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ACE FORUM - Alliance for Cooperation in Engineering
"Fostering international collaboration in the 2020 framework"

EHEA 1 - Structured projects for soft skills development: providing engineering students with international competences

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I - INTRODUCTION TO SOFT SKILLS DEVELOPMENT (SSD)

There is a lack of consistent theory for defining and classifying various skills, and there is no generally accepted skills taxonomy.

Employers distinguish between:
hard skills -> job-specific skills which are closely connected with knowledge and easily observed, measured and trained
soft skills -> non-job specific skills closely connected with attitudes, which are intangible and difficult to quantify and develop

- **soft skills**
- **generic hard skills** ⎤ high transferability across sectors and occupations ⎤
- **specific hard skills** —— lower level of transferability   **transversal skills**

Transferability of Skills across Economic Sectors, European Union Programme
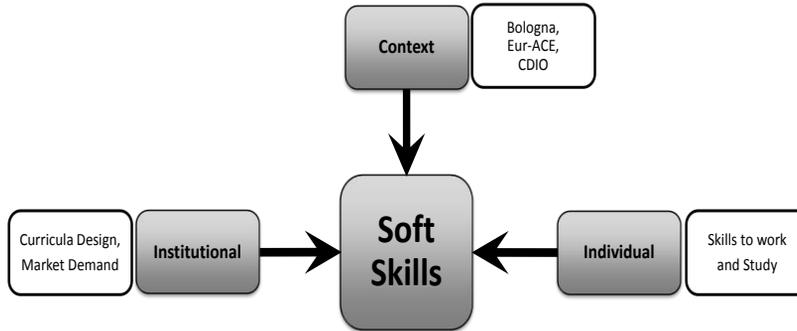for Employment and Social Solidarity - PROGRESS (2007-2013)

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CONCEPTS AND DEFINITIONS

- Hard and soft skills (SS) together constitute professional competence of an individual which allows a goal-oriented and situational accomplishment of working tasks. (Kauffeld, Grote & Frieling, 2003)

- SS are behaviors that must be internalized as a natural aspect of a person's repertory of social skills and character attributes. (ODEP, 2010)

- **While professional skills may open the door of opportunity, SS keep you in the driver's seat. (Kaipa & Milus, 2014)**

SOFT SKILLS EXAMPLES

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THE IMPORTANCE OF SSD

Soft Skills relations at different dimensions

(Sousa & Mouraz, 2014)

Context dimension

The Bologna Reform of the European Universities

Brings the explicit development of students' SS to the frontline of all Higher Education Institutions' concerns, namely those which are mainly technical, as Engineering Faculties.

EUR-ACE

Includes the importance of SS in the engineering courses' curricula.

The EUR-ACE reference model identifies technical and non-technical issues of importance and lists topics as:

1) Knowledge and Understanding;
2) Engineering Analysis;
3) Engineering Design; Investigations;
4) Engineering Practice;
5) Transferable Skills.
   - the ability to 'function effectively as an individual and as a member of a team' (team work skills)
   - the skills to use 'diverse methods to communicate effectively with the engineering community and with society' (communication skills)
   - The ability to 'work and communicate effectively in national and international contexts'.

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Individual dimension

SS are lifelong important for citizenship, technical studies and professional practice.

SS are extremely important for the development of critical thinking, argumentative thinking and the capability to read and produce high quality scientific literature.

Deficiencies in SS tend to have a detrimental effect in success throughout life (during both education and professional life).

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Institutional dimension

More than 40 years ago the German Engineering Association (VDI) recommended that 20% of courses of the engineering curricula should be soft skills.

Employers and educators have been complaining about a lack in SS among graduates from tertiary education institutions. (Schulz, 2008)

Increasing business complexity has shifted focus to coordination and communication; thus employers are putting more weight on soft skills. (Firth, 2011)

Globalization demands universities to produce engineers who can possess expert knowledge, think in terms of international, technical, social and financial relationships and be equipped with skills to easily cross national and cultural differences.

It is necessary to develop soft skills?
It is important to provide SSD in engineering students?
We answer with a qualified yes!

But, how can SSD be promoted? Better taught, learned and assessed?

Despite the difficulty to promote and assess SSD, nurturing them is a task to be taken in the long run and this nourishment is most likely best if taken right from the start to provide the time and the experience needed for the personal growth of such skills.

Skills can be considered as a result of three factors:

knowing how to act that supposes know how to combine and mobilize relevant resources (knowledge, know how, networks, ...);

wanting to act regards the motivation and the personal commitment of the individual and the context more or less stimulating in which he operates;

opportunity to act which refers to the existence of a context of a labour organization, the choice of form of management, social conditions that make it possible and legitimate for the individual to take responsibility and take risks.   (Le Boterf 2005)

II - SHARING SOME FEUP TEACHING EXPERIENCES

Curricular Units linked to SSD

Bologna First Cycle
- Project FEUP (1st year – all Integrated Masters of Engineering Courses)
- Personal and Interpersonal Skills (2nd year-Master in Electrical and Computers Engineering)
- Personal and Interpersonal Proficiency (3rd year-Master in Informatics and Computing Engineering)

Bologna Second Cycle
- Organizational Behavior (Master in Services Engineering and Management)
- Organisational Behavior and Leadership (Master in Innovation and Technological Entrepreneurship)
- Project Management Laboratory – LGP Challenge (Capstone Course at MICE)

- **Preparation for Dissertations** (Master and Doctoral Levels)

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Projeto FEUP

Curricular Unit transversal to all programs and organized globally at faculty level.

