Improving Effectiveness in Teaching Core Chemical Engineering Knowledge and Competencies

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Outline

- Project overview
- Project schedule
- Survey, the first results
- Highlights of the results
- Conclusions

Project overview

- The consortium is keen to engage as many higher education chemical engineering degree providers and potential employers as possible.

- Get in touch with us through our website: http://www.iteach-chemeng.eu or e-mail the project coordinator, Dr Jarka Glassey directly: jarka.glassey@ncl.ac.uk

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INTERNATIONAL BALKAN UNIVERSITY

IMPROVING TEACHING EFFECTIVENESS IN CHEMICAL ENGINEERING EDUCATION

Project members

- Newcastle, Nancy, Porto, Skopje, Bratislava, Dortmund

Kickoff meeting Newcastle Jan 2014

Project aim

- develop a framework which will support the assessment of teaching effectiveness in delivering not only core chemical engineering knowledge, but also core employability competencies.
- More detail on www.iteach-chemeng.eu

Project structure

This consortium brings together six European academic institutions (including partners from the UK, France, FYROM, Portugal, Slovakia and Germany) providing chemical engineering degrees with professional / accreditation bodies and employer organisation representatives (as associate partners of the consortium). The aim of the project is to develop a framework which will support the assessment of teaching effectiveness in delivering not only core chemical engineering knowledge, but also core employability competencies.

The project officially started on the 1st October 2013 and will complete its activities on 30th September 2016. It is divided into seven work packages.

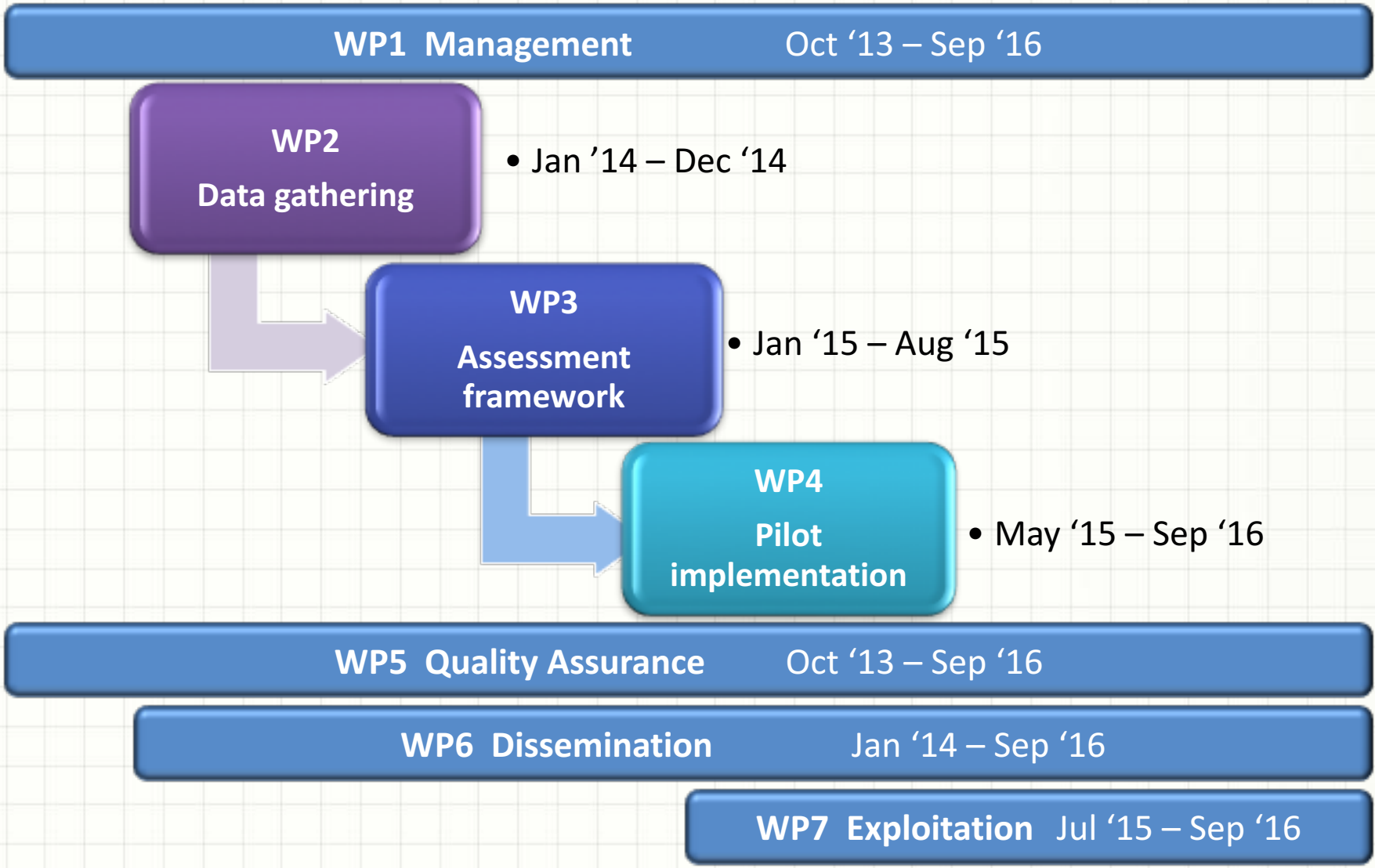
Project Overview

- Oct '13 – Sep '16: WP1 Management
- Jan '14 – Dec '14: WP2 Data Gatherinng
- Jan '15 – Aug '15: WP3 Assessment Framework
- May '15 – Sep '16: WP4 Pilot Implementation
- Oct '13 – Sep '16: WP5 Quality Assurance
- Jan '14 – Sep '16: WP6 Dissemination
- Jul '15 – Sep '16: WP7 Exploitation

Work packages 2, 3 and 4 will deliver the aims of the project through the following objectives:

