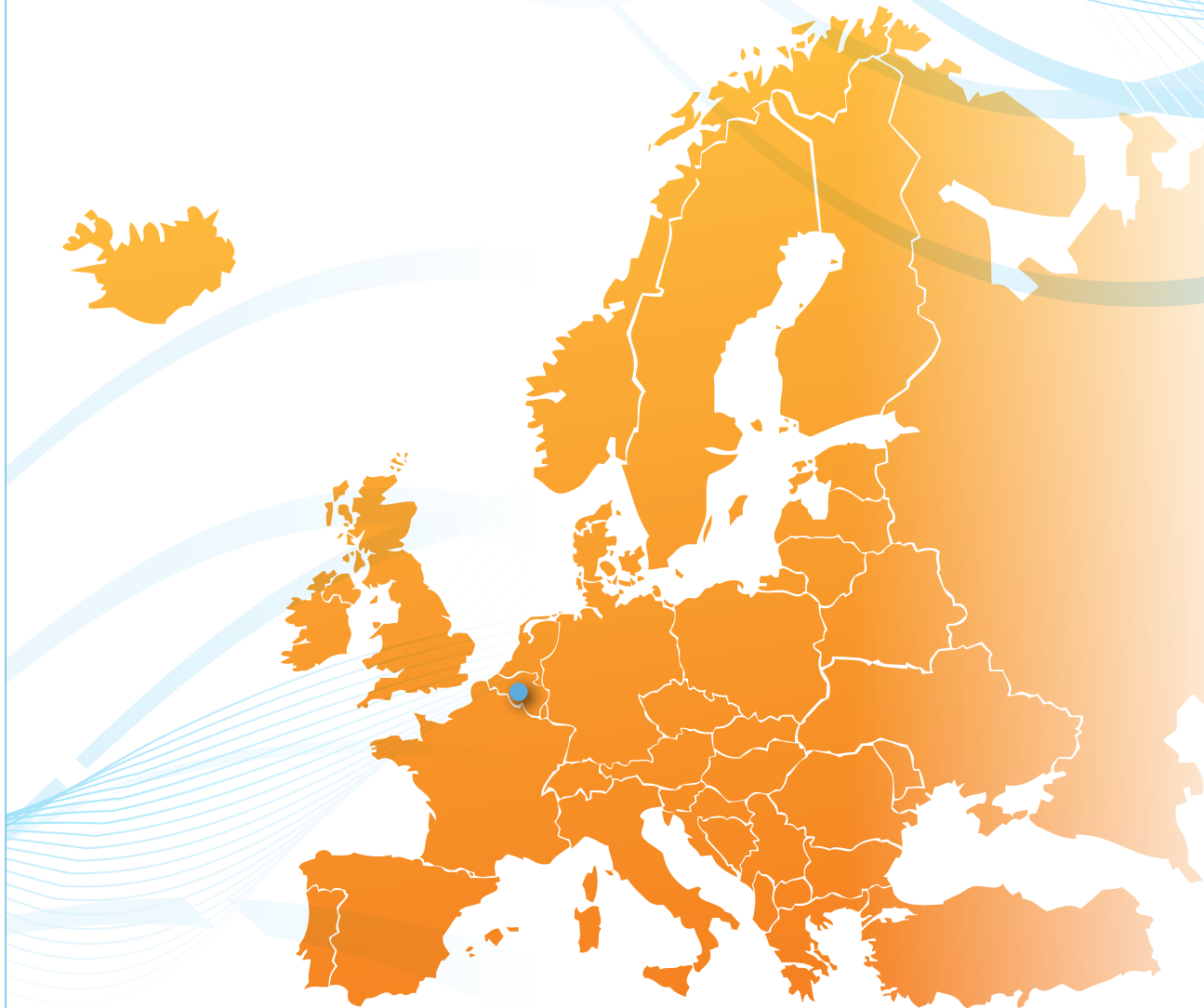


# Engineering Education and the Bologna Process

**SEFI** Position Paper



**A Joint communication of SEFI and BEST in view of  
the 8<sup>th</sup> Ministerial Conference in Bucharest, 26-27 April 2012**

