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Escuela Técnica Superior
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The use of rubrics for the evaluation of the student practice in engineering subjects, improves the Teaching-Learning process and the students' understanding of the evaluation process

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Background

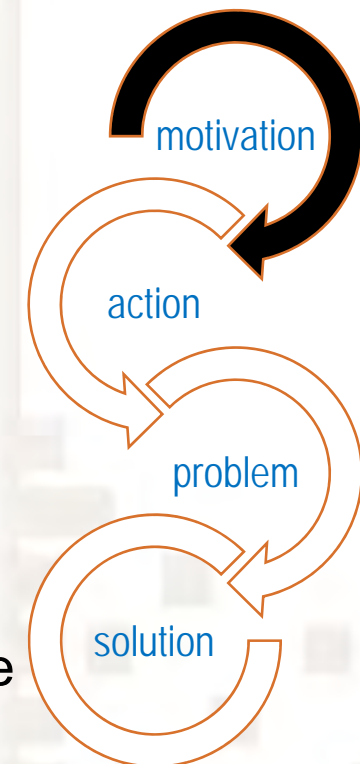
The motivatoion

- Agenda for the Higher Education Modernization, 2014 (EACEA, 2014)

PRIORITY: to adjust the higher education studies to the labour market promoting the entrepreneurial spirit and enhancing the links between education, research and enterprise

- Spanish National Agency for the Higher Education Quality (2016)

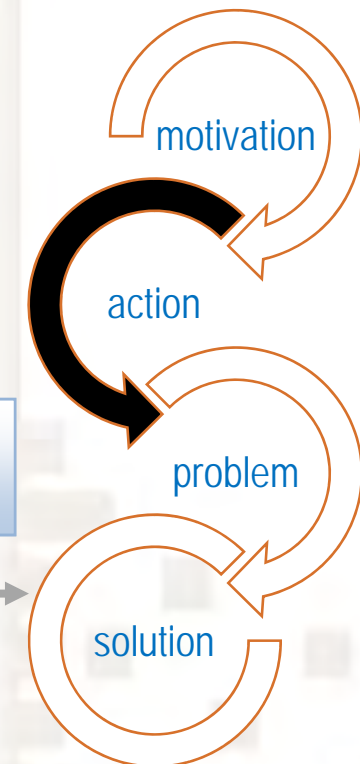
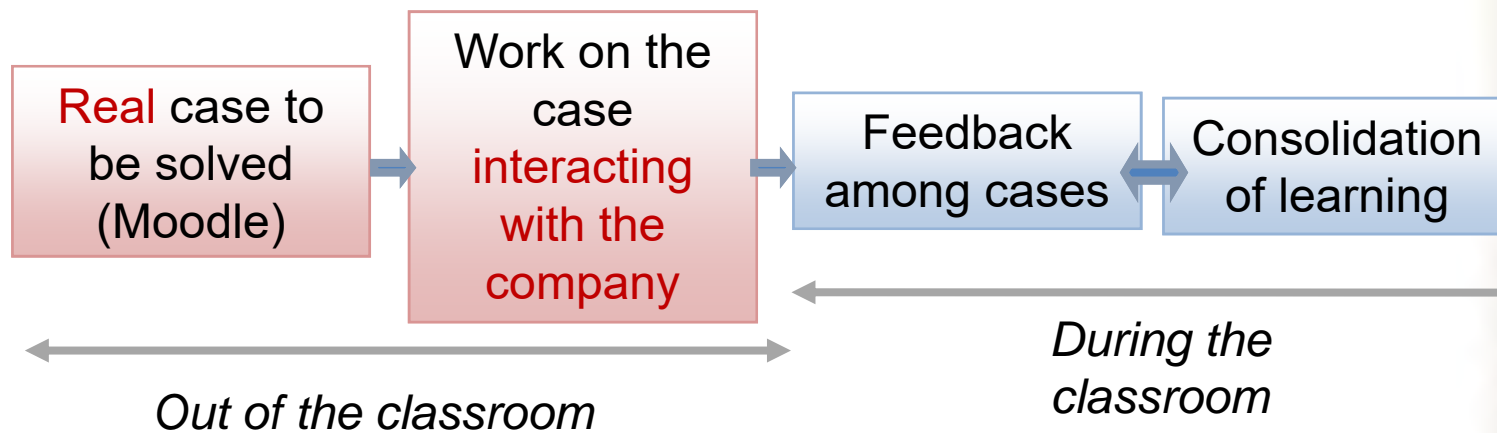
ADVICE: to reinforce the actions to close the students to the professional sectors in order to support the students in their access to the labour market