- Review the learning outcomes of a chemical engineering higher education formation (as set out by the Bologna recommendations and professional accreditation requirements), in consultation between industrial and academic partners. (WP2)
- Promote closer involvement of employer organisations in chemical engineering curriculum formation by carrying out focus groups and semi-structured interviews with associated industrial network partners, as well as questionnaire surveys of wider labour market representatives, to identify the skill gaps and requirements. (WP2)
- Establish state-of-the art in assessing the effectiveness of teaching of core (chemical) engineering knowledge and of the development of professional skills and competencies required to increase the employability of the graduates. (WP2)
- Define various indicators of the effectiveness of teaching in chemical engineering higher education, share them with the community to help HE institutions to improve their formations both in chemical engineering as well as broader subject areas. (WP3)
- Investigate in more depth methods of effectively acquiring employability competencies, using psychometric approaches amongst others. (WP3)
- Use decision making technology and multiobjective optimisation to identify the most appropriate evaluation methods and develop a robust framework for supporting effective delivery of core knowledge and employability competencies. (WP3)
- Test the framework at partner institutions focusing on various pedagogic methodologies (e.g. recorded instruction material used for directed learning, problem based learning, work based learning, tutorial and traditional lecture delivery as well as practical laboratory instruction) in each geographical area to enable the investigation of dependencies between educational systems and the effectiveness of pedagogic methodologies. (WP4)

Project schedule



Survey

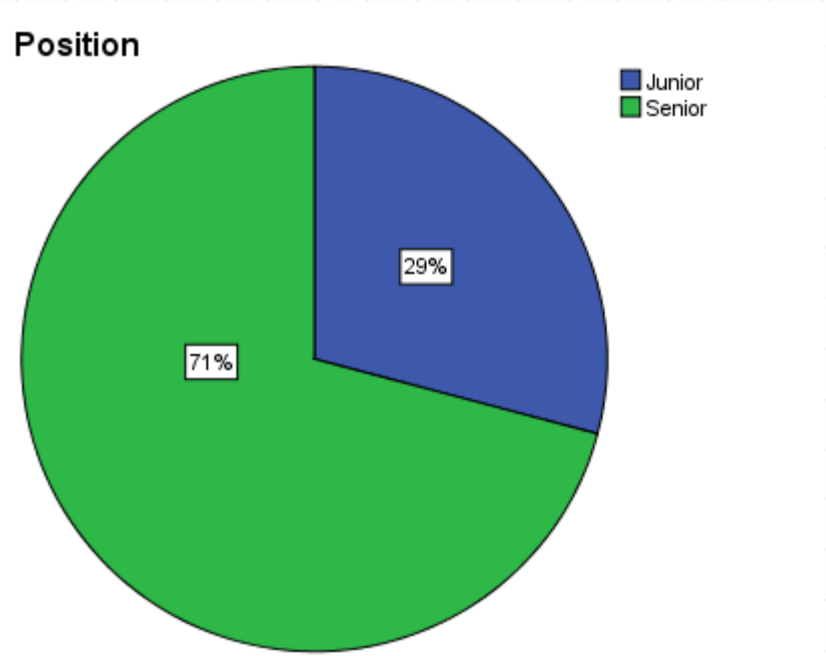
- Survey sent out by all partners in May 2014 to academic, industrial and graduate contacts as detailed in the iTeach database
- Further requests sent to EC2E2N network contacts and through associate members
- Responses were ‘cleaned’ by removing incomplete entries and duplicates (checked by IP address)
- 97 academic, 97 employer and 70 graduate responses

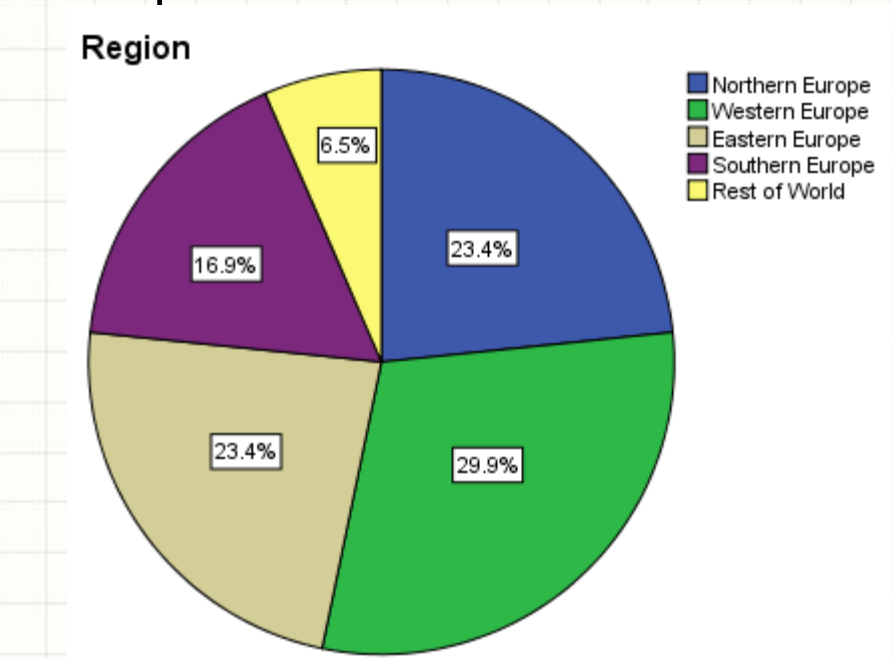
Highlights of the preliminary results

Academic survey

Disclaimer: all results presented are based on the preliminary analysis of the survey responses available to date. Final report will be available in Dec 2014

- Importance of knowledge and skills – as expected, most fundamental knowledge classed as very important
- There are some geographical group differences, although caution should be exercised due to small sample sizes