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# SEFI Position Paper

## The Bologna Process and the Education of the Engineers

### Introduction

As an organisation involved in the promotion and improvement of Higher Engineering Education in Europe, SEFI, the European Society for Engineering Education, is very much in support of the implementation of the Bologna process all over Europe. Major achievements such as the three cycle study system, increased student and teacher mobility, qualifications frameworks as well as the increase of the cooperation between institutions from the EHEA countries and their counterparts from all over the world are well appreciated by our members. The fact that the Bologna process has put again higher education on the political agenda is also a key issue.

Also BEST, the Board of European Students of Technology, supports the direction in which the Bologna process is leading Engineering Education. As students, we strongly believe that it is important and valuable for students to set aside cultural, national and language borders and interact with other like-minded students to exchange valuable

experience and knowledge. The Bologna process allows for these interactions to take place.

2011 was the Year of "SEFI Student Cooperation". In this context, many activities have successfully been developed in close cooperation with BEST: creation of a SEFI student cooperation Task Force, free membership offered to students, free participation of 250 students at the SEFI Annual Conference organised in Lisbon in September 2011 on a basis of a pairing system, creation of a SEFI Blog and of a SEFI Student Facebook page maintained by BEST students for SEFI. All these activities strengthened the links between SEFI and BEST and let the European engineering students' voice heard by a wider audience.

Therefore, SEFI and BEST decided to join their forces in this position paper focusing on the student perspective with regard to the Bologna process, addressing a selection of themes of the Bucharest Ministerial Conference.

### Recommendations : Promoting interdisciplinarity and transdisciplinarity

Interdisciplinarity and transdisciplinarity in teaching and learning integrate traditional academic fields and ways of thinking into new avenues of creativity and innovation, and foster the development of new disciplines and learning outcomes thereof. In line with emerging new needs and new professions, traditional boundaries need to be challenged and crossed in the engineering field but also between engineering and other disciplines. Good examples are mechatronics, biomedical engineering, bioinformatics and nanotechnology. Moreover, sustainability, innovation and global welfare need to be addressed by bold combinations of technology, science, arts and business.

#### It is our view that:

- Students should be provided with excellence in education which stimulates their motivation and appreciation of the benefits of learning across borders, within their chosen engineering discipline, but also, and even more, outside the engineering world. Students should be guided in planning and implementing

personal study goals in order to balance a strong focus on their own speciality with a refreshing view on a broader context.

- Academic staff needs to be provided with sound support, pedagogical insights and concrete incentives to engage in promoting interdisciplinary and transdisciplinary learning which stems from highest quality research and education. Educational development for promoting innovation and creativity leading to transdisciplinary knowledge and skills needs to be recognized in the career development of academic staff.
- The Bologna Process stakeholders should foster interdisciplinarity and transdisciplinarity in all future development of the EHEA, the ERA and the EIT. This could be done by adapting currently available funding mechanisms and by providing new earmarked budgets for interdisciplinary and transdisciplinary academic activities, both in research and education.

## Emphasising engagement

Teaching and learning are human activities involving several actors with different backgrounds, diverse expectations and responsibilities. This is absolutely relevant in the context of Higher Engineering Education, with stakeholders who are students, researchers, academic staff, engineers, corporate and societal representatives. We all share the common goal and the responsibilities of improving the society in which we live, learn and work, with engineering and engineered solutions and of extending these activities to individuals and societies in need. This calls for a strong internal driving force for individuals to engage in various teaching and learning activities to fulfil these goals and responsibilities.

### It is our view that:

- Engagement of students in voluntary organisations contributes to the development of various skills that are very valuable in today's global world. Students should learn 'out of the box' and see the world and our society as one immense learning space. They should use and develop their own competences anywhere and anytime in order to really become better global citizens with a great local heart.