Background

The action

TIG INGENIAQ (University of León, Spain) has re-designed the **subjects' practices** of the engineering studies using Flipped Learning and involving a Company representative



Background

The problem created

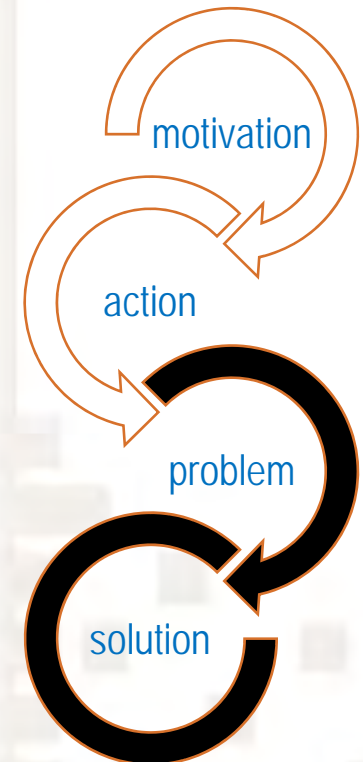
Such uncommon practical activities pose the threat of how to evaluate them.

Requirements of the evaluation process:

- Continuous
- Formative
- Shared by students and teachers
- Based in competences

The proposed solution

The so called rubrics designed for the continuous evaluation oriented to the learning



Objectives

General objective to create rubrics and to evaluate their performance for the evaluation of the aforementioned student practice in engineering studies

The **specific objectives** of this work were:

- i) to **develop** the rubrics for the evaluation of the practical activity
- ii) to **find the weak points and the inconsistencies** of the rubrics design process
- iii) to use the rubrics, at a **pilot scale**, in six engineering subjects
- iv) to **compare** the results of the teachers' evaluation with the students' expectations, from their self-evaluation
- v) to **assess the usefulness** of the rubrics for the evaluation of the practice.

Methodology and structure of the action

Subjects included in the pilot experience of rubrics design for the shared evaluation of the practical credits

Subject	Level	Knowledge area	Studies
Ornamental crops	Grade	Production	Agricultural Engineering
Biotechnological processes	Grade	Engineering	Biotechnology
Plant Production Systems	Master	Production	Agricultural Engineering
Business administration and Marketing	Master	Economy	Agricultural Engineering
Innovation in industry	Master	Engineering	Production in Pharmaceutical Industry
Rural and agricultural development	Master	Production	International Cooperation for Development

Methodology and structure of the action



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1. Rubric development (Romeo et al. 2017)

Phase 1. Definition of dimensions and indicators by the teachers

Action 1.1. Definition of the dimensions

- ☞ Logical and natural components of a competence

Action 1.2. Definition of indicators

- ☞ They are proofs or evidences
- ☞ They must be designed taking into account the competences and the learning outcomes.

Phase 2. Elaboration of the rubric by the teachers (RUBISTAR)

Action 2.1. Quality definitions

- ☞ Three levels

Methodology and structure of the action

2. Rubric analysis

Phase 3. Validation of the rubric involving the teachers in the TIG and the company representative

Action 3.1. Cross-validation inside the TIG

Action 3.2. Validation with the company representative about:

- ☞ Suitability of the competences covered by the students practices
- ☞ Suitability of the dimensions selected, the indicators and the quality definitions



Methodology and structure of the action

3. Rubric implementation

Phase 4. Rubric implementation to the students, rubric testing and rubric evaluation

Action 4.1. The students carry out the practices

- ☞ The students receive at the same time the directions to carry out the practices, and the rubric for their evaluation

Action 4.2. Evaluation of the students practices based on the rubric.