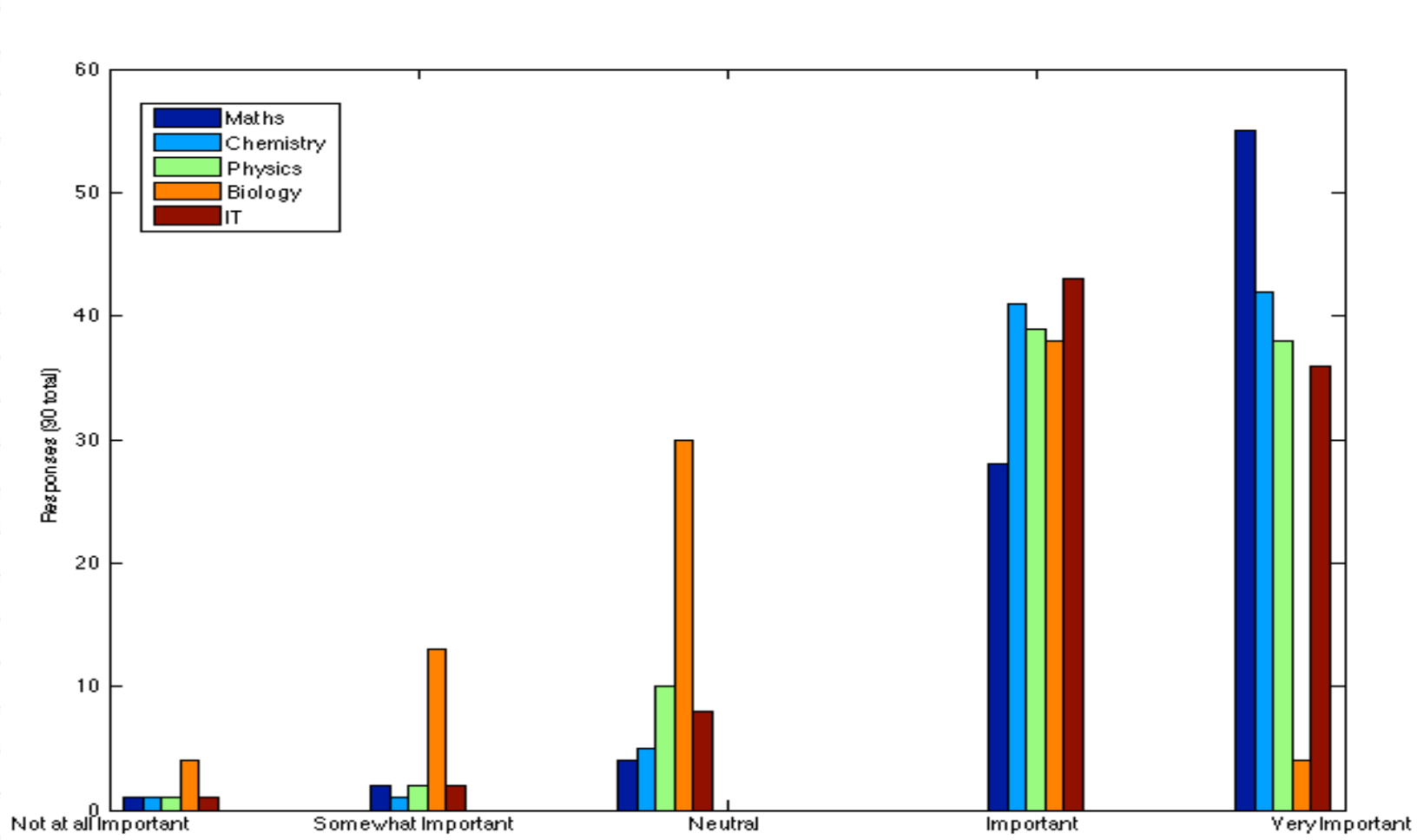




Highlights of the preliminary results

Academic survey

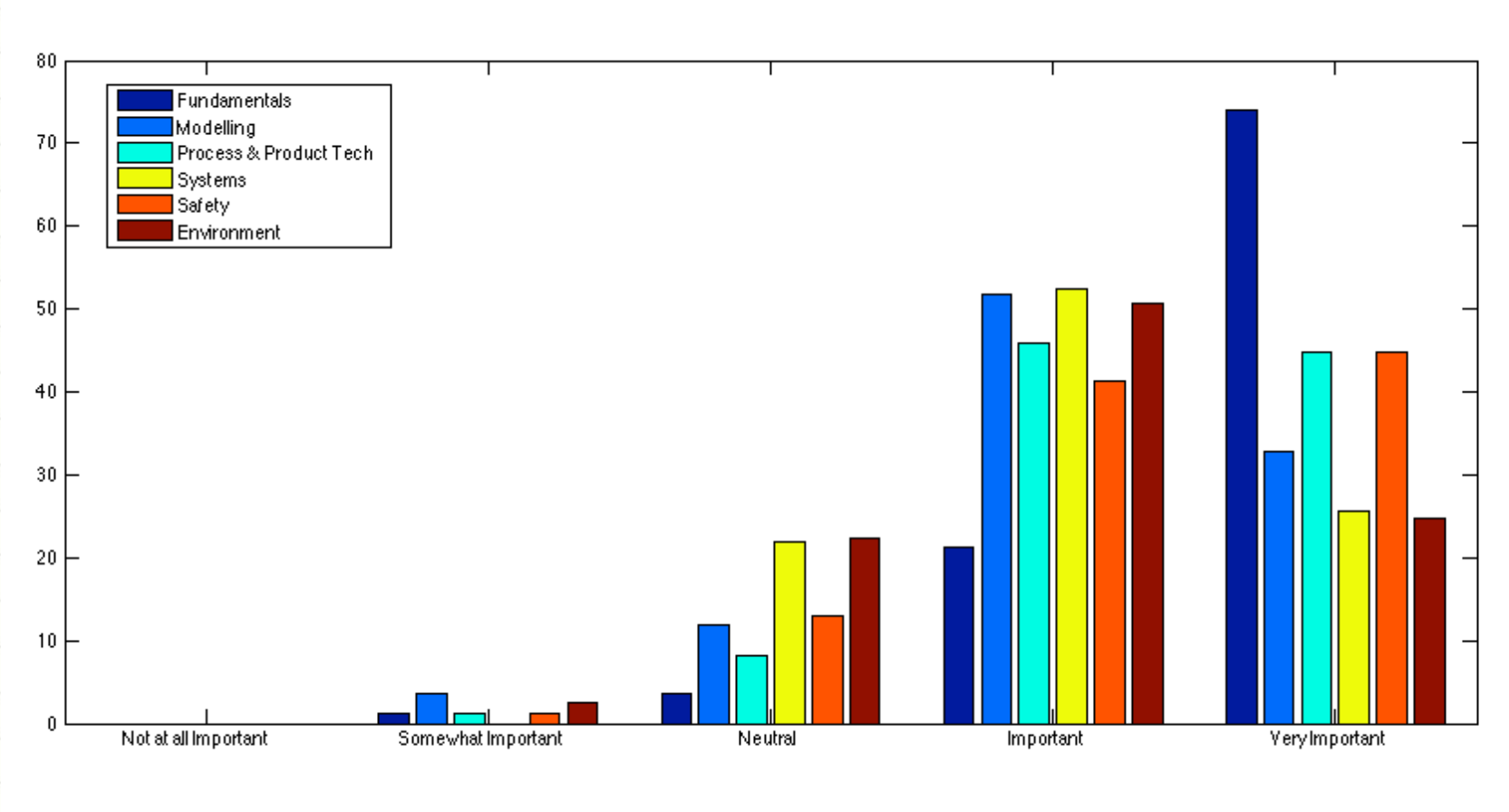
- Importance of **underpinning** knowledge for graduate´s careers