- Academic staff must provide and create opportunities and spaces for stimulating students to also learn outside the formal learning environment and challenge them to link this with their living (and possibly working) environment. They should create necessary boundary conditions and find ways to integrate those learning experiences into the traditional teaching practice.
- The Bologna Process Stakeholders should open up mobility schemes not only for formal learning activities, but also for new and advanced ways of developing competences. The European Credit Transfer and Accumulation System should be enhanced to accommodate for participation in other activities than traditional course work, even outside the formal learning environment. Mobility of teaching staff should be actively supported for the acquisition of new skills and pedagogical competencies which are necessary for fulfilling new educational goals.

## Stimulating entrepreneurship and innovation

In today's society, it is recognized that entrepreneurial skills and attitudes are absolutely needed by everyone. The societal, financial and technological changes taking place in Europe and in the World over the last decade constitute for all the higher education stakeholders crucial factors for the development of new policies to encourage entrepreneurship and innovation.

### It is our view that:

- Engineering students must be trained in line with the evolution of a more abstract and changing working environment. Decades of service in one single profession are no longer the norm. Therefore, students should be given the opportunity to develop other skills outside their field of study. To become innovators, young graduates should possess a range of soft skills as well as interdisciplinary knowledge. This could be encouraged by developing more flexible curricula allowing the students to explore.
- Education and preparation for entrepreneurship should be encouraged in engineering education programmes. This can be achieved by student-centred teaching and learning, where students are real actors of their learning. The teachers in higher engineering education need to become the promoters of entrepreneurial skills and the facilitators of development of such learning experiences.

- The Bologna Process Stakeholders should encourage such entrepreneurial attitudes and skills and promote new teaching and learning models such as PBL or CDIO throughout Europe. The role of University and Higher Education leaders in committing into these actions is crucial. New approaches for promoting interdisciplinarity, transdisciplinarity and innovation can only be achieved by the introduction of streamlined programmes throughout Europe, which will also promote student mobility and support the completion of degrees within desired timeframes. Engineering education programmes should generate a positive framework for innovators focusing on social values and social trust.

### For SEFI and BEST

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**SEFI** is the largest network of higher engineering education institutions (HEIs) and educators in Europe. It is an international non profit organisation created in 1973 to contribute to the development and improvement of HEE in Europe, to reinforce the position of the engineering professionals in society, to promote information about HEE and improve communication between teachers, researchers and students, to reinforce the university-business cooperation and to encourage the European dimension in higher engineering education. Through its membership composed of HEIs, academic staff, students, related associations and companies, SEFI connects over 1 million students and 158000 academic staff members in 47 countries. To reach its goals, SEFI implements diverse activities such as Annual Conferences, Ad hoc seminars/workshops organised by its thematic working groups and task forces, organises the European Engineering Deans Conventions, publishes a series of Scientific publications (European Journal of Engineering Education) and Position Papers, is involved in European projects, cooperates with other major European and international associations and international bodies (European Commission, UNESCO, Council of Europe, OECD). SEFI also participated in the creation of ENAEE, IFEES, Euro-Pace, IACEE and very recently of the first "European Engineering Deans Council", EEDC.

The Board of European Students of Technology (**BEST**) is a non-profit and non-political student organisation aiming to provide communication, cooperation and exchange possibilities for students of technology since 1989. BEST reaches over 1 million students in more than 30 countries via its 91 local groups. We strive to help students learn in new and more non-formal ways and to become more internationally-minded by introducing them to cultures around Europe. We do this by organising around 100 academic courses annually, engineering competitions, educational symposia and various leisure events. In the field of (Engineering) Education, BEST is a contributing partner in several Thematic Networks (ERABEE, EUGENE, EU-VIP and StartPro). We do this by organising Events on Education: a one-week event where 25 students from all over Europe gather to discuss educational issues with academics, companies and other stakeholders. BEST members attend conferences organised by our partners such as SEFI, IFEES, EuroPace, IGIP, ...) where we present the outcomes of those Events on Education as well as the outcomes of surveys we conduct.

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