

Soft Skills: how to make the young engineers aware of their new talents? (EESD2018)

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Abstract

The competency framework attached to the Life science engineering Master at Gembloux Agro-Bio Tech, University of Liege (Belgium) is composed of technical and scientific skills but also soft skills which are not connected to academic courses. For the training of these skills, university needs the collaboration of the professional world. Therefore, the role of our teachers evolves towards a guiding or mentoring role. They will help students to analyse their professional experiences in order to shape their professional identity, to bring to light their acquired skills. This article describes how the portfolio, used as internship's report, will help students to gain the self-confidence about their abilities and how professors can use these reflexive analyses to evaluate the acquisition of these soft skills.

1 Introduction

The “Commission des Titres d'Ingénieurs” (CTI, 2006) defines engineers as individuals who are able of resolving technical, practical, often complex and, usually, new problems. For a long time, recruitment and selection processes concentrated on hard skills which are attached to technical and scientific skills. Today, employers give much more importance to so called soft skills which include teamwork, management, communication and professional identity. In the first part of this article we will describe the philosophy followed from the design of our competency framework to the identification of the learning activities which support it. In a second part we will describe the particular case of the softs skills for which our professors feel less comfortable. This article will describe the procedure put in place for the first time this year to allow students to acquire these skills and become aware of their acquisition.

2 From the identification of the skills to the implementation of learning activities in our cursus

In order to prepare efficiently our students to these competencies we built a competency framework as the keystone of the curriculum. The competency is by definition general and complex. It is quite challenging to define precisely which learning activities train it efficiently. To be more explicit the competencies must be developed into real situations. That's why we translated these competencies into relevant professional situations. The professional situations take into account the extent and diversity of the resources, skills and abilities that the competency needs in this context. It's therefore the translation of the competency in the professional context. The professional situations are more concrete for the teachers. Although the professional situations are more concrete, there are not less complex. It's difficult to imagine learning

activities that will train our students to this high level of complexity without reaching some intermediate states. Developing a professional situation takes time and involves going through various stages of development. Dreyfus (1980) established that in the acquisition and development of a competence, a student goes through five successive levels: novice, beginner, competent, proficient, expert which reflect various changes which take place during the acquisition of a competence (Hallam, 1992). Progressively, and as the result of acquiring a certain level of 'professional' experience, the novice ends up being an expert; a professional able to exercise his or her profession in an autonomous and considered way, offering appropriate services while respecting professional ethical values (Cheetham, Chivers and Hardcover, 2005). This justifies the concept of 'lifelong learning' and will oblige some teaching staff to reconsider their belief that they train experts across a large range of areas. Although the two most complex levels are only achieved after several years of professional experience, the others are usually acquired during the student's education. This notion of progressivity was therefore incorporated in our competency framework. In most situations, we decided to address the three first levels, each level being certified by a precise activity in the cursus. With these different stages description, it is easier for teaching staff to structure their courses and to organise appropriate and varied learning activities in order to support students on their way to skills acquisition. Figure 1 shows the trajectories development of the professional situation: "Design and size monitoring and production equipment in an agro-environmental context". The courses implied in the development or the evaluation of each stage (four in this example), are identified. In accordance with this matrix, the professors developed specific learning activities and adapted evaluations.