- ☞ Teacher evaluation
- ☞ Self-evaluation



Methodology and structure of the action

4. Results analysis

Phase 5. Analysis of the results involving the teachers and the company representative

Action 5.1. To identify indicators with higher differences teachers' evaluation - students' self-evaluation practices



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Results: Rubrics development

Relative importance (in percentage) of the dimensions and indicators considered in the rubrics developed for the five subjects analysed in this work.

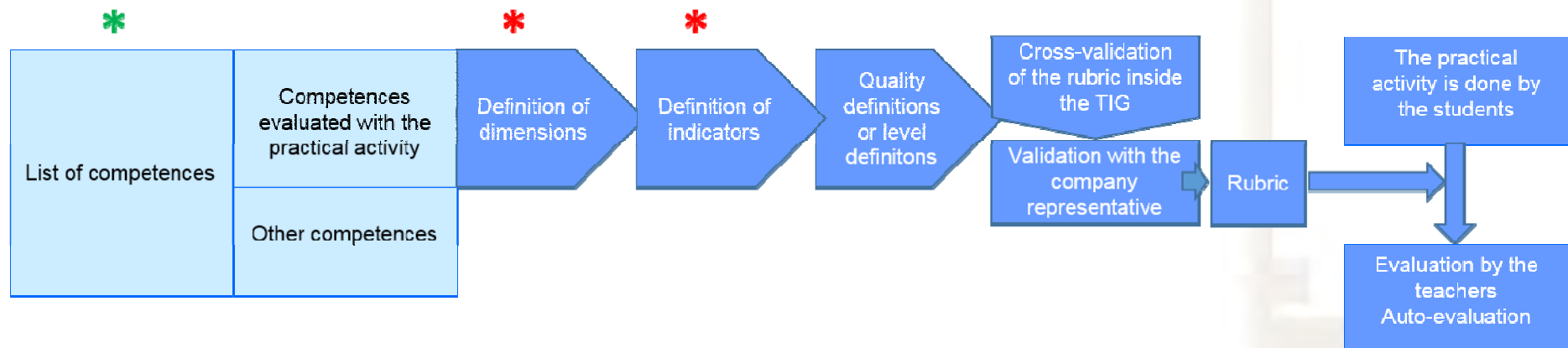
Dimensions	Indicators	Ornamental crops	Biotechnological processes	Plant Production Systems	Business administration and Marketing	Innovation in industry
Understanding of the problem and search for information about the state of art	Ability to understand the problem to be solved	15 %		15 %		
	Ability of searching information to make an adequate state of art	15 %		15 %		
	Level of interaction with the company	15 %		15 %		
Content of the solution	Excellence in innovation proposals	15 %	17 %	15 %		30 %
	Technical and methodological excellence	10 %	17 %	10 %	37,5 %	
	Technical viability of the proposal	15 %	17 %	15 %	25,0 %	30 %
	Socioeconomic impact		17 %			
Oral presentation to the potential client, academics and company representative	Quality of the presentation from the formal viewpoint	10 %	33 %	10 %	25,0 %	15 %
	Quality of the responses to questions from the company supervisor and from the audience	5 %		5 %		15%
In classroom activities	Attendance to the classes and attitude during the presentation of problems from other students				12,5 %	10%



