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The use of rubrics for the evaluation of the subjects' practices in engineering studies, consisting in solving real cases in direct contact with companies: the case of the project EVALUA-PRACTIC

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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

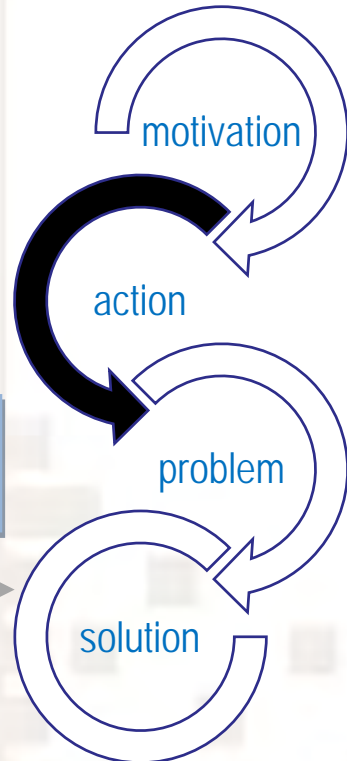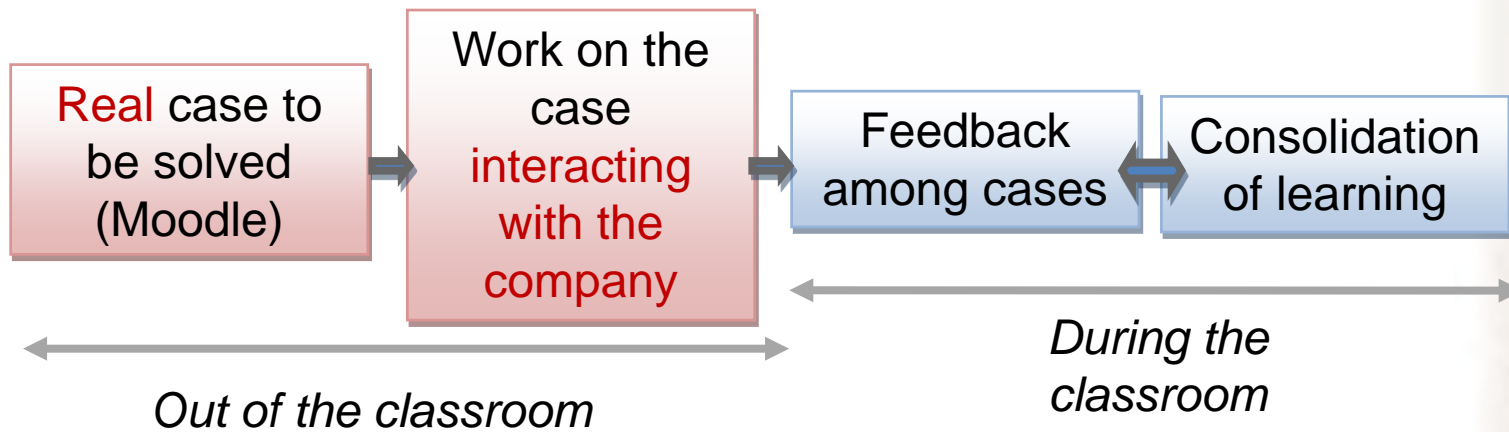- Spanish National Agency for the Higher Education Quality (2016)

  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

motivation

action

problem

solution
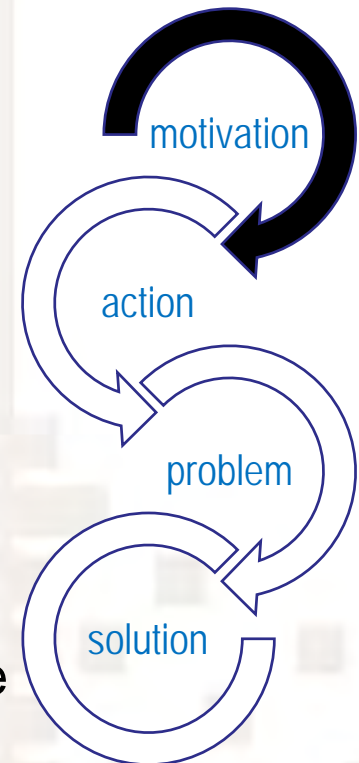
Background

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

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┌──────────────┐   ┌──────────────┐   ┌──────────────┐   ┌──────────────┐
│ Real case to │   │ Work on the  │   │   Feedback   │   │Consolidation │
│ be solved    │──▶│ case         │──▶│ among cases  │◀─▶│ of learning  │
│ (Moodle)     │   │ interacting  │   │              │   │              │
│              │   │ with the     │   │              │   │              │
│              │   │ company      │   │              │   │              │
└──────────────┘   └──────────────┘   └──────────────┘   └──────────────┘
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Out of the classroom   *During the classroom*