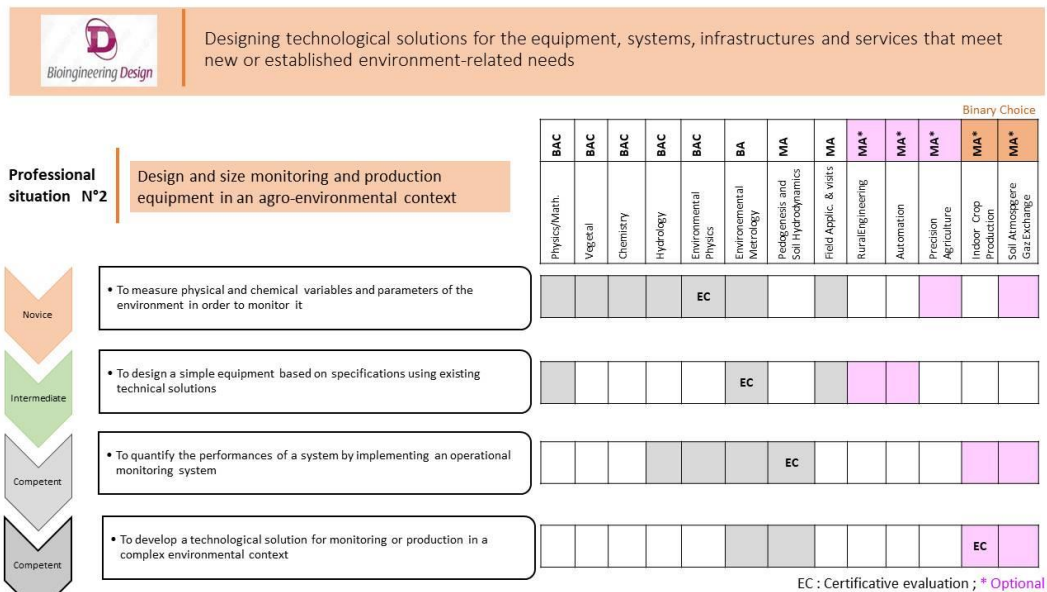


Figure 1 : Matrix development trajectories versus courses implied in the learning or the evaluation of those different development trajectories of a specific professional situation of the competency framework.

3 The special case of soft skills training

Regarding soft skills, the approach is much more difficult (Chamorro-Premuzic *et al.*, 2010; Haselberger *et al.*, 2010; O ’connor *et al.*, 2016). These skills are not connected to specific tasks trained during courses. Of course, some contents can be provided for students in order to “practice” their professional behaviours, but the complexity of the situation, the interaction with colleagues, the context of hierarchy cannot be presented through courses as specialized as technical and scientific ones can be. University education is unable to mimic workplace and complexity. Professional identity development is fostered by the authentic experiences of students in workplace through internships for example (Billett, 2009; Bowen, 2016).

During their internship, the students can observe and use their observations for shaping their own professional behaviors. But they can’t do this without help, without advises and preparation. The professors still play a crucial role in students’ identity building. University has to assist students in learning from workplace experiences (Trede, 2012). For example, the professional situation “strengthen his/her skills and his/her critical thinking” is clearly part of what is called the professional identity (Figure 2). The critical thinking, the professional ethics, the deontology can be discussed during some courses but it is during the internship that students can really develop this particular skill. During their internship, the graduates can compare themselves to a professional community, they are better positioned to develop as professionals themselves (Trede, 2012).

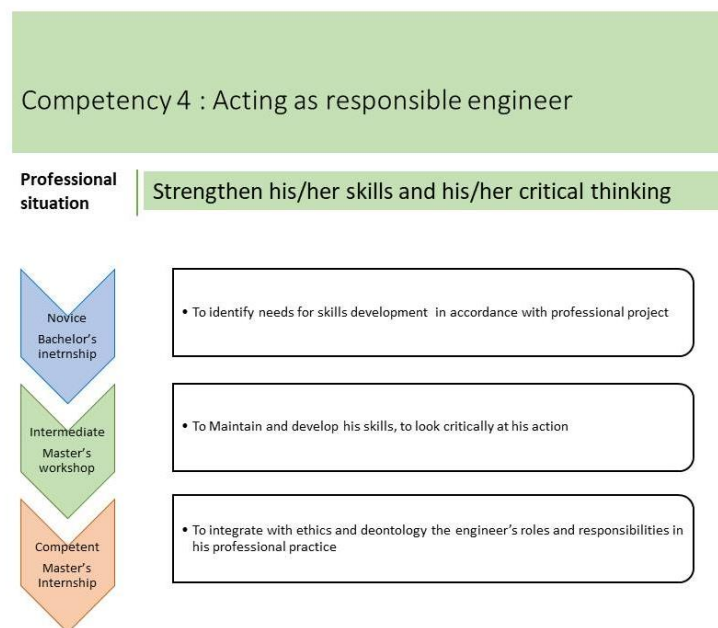


Figure 2 : Description of the development trajectories of a professional situation attached to a soft skill

But, professional ethics cannot be acquired only by osmosis in the workplace. Schön which is in favor of immersion learning in professional context insists on the importance of what he calls “Reflecting-on-action” (Schön, 1983). The professional ethics can be integrated progressively, when students encounter some professional situations of course but especially if they analyze some actual experiences, examine how decisions are made, processes are developed and finally thinking about how they would have reacted in similar situations. Reflecting-on-action is crucial to improve one’s capacity to act within a professional

community and avoid repeating mistakes (Schön, 1983). Therefore if the learning of professional ethics is beyond the control of university, the process of reflection which is critical to develop this "professional posture" is the job of the university.

