IMPROVING TEACHING EFFECTIVENESS IN CHEMICAL ENGINEERING EDUCATION

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DATA GATHERING

1. Review the learning outcomes of a chemical engineering training,
2. Promote closer involvement of employer organisations in chemical engineering curriculum by carrying out focus groups,
3. Establish state-of-the art in assessing the effectiveness of teaching of chemical engineering skills and knowledge

Predominant method of **delivering** identified as

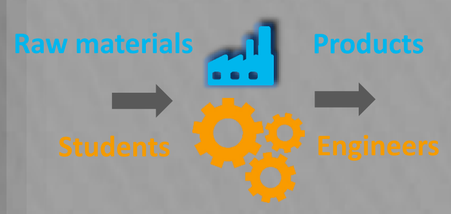
- traditional lectures for the vast majority of knowledge areas
- alternative project/case based and practical approaches to the delivery of employability competencies.

- The current means of assessing effectiveness in the academic environment center around examination performance and student satisfaction questionnaires with more project based assessment and presentations for the employability competencies.
- From the employer perspective, the assessment methods include CV and references, performance during the interview and assessment centers as well as 'on-the-job' performance during probation periods

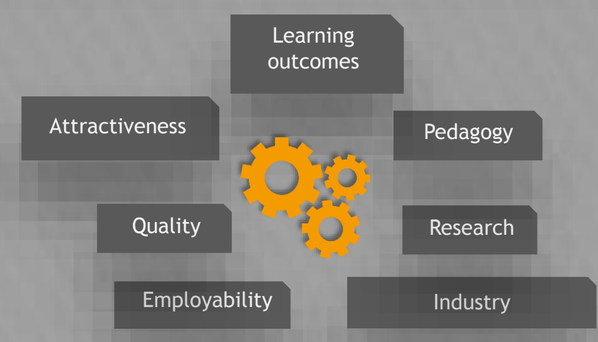
ASSESSMENT FRAMEWORK

4. Define various indicators of the effectiveness of teaching in chemical engineering higher education,
5. Investigate in more depth methods of effectively acquiring employability competencies,
6. Use decision making technology and multi-objective optimization to identify the most appropriate evaluation methods

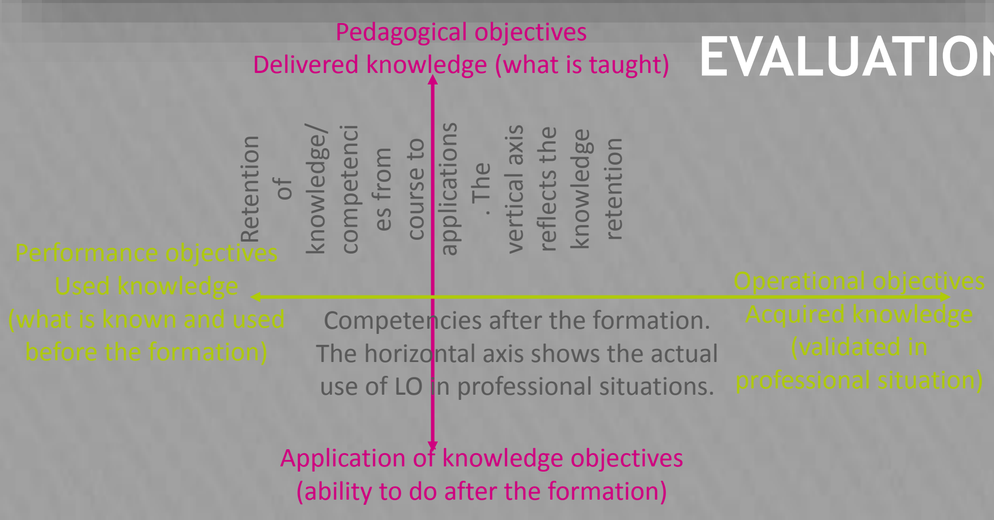
EVALUATION OF A WHOLE FORMATION



Using WP2 Results, Data analysis, Literature results, Discussions with Stakeholders, Decision matrix…
Definition of 160 parameters, gathered in 7 global indicators



EVALUATION OF A SINGLE MODULE



Definition of 6 metrics,

- M_1 : Strategic nature of the course/discipline,
- M_2 : Relevance of the proposed formation,
- M_3 : Pedagogical relevance of the teaching approach,
- M_4 : Perception of relevance of the pedagogical approach,
- M_5 : Evaluation of acquisitions,
- M_6 : Evaluation of transfer