Highlights of the preliminary results

Academic survey

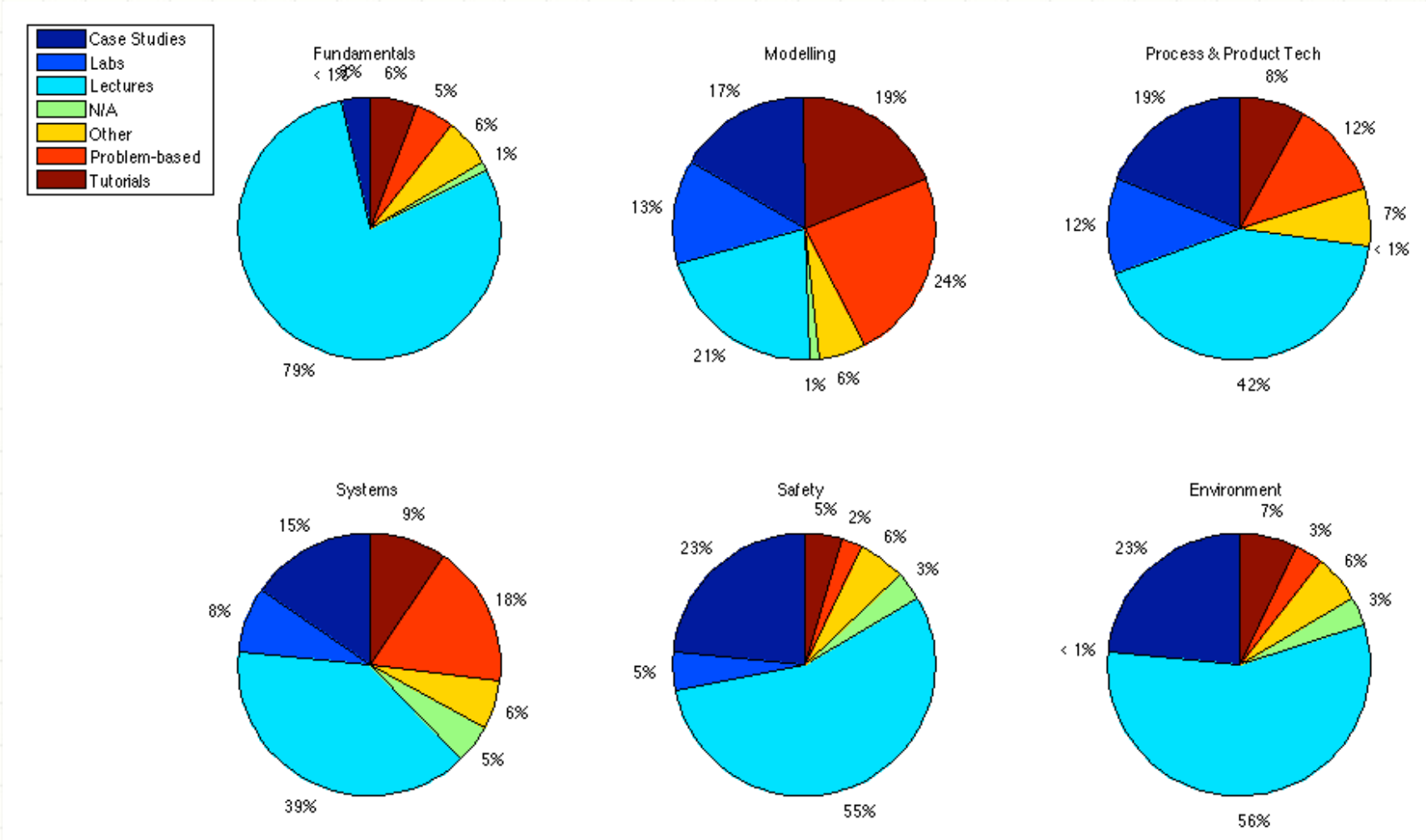
- Importance of **core** knowledge for graduate´s careers