The role of the professors and the university concerning the soft skills development is therefore original compared to the classical technical skills. First of all, it is crucial in the learning process that students are proactive during their internship. They have to pay attention to those professional situations in order to analyze them. Professors' role is to instill curiosity but mostly to encourage commitment to force students to confront their beliefs with the current professional situation in order to analyze it and build their own identity (Brookfield, 2012). If students form a professional identity on their own, without comparing their beliefs with their colleagues and professors, the risk is that they will simply imitate what they observed rather than critically evaluate those observations in relation to context (Trede, 2012). It is important to give the opportunity to students to share, critically analyze their observations and experiences with others students, with their professors. This step will help students to shape their professional values and build their professional identity (Brookfield, 2012). Students who critically observe practice and practice critical thinking can become more professional.

4 Portfolio as tool to help students to shape their own professional identity

A portfolio is the tool which is the most adapted to encourage personal reflection on experiences, to reflect the learning and the competences development by the students (Tardif, 2006; Bélanger, 2008; Prigent, Bernard and Kozanitis, 2009; Berthiaume and Daele, 2010; Michaud, 2012; Berthiaume and Rege Colet, 2013; Poumay, 2016). It provides a useful link between the academic knowledge and the professional situations, promotes critical thinking and makes students much more aware of their own learning, of the quality of their experiences. This last point is really important because too many students perceive themselves as under skilled and don't feel ready to step into professional working life at the end of their curriculum.

According Tardif (2006), "a portfolio is a purposeful collection of selective traces selected by the student in order to reflect his/her learning". But building a portfolio is not just collecting information without distinction. To become a proof of learning and a way to certificate the skills acquirement, a portfolio must be a "bundle of evidences"(Poumay, Tardif and Georges, 2017). According to Poumay et al., an evidence is a selected trace commented by the student him/herself (Poumay, Tardif and Georges, 2017).

Literature presents the reflective learning approach as a cyclic process which asks the students to collect information about his/her learning, to select the most pertinent and more importantly to analyse his/her experiences. This process of reflection is the key stage where students will integrate new information, realize the acquired skills and can plan his/her learning by selecting the activities which will help him/her to progress (Bélanger, 2008; Poumay, 2017; Stewart *et al.*, 2017). In this step the student needs guidance, feedback, advice from professors. In literature, this process of mentoring is recognized as the most decisive factor in portfolio success (Bélanger, 2008; Cahour and Licoppe, 2010; Poumay, Tardif and Georges, 2017).

Since our students hardly realize their progresses on soft skills development, and since the learning and the evaluation of these soft skills is much more complex than technical skills, we introduced, for the first time

in 2017-2018 academic year, the building of a portfolio of evidences in the frame of the Master's internship. It will therefore be centred on the soft skills competency named "Acting as a responsible engineer".

Through this work, we will force students to reflect and start building their professional identity. Search traces, select and analyse them. It will help the students to acquire and perceive their real abilities. Furthermore, this reflexive work will be exploited by the teachers to evaluate if the skill is really acquired. The next section will describe the process implemented during this test year.

5 From the Master's internship to construction of their professional identity

5.1 Step 1 : "traces" Workshop

In order to help the student in this new task, a "traces" workshop is programmed before the internship. The objective of this workshop is to help students to perceive what is expected in terms of development and proof of their skills. During this workshop we explain what can be a trace. Traces are numerous (Bélanger, 2008; Cahour and Licoppe, 2010): reports, research projects, videos, pictures, observations on professional situations, comments of supervisor, mind maps, emails etc. The important point is to select the relevant traces. The traces that can illustrate the level of skill acquired.

During this workshop, the professor explains to students what is expected of them. They have to instil curiosity, encourages students to imagine the situations in which they might collect some traces during their internship. The students have to be proactive, pay attention to each situation in order to collect those traces at the right moment. Generating discussion about the traces will enhance students' observations during their internship.

