, enabling Europe to strongly reinforce its role as a global leader in this respect.

COOPERATION WITH STUDENTS

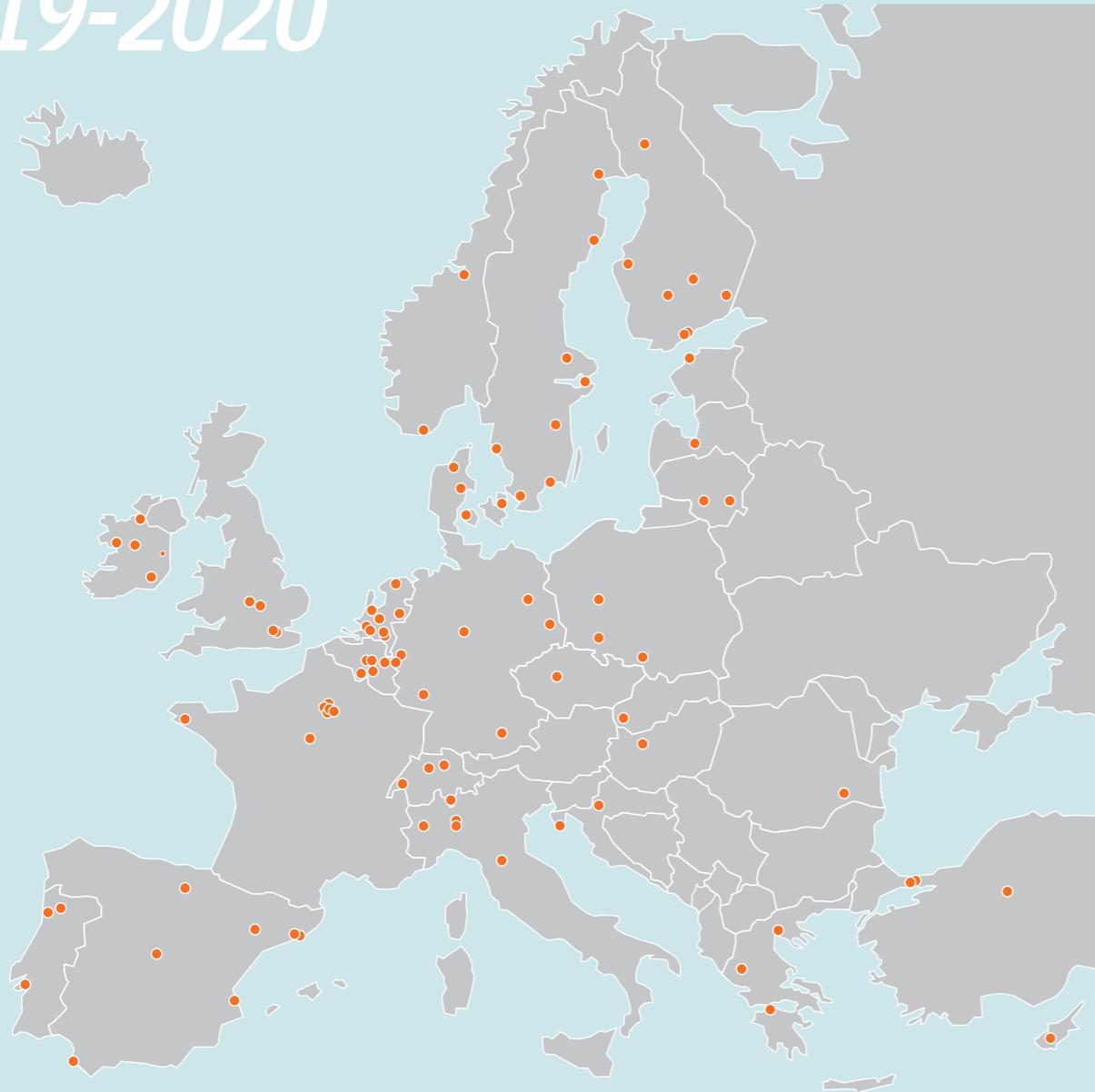
SEFI has a close cooperation with students through the partnership with the Board of European Students of Technology – BEST. Members of BEST represent the student voice at the SEFI events and SEFI members come as speakers to the BEST events. Both organisations also actively participate in the A-STEP 2030 Project.

In the past year, BEST students **Antonia Nanau** and **Senne Meeusen** led a plenary session on Academia-Industry cooperation at the 2019 SEFI Annual Conference in Budapest. In return, SEFI was represented by speakers at the Best Symposia on Education that took place in four different cities in summer 2019; as well as in the first BEST Virtual Summit “Beyond The



Pandemic”, an online conference that took place in June 2020 where **Frederik Georgsson**, **Gillian Saunders-Smits** and **Klara Kövesi** participated in three different sessions focused on the future of Education, Work and UN SDGs.

SEFI MEMBERSHIP 2019-2020



SEFI institutional members 2020

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