Highlights of the preliminary results

Academic survey

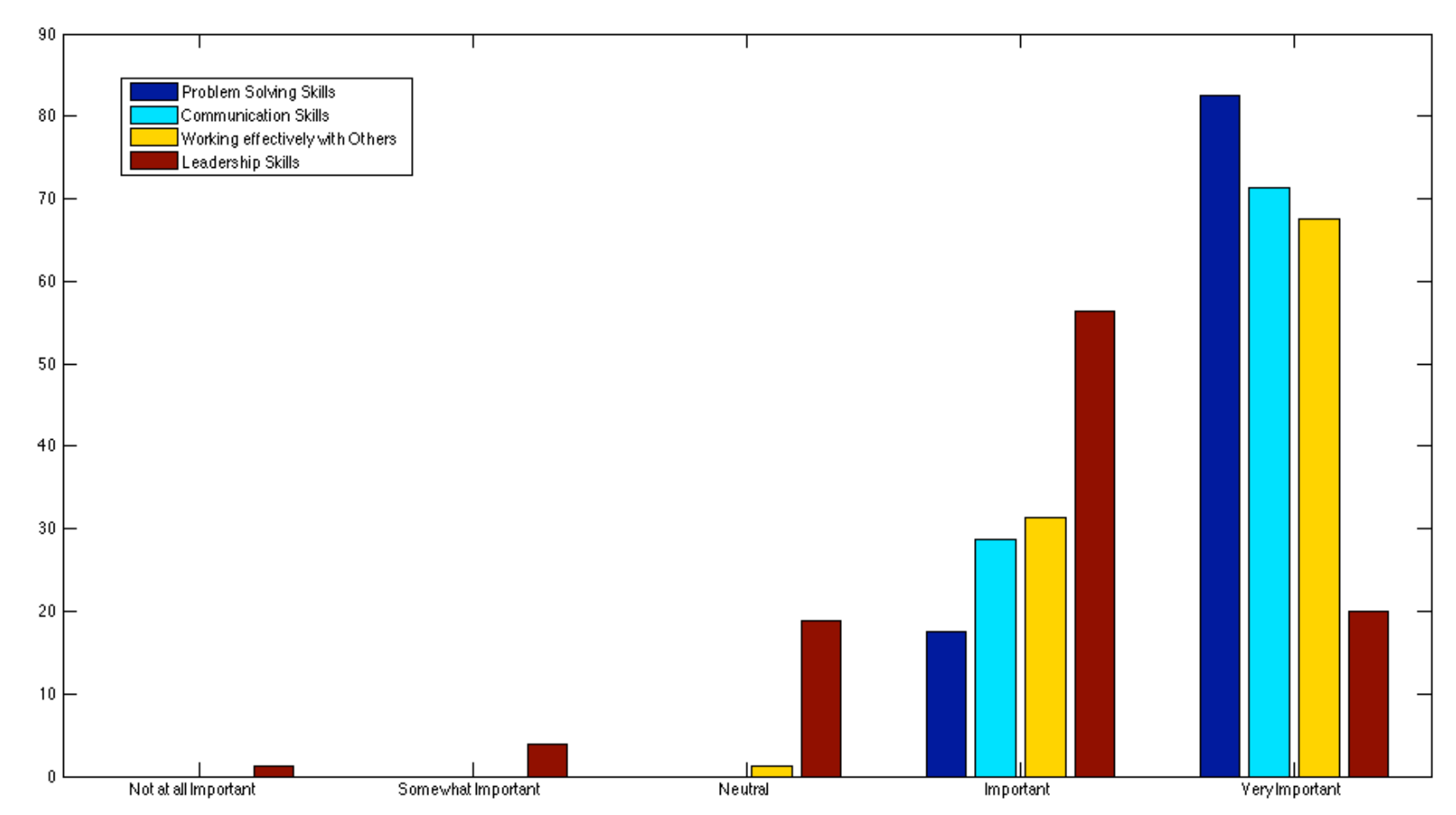
- Predominant teaching method of **core** knowledge



Highlights of the preliminary results

Academic survey

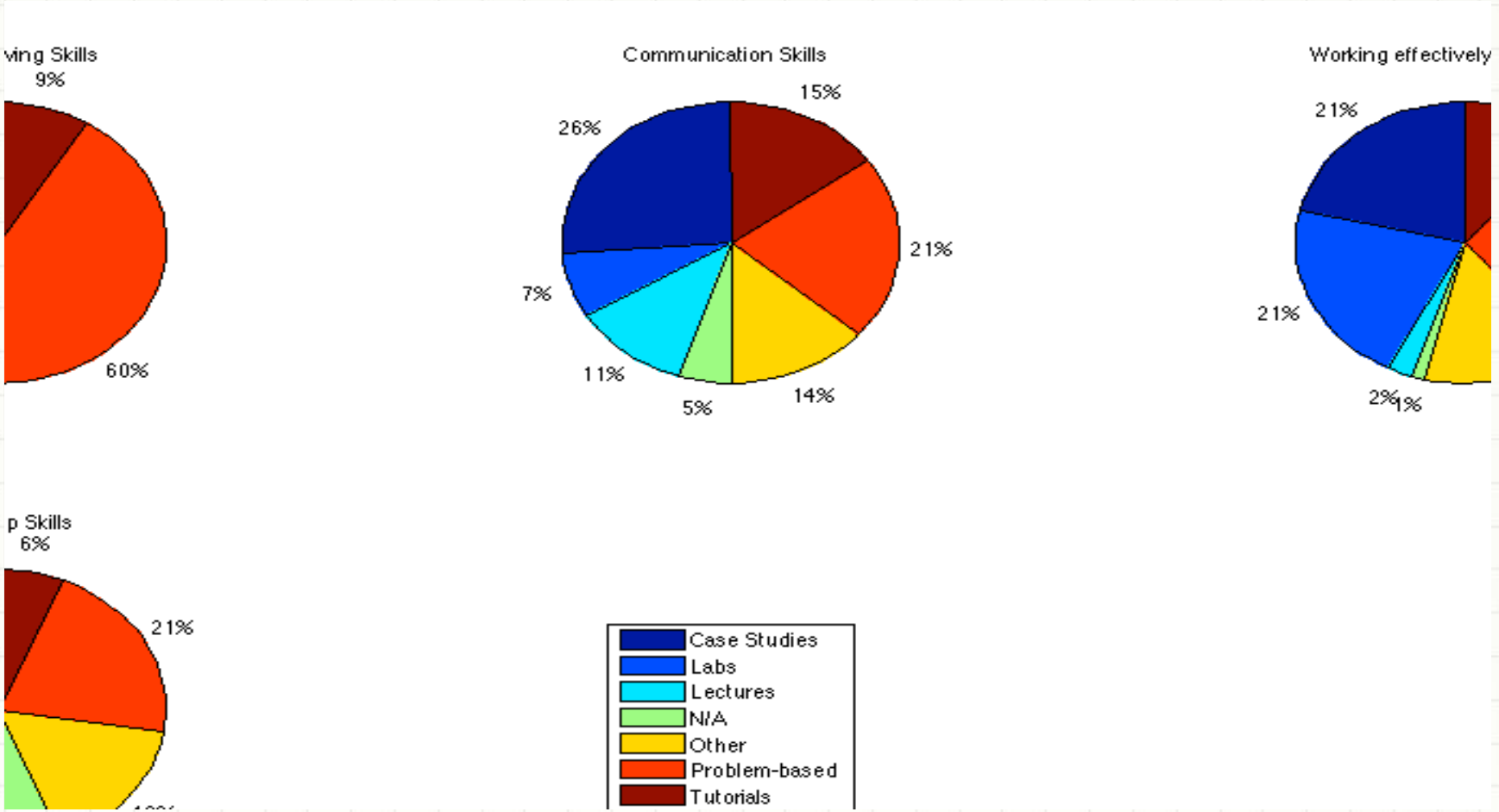
- Importance of **employability** competencies for graduate´s careers