5.2 Step 2 : "Sharing of experiences" workshop

The next step is to help students analysing the traces, to practice critical thinking in order to create the evidences. A second workshop is organised later, during the internship, to guide the students in the analysis and writing process. During this workshop students can present and comment their own traces. Their colleagues can react and discuss about their interpretations with the help of the professor. When students compare their experiences and their visions, they will learn from each other. The students will suggest some ideas, some resources to their peers, help to step back from their analysis, and try to evaluate the quality of the traces. This questioning will be source of learning in itself. It is important to give them the opportunity to confront their analysis to other students, to professor.

At the end of this workshop the student must be more comfortable with his/her own analysis and the redaction of the portfolio.

5.3 Step 3 : Presentation of the portfolio

At the end of their internship the students have to present their portfolio. Through this presentation they have to convince professors that they acquired the selected skills, how their internship has shaped their professional identity. The criteria of the evaluation have been explained to the students during the first workshop. The criteria will include "administrative" validity (authenticity, completeness) and criteria much more dedicated to the proof of competence. Those criteria are the relevance of the comments and the evidence that this learning is transferable to other contexts (bigger companies, global south context etc.)

In order to help student to visualize his/her progress, his/her level of acquisition, we opted for a graphical summary of the acquired stages (Figure 3). Thanks to this graphical representation the student can easily identify which skills are acquired and which ones he/she still has to work on.

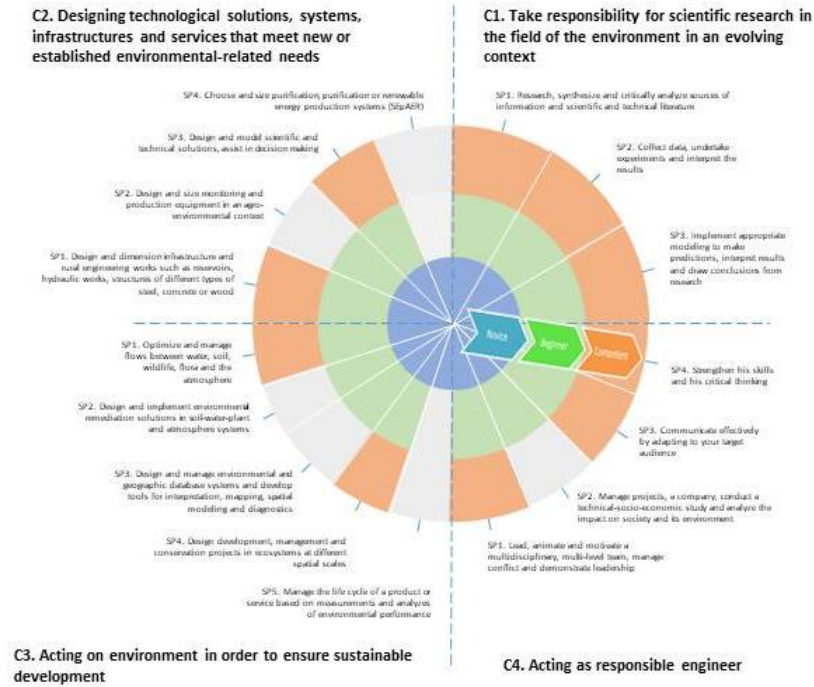


Figure 3 : Graphical representation of the acquisition of skills included in the competency framework

6 Conclusion

The professional development of students and the learning of autonomy in self-knowledge are essential complements to the teaching of technical skills. Creating holistic engineers means giving this type of approach a significant role in curricula and adapting methods and assessments. Many initiatives are taking place around the world, it is essential that schools and universities communicate and exchange on these practices, because the diversity of practices and professional environments will only enrich the approach.

Our competency framework refers explicitly to soft skills which are difficult to train and evaluate in academic courses even the most specialized. To overcome this problem we introduced a portfolio combined to the internship during the master degree.

This process combined preparatory workshops to set the general framework of the portfolio (criteria, structure etc.) and to encourage students to remain alert during their internship to traces that can illustrate the level of acquired skills. A second workshop organised during the internship will be the place of sharing of experiences. During this time, students could compare, discuss about their own traces and the analysis they made of it. The role of the professor is therefore much more a guide than a teacher. At the end the

student has to present his/her portfolio of evidences and prove to the professors but also to himself/herself that he/she developed identified soft skills.

We will follow our students during those workshops and evaluate the impact of this reflective practice on their learning and self-confidence. If this trial is a success, the portfolio could be extended to the whole competency framework.

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