Aim: to maximize the efficiency of the learning experience among about the 1000 new students that the institution yearly receives.

Main goals: to integrate students into working at faculty and campus and to improve SS.

TEACHING METHODS AND LEARNING ACTIVITIES
Initial training/lectures (one week) and latter teamwork for production of deliverables (half semester) with the support of older students (monitors) and professors (supervisors)

Written Report: production of a healthy report to improve *scientific analysis* and a first approach at issues like structure of scientific reports, citations, info-literacy, ethics, plagiarism, etc.;
Poster: visual communication is demanding and requires *synthesis capability* to construct powerful figurative illustrations that summarizes complex issues (good, informative, trust worthy figures and charts, etc.);
Public Presentation: oral presentation (and associated preparation and support media) is important to disseminate results to large audiences (frequently followed by questions and answer period).

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Personal and Interpersonal Skills
Personal and Interpersonal Proficiency

PROGRAMME
- Quality Customer Service (Internal/External)
- Interaction and Communication Attitudes
- Professional Communication Rules
- Non-Verbal Communication Signs
- Preparation and Guidance of Meetings
- Assertiveness in Interpersonal Relationships
- Individuals and Group Management in Organizations
- Teamwork Development
- Micromarketing and Professional Effectiveness
- Oral, Written and Audiovisual Communication
- Time management and Work Organization
- Personal Responsibility Development
- Maximization of Creative Capacity

TEACHING METHODS AND LEARNING ACTIVITIES
Theoretical classes: lectures about personal and interpersonal skills.
Practical classes: personal and interpersonal skills training exercises/activities; practical work developed in teams linking soft and hard skills, with briefings and final presentations of innovation projects that must be critically evaluated by all the other teams.

Organizational Behavior
Organizational Behavior and Leadership

PROGRAMME

- Human behavior in organizations
- Teamwork management
- Interaction control and conflict resolution
- Work organization models evolution
- Organizacional structure and culture

- Strategic analysis and change in organizations
- Leadership and group management
- Management of different leadership styles
- Professional negotiation techniques
- Techniques for successful presentations

TEACHING METHODS AND LEARNING ACTIVITIES
Lectures (in english) with practical examples and analysis of case studies; practical work in self-regulated teams (with foreign students) applying a socio-technical analysis guide to real organizational systems, with the ultimate purpose of generate innovation scenarios to promote the necessary changes to reach better performance levels.

III - GIVING SOME EDUCATIONAL GUIDE LINES

The implementation of the Bologna Process has contributed to force Universities to face significant changes and challenges, which imply the **need to rethink and renew the existing concepts of teaching, learning and assessment**. (CEDEFOP, 2009; Boud & Ass., 2010)

Research for 5 years: "Pedagogical work modes and learning assessment in higher education – a study in University of Porto"
(PhD in Educational Sciences- Manuel Firmino Torres, 2012)

→ High correlations between:
- Pedagogical work modes
  - Learning strategies
    - Assessment types

More than the traditional link between teaching and learning, we must consider a **strong interrelationship in the teaching-learning-assessment processes**.

Thus, more important than the question if assessment is *of*, *for* or even *as* learning is to understand that **assessment can facilitate or hinder teaching-learning strategies.**

So, we have to carefully **design the alignment of teaching-learning-assessment** processes to meet the desired learning outcomes stated in higher education engineering curricula.

$\rightarrow$ In a context of transition paradigms in higher education, there seems to be a shift:

▪ **Traditional lectures**
▪ **"Passive" learning**
▪ **Summative assessment**
More used in: 1st year course (in which pedagogical work is focused on more introductory skills for higher education), simpler contents and classes with high number of students
-> *Regulation perspective of education*

▪ **Student-centered teaching**
▪ **Active learning**
▪ **Formative assessment**
More used in: 4th year course (in which pedagogical work is focused on more professional skills), more complex contents and classes with lower number of students
-> *Emancipatory perspective of education*

Formative assessment (and self-assessment) is an inseparable part of more emancipatory teaching-learning processes and it is indispensable for an effective active learning. The desirable autonomy of students to manage their own learning, is strongly conditioned by the possibility of being able to use self-regulation in HE.

It is not enough attend lectures, read books and watch videos about marathons to become a marathon runner ... we must experience the process to develop the desired skills and train its practical application.

Regulation Perspective

Low maturity levels in learners' autonomy and responsability

stimulating promoting

TEACHING LEARNING ASSESSMENT

SOFT SKILLS DEVELOPMENT

supporting allowing to

Emancipation Perspective
• Self-regulation
• Learning to learn
• Life long learning

High maturity levels in learners' self-awareness, empowerment and critical thinking

• International teamwork
• Intercultural communication
• Interdisciplinary projects
• Employability in a global and competitive market
• Necessary and flexible skills to face today's world economic and professional growing challenges

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Conclusions

Besides agreeing with EURACE guide lines to SSD, I still argue that we should plan the SSD at a curricular design politic level and at the teaching-learning-assessment daily practices. It's necessary to promote students' SSD throughout the whole 1st and 2nd cycles, as a developmental process that must integrate technical and non-technical contents in HE.

Finally, it is worth to point out that for such challenge it is imperative to intensify the teachers' training about the most emancipatory teaching-learning-assessment procedures and develop more structured projects at an international cooperation level to promote a higher SSD in engineering students.

THANK YOU VERY MUCH!

QUESTIONS?

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