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LEARN FROM MISTAKES. A WAY TO ACQUIRE ETHICAL AND PROFESSIONAL RESPONSIBILITY

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Abstract: One of the skills that students of the degree in civil engineering in Spain must acquire during their studies is: "understand and assume the ethical and professional responsibility of the activity of the Civil, Canal and Port Engineer." In the current study plan in the Higher Technical School of Civil Engineering, Canals and Ports of the Polytechnic University of Valencia, this competence can be acquired in two ways: students can take an optional subject (not all students enroll), called "engineering ethics civil" and, in addition, in several subjects of the curriculum, the transversal competence "ethical, environmental and professional responsibility" is worked on and evaluated.
This work presents the methodology used in the subject "Construction Materials and their applications to civil engineering" in the second undergraduate year to introduce this transversal competence in the classroom. To do this, cases are studied in the history of civil engineering, in which failure to behave in an ethical and/or professional manner has caused the collapse or accidents in structures. The great achievement of this methodology is to ensure that this transversal competence is present in all work sessions in the classroom, so reflecting on the ethical and professional behavior of civil engineers becomes part of the student's daily work. Furthermore, it presents additional advantages for skill assessment thanks to the continuous acquisition of evidence.
Keywords: Responsibility, Ethics, Civil Engineering, Curriculum.

INTRODUCTION

The arrival of the European Higher Education Area (EHEA) forced Spanish university degrees to be redesigned to match the characteristics in terms of duration (number of credits) and content of those taught in the rest of the EHEA (Europeas, 2009). In 2003, the Ministry of Education and Science published various reports in which it spoke of "providing university training in which basic generic skills, transversal skills related to the comprehensive training of people, and more basic skills are harmoniously integrated. specific ones that enable professional orientation that allows graduates to integrate into the labor market" (Rúa, E. 2004).

Based on these reports, the Schools began to write the study plans for the different grades incorporating the skills that the students had to acquire. But despite stating them and assigning them to different subjects, it can be said that, in a general way, in the first years of implementation of these new study plans, transversal competencies were not systematically worked on and were not evaluated, which meant that they could not be guarantee its acquisition.

For this reason, at the initiative of the Vice-Rector for Studies, Quality and Accreditation and supported by the UPV2015-2020 strategic plan in several of its strategic challenges, the institutional project to incorporate transversal competencies in the curriculum of graduates of the Polytechnic University was developed. of València (hereinafter UPV) whose fundamental objective is the accreditation of the transversal skills of students graduating from the UPV. Based on national and international guidelines and regulations, specialized publications and taking into account the regulations or recommendations of some degrees, the UPV defined 13 transversal competencies (table 1) that must be exercised in all study plans. Most

of these competencies were already worked on regularly, but in most cases they were not evaluated.

Transversal Competencies
CT-01 - Understanding and integration
CT-02 - Application and practical thinking
CT-03 - Analysis and problem resolution
CT-04 - Innovation, creativity and entrepreneurship
CT-05 - Design and project
CT-06 - Teamwork and leadership
CT-07 - Ethical, environmental and professional responsibility
CT-08 - Effective communication
CT-09 - Critical thinking
CT-10 - Knowledge of contemporary problems
CT-11 - Lifelong learning
CT-12 - Planning and time management
CT-13 - Specific Instrumentation

Table 1. Transversal skills in all degrees at the UPV

As a result of the aforementioned project, at the Higher Technical School of Civil, Canal and Port Engineers, the transversal competencies that their study plans must include were redefined, where they were acquired and how to evaluate the competency so that the acquisition of this knowledge was creditable.

To do this, regardless of the number of subjects that worked on these competencies, control points were established for their evaluation at different times during the students' training, with different degrees of mastery.

According to this organization, the subject "Construction Materials and their applications to civil engineering" in the second year of the Degree in Civil Engineering, and the Degree in Public Works Engineering would be a control point for transversal competence 07 "Ethical, professional and environmental responsibility" in the first degree of mastery.

GOAL

The objective of this communication is to show a way of working on the transversal competence "Ethical, environmental and professional responsibility" in the classroom and how to evaluate it. The reasons for choosing this mode of work and the main advantages and difficulties encountered in its implementation will be explained.

DEVELOPMENT OF THE PROPOSAL

Since the launch of the current Degree in civil engineering, the teachers of the subject "Construction Materials and their applications to civil engineering" have kept in mind the need to incorporate content related to transversal competencies into their specific teaching. In particular, they have always kept in mind the importance that engineers, when they finish their training and enter the labor market, must be aware of their responsibility and carry out their work ethically.

PREVIOUS EXPERIENCE

As a result of the incorporation of transversal competencies in the students' curriculum, attempts had already been made to incorporate ethics and responsibility in the classroom in two different ways. The first action consisted of raising awareness among students, throughout the development of the subject, of the professional responsibility that they will assume at the end of their degree studies. This action has been carried out in a general way since the beginning of studies related to civil engineering and there have always been teachers who describe in the classroom real experiences and decisions made in the professional field that undoubtedly influence students' awareness of the responsibility that goes along with their professional work.

The second action was the approach of

classroom practices in which moral dilemmas (Boni and Lozano 2005) related to the subject were worked on. After using these dilemmas during several courses, it was concluded that the desired objective was not achieved.