motivation

action

problem

solution

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

motivation

action

problem

solution
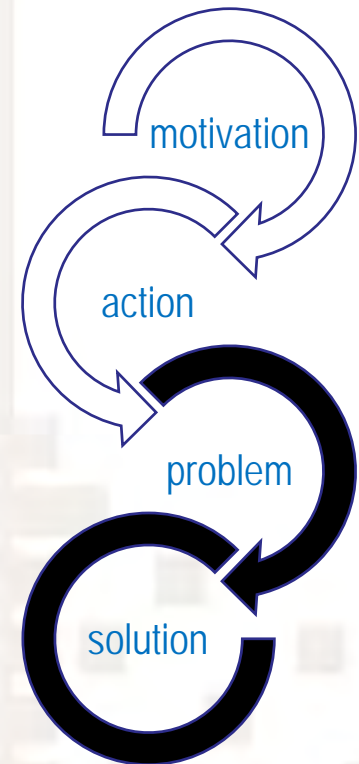
Objectives

General objective: To create rubrics for the evaluation of the subjects' practices in Engineering studies, and to assess such rubrics.

Specific objectives:
- To develop the rubrics for evaluating the practical activity of five subjects from Engineering studies
- To find the weak points and the inconsistences of the rubrics design process
- To stablish the best procedure to design successful rubrics

Methodology and structure of the action

Subjects included in the pilot experience of design rubrics 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

1. Rubric development (Romeo et al. 2017)

Preliminary phase

    Kick-off meeting

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

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 subjects' practices

  ☞ Suitability of the dimensions selected, the indicators and the quality definitions

Results

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	Understanding the problem	15 %		15 %		
	Searching information for the state of art	15 %		15 %		
	Level of interaction with the company	15 %		15 %		

Results

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
In classroom activities	Attendance to the classes and attitude during the presentation of problems from other students				12,5 %	10%

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
Written document to be presented to the potential client	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 %			

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

Results

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
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	5 %		5 %		15%

Weak points of the rubrics design process
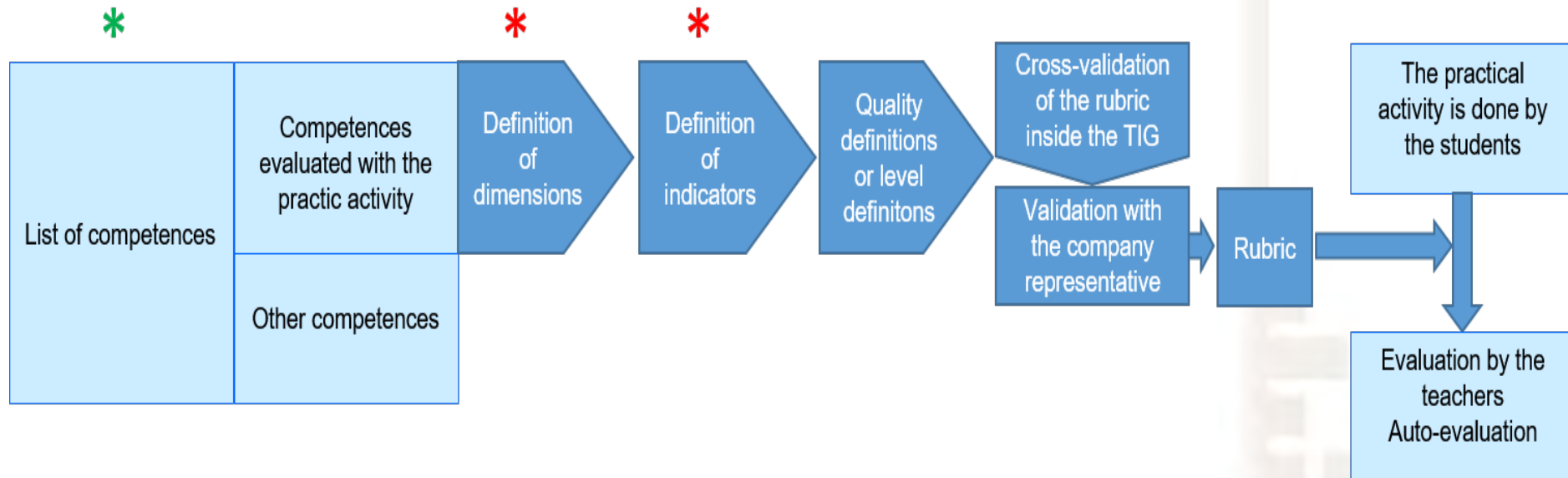
Prospective steps

- Application of the rubrics for the evaluation of the students' practices:
  - Teachers to evaluate the students
  - Students for self-evaluation
- Analysis of the discrepancies in the previous point
- Analysis of the reproducibility of the evaluation results using the rubric, for different teachers in the same subject and the same group of students.

Conclusions

- Developed the rubrics five Engineering subjects.

- Rubrics evaluated in a two-step process; inside the TIG, with the company representative.

- Weakest point of the rubrics is the great variation of approaches for the same competences in different subjects $\Rightarrow$ coordination effort in the formulation of the rubrics.

- Weakest point of the teaching-learning system at the University according to companies:

  - The lack of achievement of the competences related with the autonomous and individual work,

  - The graduates have fear to make decisions.