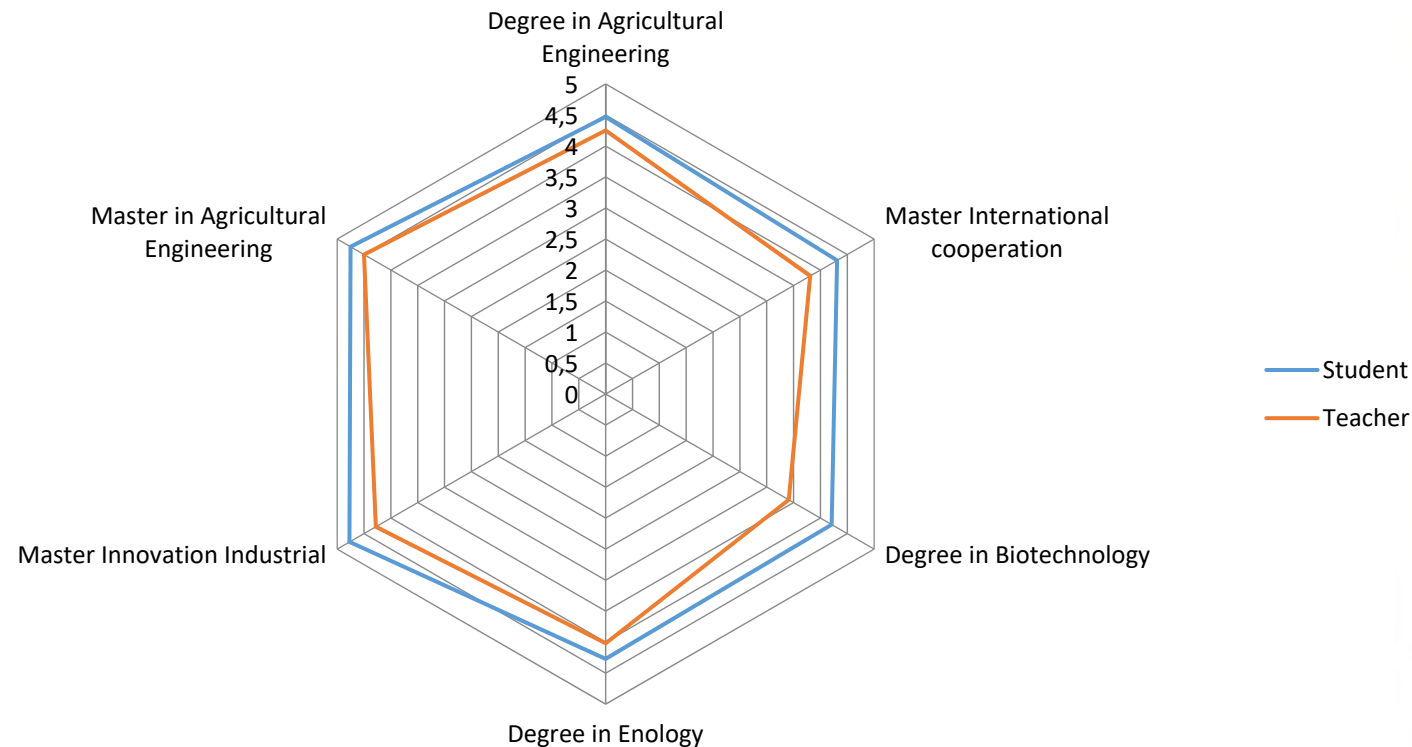
☞ The same competence was evaluated with different indicators in different subjects which means different interpretation of the dimensions

Results: Weak points and inconsistencies

Weak points of the rubrics design process



Results: Analysis of the results after pilot test



This result indicates the success of the rubric, because the expected score by the students (their expectations) are close to the final score. Closer than when the score was based on a general feeling from the teacher

Conclusions

- The rubrics of 5 subjects have been designed and evaluated in a two-step process
- A weak point of the rubrics is the great variation of approaches for the same competences in different subjects, depending on the teacher, which makes necessary a coordination effort in the formulation of the The companies' representative highlighted that the main weak point is the lack of achievement of the competences related with the autonomous and individual work
- The use of the rubrics has helped the students to understand the objective of the subjects' practices, keeping to a minimum the differences between the students' expectations and the teachers' rating
- The system based in rubrics has the disadvantage of being time consuming to prepare, but they make easier and more objective, the final evaluation of the subjects' (though a traditional evaluation based on "the feeling" of the student's performance is less time consuming



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