On the one hand, this was because the degree of development of the students was not taken into consideration, and often overly complex dilemmas were posed for which they were not prepared. In the classroom, moral dilemmas were posed in teams (the number of students depends on the size of the group), followed by a debate and later each student individually filled out a questionnaire that they gave to the teacher. Due to the duration of the activity, it could only be proposed once during the development of the subject in the semester and it represented a large correction workload for the teaching staff. This implied that transversal competence was worked on in the classroom in one session, and the rest of the course was relegated.

However, carrying out these classroom practices allowed the design of a rubric with which to evaluate the students' work, and provided evidence with which to justify their grade. It also made it possible to diagnose the level of competence of the students in this subject, reaching the conclusion that the demand of the dilemmas was for students in higher grades.

PROPOSAL FOR A NEW ACTIVITY

With the experience acquired in previous courses, and with the conviction that the ethical and professional responsibility that our students must have is essential to achieve their professional excellence, an activity was designed to work on and evaluate this transversal competence in all classroom sessions.

The activity is planned taking into account that it will be carried out in the second year of the degree and that the first level of mastery in this competence will be acquired. This means that: "The student body will be able to question reality and be aware of the concepts and values from which it is built." Figure 1 shows the rubric designed to evaluate competence.

Finally, the designed activity consists of preparing individually or in small groups a presentation, of a maximum of 5 minutes, to present in the classroom a news item published in the press or any media, where inappropriate behavior on the part of the student is presented. individuals or companies. These inappropriate behaviors may consist of cases of corruption, poor professional practices, poor waste management, causing ecological damage, etc. Preferably the issue will be related to civil engineering, but it is not essential.

The presentation will present the facts and comment on at least the following aspects:

- Agents involved in the case
- Identification of inappropriate action
- Identification of the motivation to carry out the inappropriate action (economic enrichment, professional advancement, fear of possible retaliation, etc.)

The presentation will be followed by a debate among all the students. And based on what happened in the classroom, and with the support of the rubric shown above, the teacher will evaluate the students.

If the work is carried out in a group, all group members will obtain the same grade for the presentation, but depending on the degree of participation in the debate this grade may vary.

Descriptors				
Indicators	D: not reached	C: under development	B: well / adequate	A: excellent / exemplary
Become aware of another way of seeing and perceiving things	It shows difficulties in understanding that there is a plurality of ideas and people who consider and value reality differently than their own.	It accepts other people's judgments without questioning.	It assumes the differences explicitly and reasonably.	It incorporates ideas from others into their own reasoning and judgments.
It critically accepts new perspectives, even if you question your own.	It only takes into consideration, one's own perspective or that of those who are most involved in the course of an action and avoids the point of view of third parties.	It critically maintains what must be preserved in a dialogic positioning in a reasonable positioning.	It captures and shows sensitivity to the needs and interests of others, their feelings, values, opinions and reasons.	Dialogue constructively with the aim of contributing to understanding and solving problems, respecting and recognizing the validity claims of other people.
It differentiates facts and opinions or interpretations in other people's arguments.	It does not differentiate opinions or judgments from subjective facts.	It questions judgments or decisions based on opinions, evaluations, etc.	It differentiates objective facts from opinions and evaluations	It justifiably analyzes judgments or decisions based on opinions, evaluations, etc.
It reflects on the consequences and effects (practical implications) that decisions and proposals have on people.	There is no evidence that he knows the Effects of the proposed decisions	It provides for the practical implications of decisions and proposals	It analyzes pros and cons of the Effects of the proposed decisions. Noticeably improves the proposal or decisions due to the assessment made.	It is able to analyze pros and cons and gives importance to an adequate evaluation of the proposed decisions.
It recognizes the ethical and deontological concepts of the profession.	There is no evidence that it questions the reason for the ethical sign of some basic principles.	It expresses basic moral opinions based on the application of some principle or specific professional situation.	It expresses moral opinions about the correctness or incorrectness of an activity or action.	It is capable of elaborating arguments where moral principles and judgments linked to the profession come into play.

Figura 1. Rúbrica para evaluar la CT-07. Responsabilidad ética y profesional.

RESULTS

The activity presented has been carried out since the 2015-16 academic year, in the second-year subject "Construction Materials", and the result so far is very satisfactory. The advantages it presents compared to the activities carried out previously are:

- Transversal competence is present in all classroom sessions, which guarantees its presence throughout the course.

- When making presentations and oral debate, the teacher present in the classroom can carry out the evaluation quickly, agilely and directly with the help of the rubric. This avoids lengthy correction tasks for written work.

- The evidence of the evaluation is the news presented by the students in any format (.pdf, ppt, etc.)

- The students are active during the debate, incorporating diverse points of view and enriching the activity.

- Debate must be used by the teacher to ensure the acquisition of the intended learning outcome.

So far all the students who have carried out the activity have obtained a positive assessment in acquiring the planned learning result.

CONCLUSIONS

A way of working and evaluating the transversal competence "Ethical and Professional Responsibility" has been presented that is valid for the required level of mastery and that allows acquiring the expected learning result. The described activity allows this competence to be introduced in each class session while providing a simple and quick way to evaluate students with the help of a rubric and with the acquisition of evidence of learning.

However, the authors consider that including specific subjects on ethics and responsibility in the curriculum is the most appropriate way to guarantee the acquisition of certain skills in university studies. Only in this case would it be given importance: "A society demonstrates that a subject seems essential for the training of a professional when it explicitly includes it in its study plan" (Cortina 2013).

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