Highlights of the preliminary results

Academic survey

- Predominant teaching of **employability** competencies



Highlights of the results
Academic survey

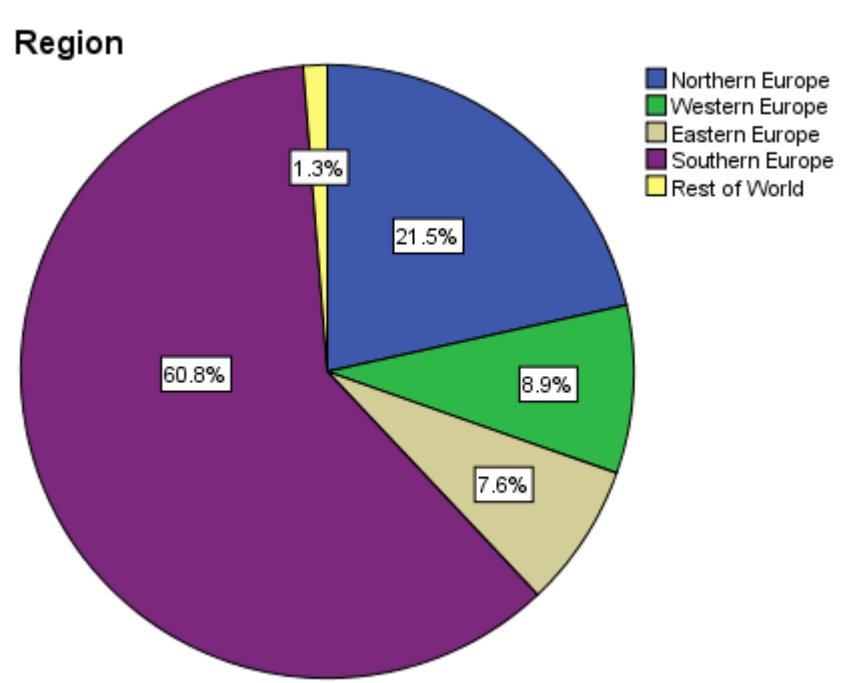
- No statistical significant differences in the responses of S and E European academics in terms of the significance of knowledge and skills
- Chemistry, Biology, Process & Product Engineering, Data analysis and QA rated more highly by S and E European than W and N European
- Innovative design and problem based skills more highly rated by E than N European

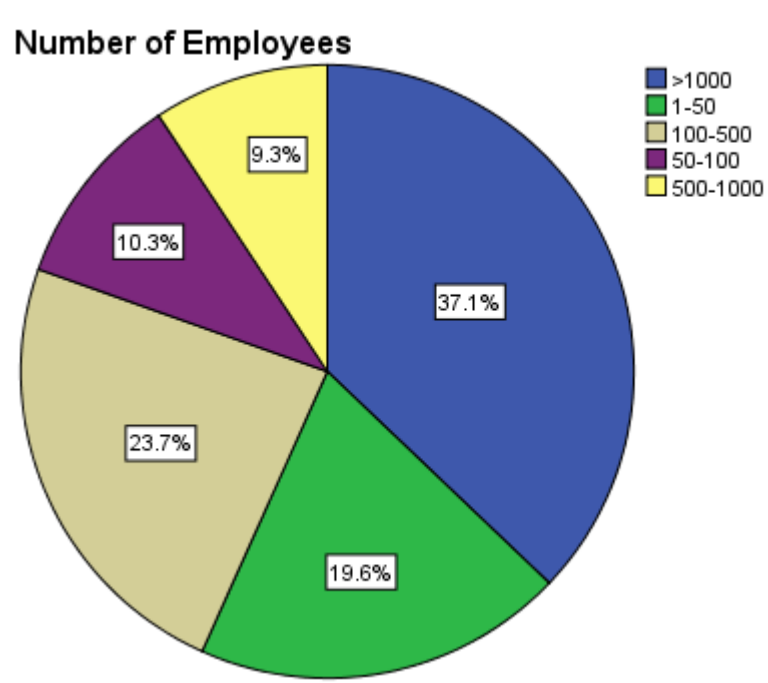
What **assessment methods** a most objective/robust for effectiveness of CE knowledge delivery?

Highlights of the results

Employer survey

- Group comparisons based on the size of the company rather than geographical region, responses predominantly from technical part of the company (not HR)
- Wide range of sectors with relatively low percentages of responses from each so no comparison possible