Assessed by different stakeholders
Academics, Graduates Students Employers

PILOT IMPLEMENTATION

7. Test the framework at partner institutions focusing on various pedagogic methodologies.

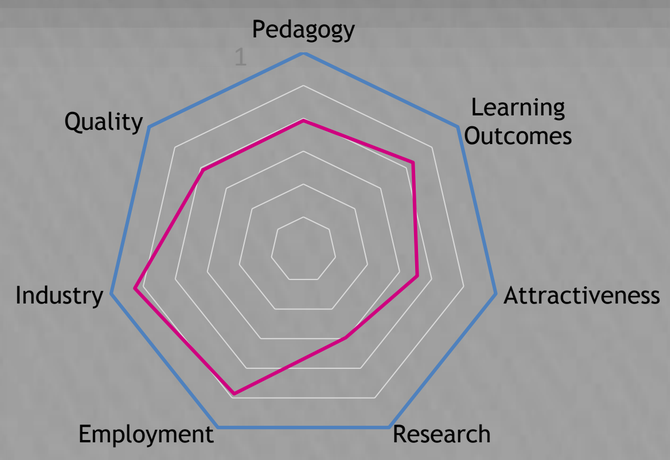
EVALUATION OF A WHOLE FORMATION

Application of the framework to a *virtual* Chemical Engineering Formation

Calculation of scores (on 300) of each global indicator, not related to the average cost and salary.

Gives an indication of improvements areas : Relations with Research, Attractiveness
Gives also an indication of strengths : Relations with Industry, Employment

Difficulty in assessing all the 160 parameters…

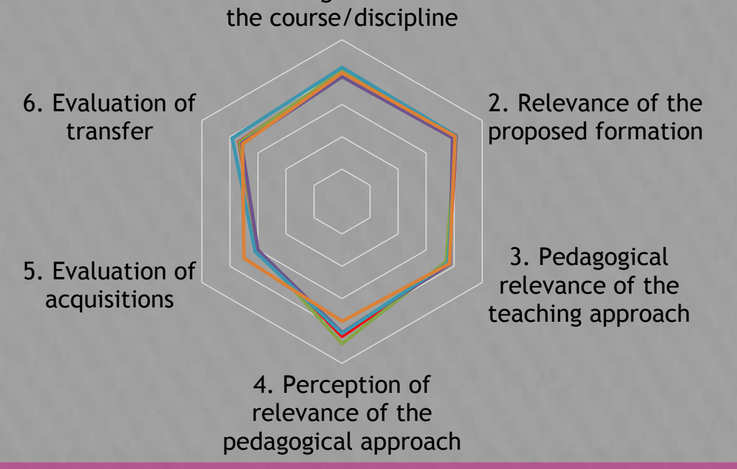


EVALUATION OF A SINGLE MODULE

Application to **Chemical Reaction Engineering I** in different countries, using different pedagogical approaches :

- P1(UNEW) – recorded lectures, problem based learning
- P2 (UL) – problem based learning, traditional lectures
- P3 (IBU) – work-based learning, traditional lectures
- P4 (FEUP) – recorded lectures, practical instruction via labs
- P5 (STU) – traditional lectures, practical instruction via labs
- P6 (TUDO) - work-based learning, problem based learning

Not so much differences in Metrics 1, 2, 3, 4 & 6…
Great difficulties in receiving feedback to our surveys…
Only students were "forced" (in face to face positions) to fulfill the (paper) surveys.



CONCLUSIONS & PERSPECTIVES

European project for improvement and assessment of teaching effectiveness
Two frameworks have been developed.

- The first one is related to the effectiveness of a whole formation : strengths and improvements areas !
- The second one is assigned to a single teaching unit : interest of PBL, self delivering, and classical teaching !

Although the focus of this project is oriented toward chemical engineering formation, the concepts and approaches could be applied to other areas of higher education.

Application of the framework to the evaluation of different modules and different pedagogical approaches, in a same university, for the same cohort of students
CRE I, in traditional teaching : Courses, tutorials and final exam
CRE II, in Project Based Learning : Design of a catalytic reactor final defense of the project
Heat Exchangers in self-delivery : Autoformation, and then Problem Based Learning applied to the design of an heat exchanger

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