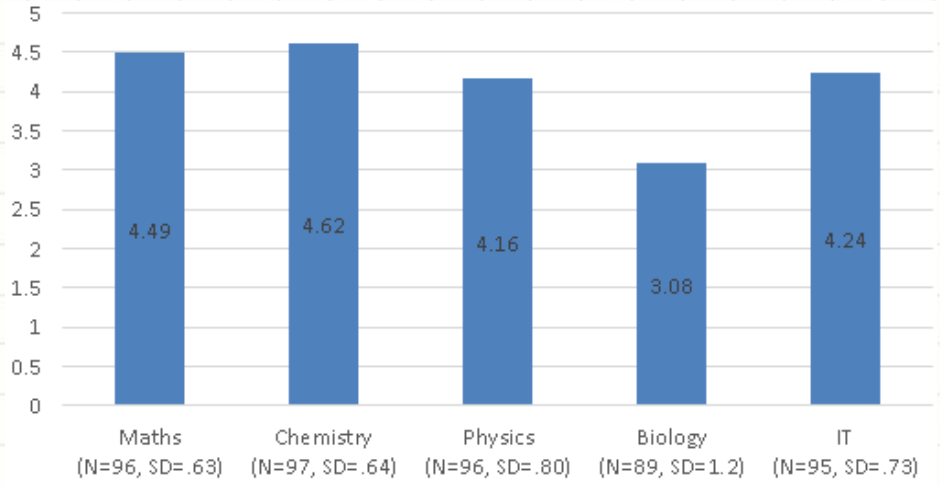




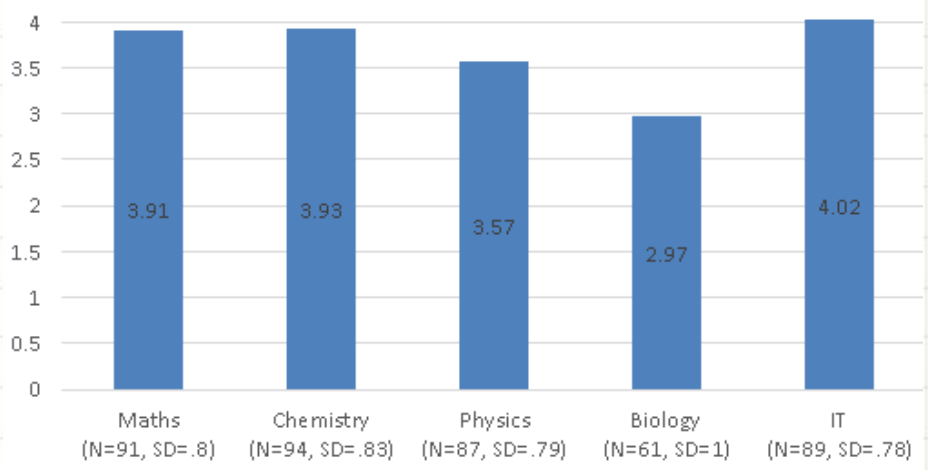
Highlights of the results

Employer survey

- importance of core competencies for the business



- competence of graduates



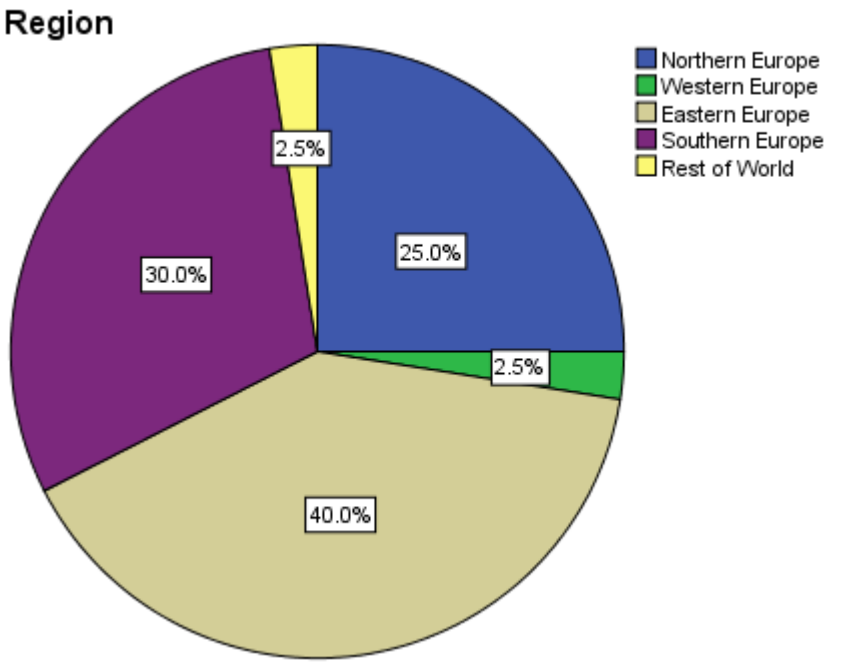
Highlights of the results
Employer survey

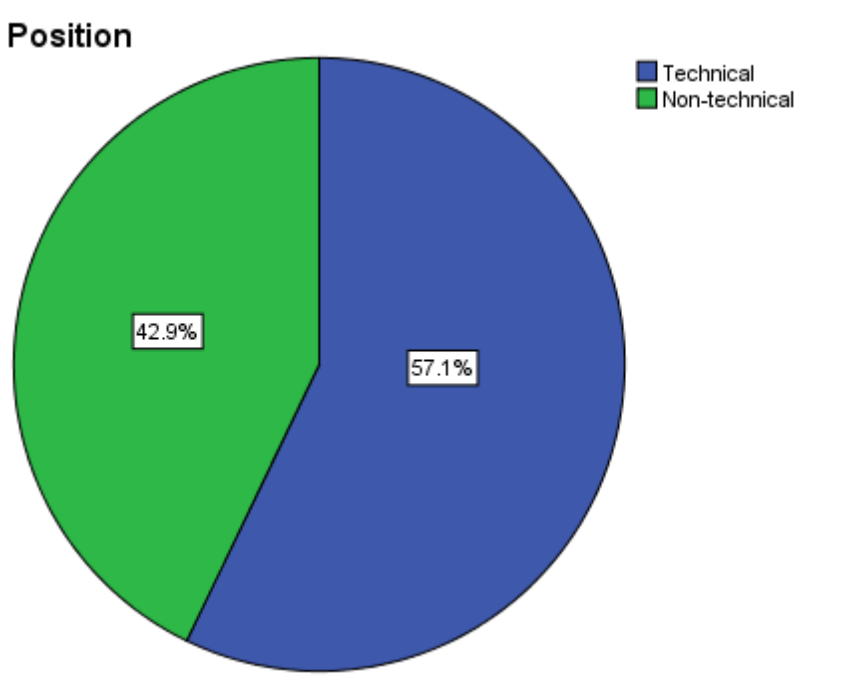
- Small company (S, 1-100, N = 29), medium-sized company (M, 100-1000, N = 32), large company (L, >1,000, N = 36)
- very few statistically significant group differences between companies of different sizes
- S and L rated Physics higher than M
- L rated communications skills higher than M and S
- M rated Safety more important than S
- Competency of graduates in Chemistry, Sustainability and Practical skills rated higher by M than by S companies

Highlights of the results

Graduate survey

- Group comparisons based on the geographical region and on the size of the company and graduate position were carried out
- Wide range of sectors with relatively low percentages of responses from each so no comparison possible

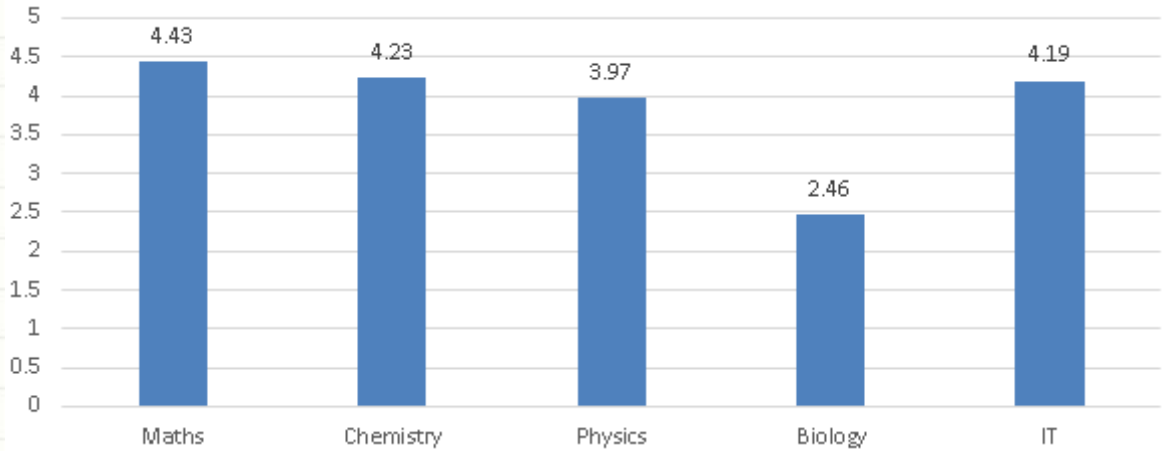




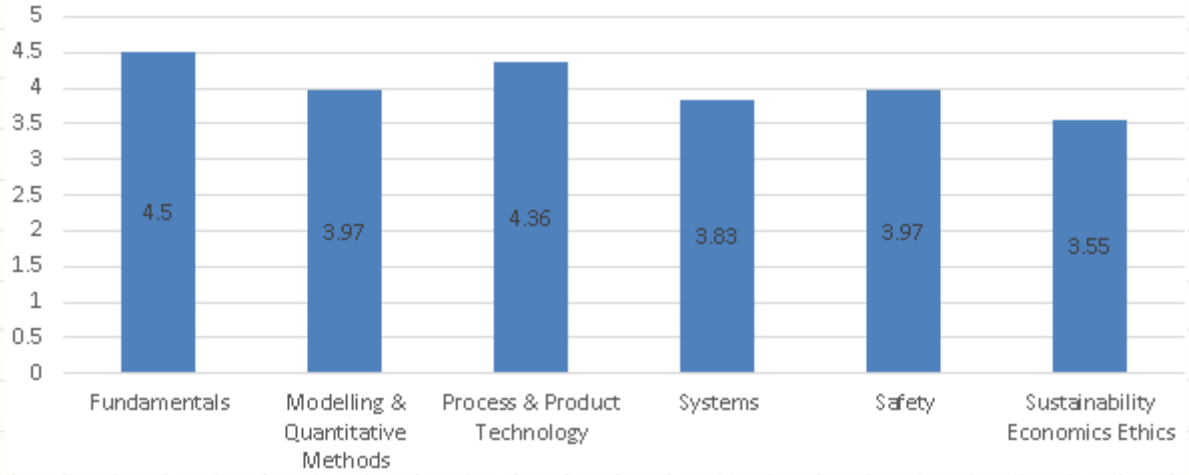
Highlights of the results

Graduate survey

- How relevant are underpinning competencies for your career?



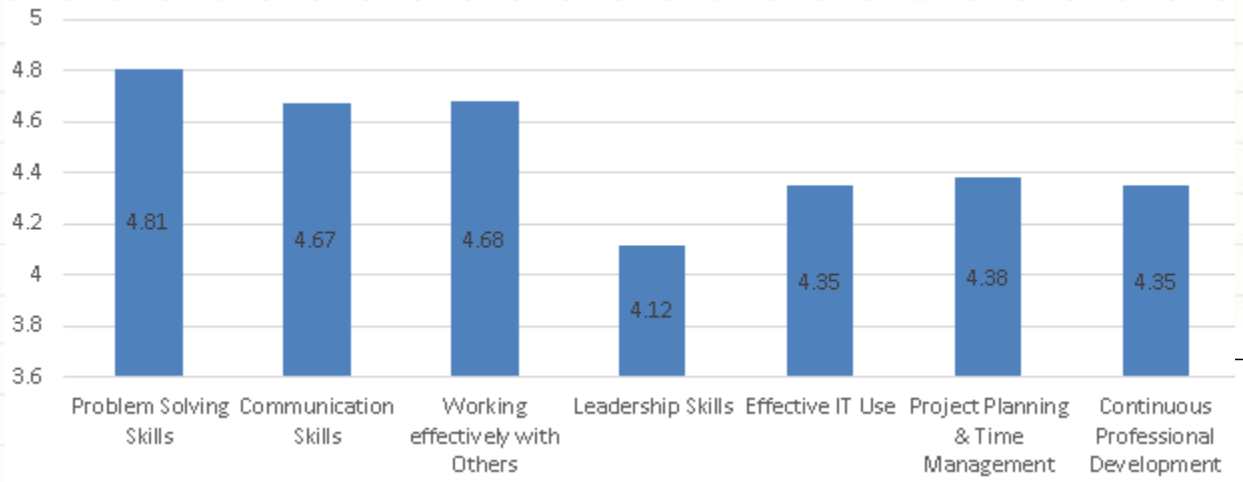
- How relevant are core competencies for your career?



Highlights of the results

Graduate survey

- How relevant are these competencies for your career?



- Answers of the academic, see slide 13

Concluding remarks

- Qualitative data analysis and quantitative data analysis is ongoing
- Discussion of the results in Q4 2014

- Basis for the draft of the framework, which will be developed in early 2015
- The framework to be piloted in late 2015-2016 (WP4)
- Anyone interested in being involved contact us

www.iteach-chemeng.eu/

Acknowledgements

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Thank you for your attention

QUESTIONS?