New Tools to Motivate STEM students towards Early-career Self-management

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ABSTRACT

The Universitat Politècnica de Catalunya (UPC), the Czech Technical University in Prague (CTU) and the Universidade de Lisboa have recently undertaken the Engine4STEMers project, a joint initiative devoted to generating a new culture of young STEM graduates willing to assume early-career responsibilities, oriented to satisfy societal challenges. It also aims to provide guidance and motivation to help young graduates adopt early-career leadership and managerial skills. In this context, this short article describes the objectives and content of a short pilot seminar that is currently taking place at UPC and that is dedicated to the concept of service, a central educational tool of Engine4STEMers that aims to motivate students to proactively manage a successful transition from university to the labour market.

1 INTRODUCTION

1.1 The Engine4STEMers context and motivation

In order to cope with fast-changing social and economic environments, STEM graduates are increasingly in need for specific personal and professional development techniques aligned to their career evolution in the technology business [1][2]. Additionally, to embrace continuous innovation, companies get progressively flatter, less hierarchical, evolving from traditional pyramidal and segregated organizations to an organizational model of shared responsibility. This new and highly demanding context requires STEM graduates to undertake a rapid change in attitude and work
methodology to evolve from a user culture (student) to a service provider culture (employee or entrepreneur). That is, moving quickly from a task executor role (doing) to assuming greater responsibility in terms of management roles (directing) and finally to leadership roles (deciding).

While STEM graduates are usually aware of their scientific and technical knowledge, they often lack deep insight into their true potential as key drivers for innovation and to effectively impact industry and society. They are also often unaware of the skills and competences required to do so. As key players for innovation and entrepreneurship in the tech market, young STEM professionals should play a key role in developing a positive attitude in the industry and a new mindset towards sustainable development and a higher concern for the impact of technology on society. To address these goals, Engine4STEMers develops a “competences to become competent (C4C)” approach that includes a set of short teaching and learning modules arranged around three topics:

- Early career tools in the tech arena.
- Critical thinking for successful career development in STEM.
- Leadership: a STEM graduate as an effective human being.

We can find a lot of literature regarding the key transversal competences demanded by employers that, in general, give growing importance to social, emotional and higher cognitive skills [3]. In this sense, STEM education is progressively including programs devoted to developing these skills. What is scarcer, however, is space for students to reflect on their current set of skills to improve their self-awareness and self-esteem. Also, to find out what they need for their near future and, more importantly, to motivate them to acquire such skills in their transition to the labour market. This is a critical need covered by Engine4STEMers, which also aims to motivate STEM graduates to engage early in management and leadership responsibilities to provide fast added value to their employers and rapidly impact on industry transformation.

1.2 The concept of service as a self-awareness and motivation tool

Within the Engine4STEMers context, this short paper presents an innovative approach, based on the concept of service, aimed at facilitating a smooth transition to the tech job market mindset. The concept of service is envisaged to help students to improve their self-awareness and self-esteem by visualizing the key competences already developed in their academic stage, but also the early career skills that require further development and the need for career planning, with a short and long-term perspective.

The main thesis of this short paper starts by highlighting the role of universities as Higher Education service providers (Fig. 1). This service provider role has proved to be highly effective in the education of STEM students since just a few years are needed to provide them with relevant knowledge and competences related to scientific
and technical work. It also develops a strong “user” mindset in students, which is useful to maximize the benefits that they obtain from the formal and informal learning activities undertaken during their university stage. However, students must be aware of this fact and take the path to become service providers in their transition to the labour market. In other words, a young graduate must smoothly switch from enjoying the benefits of university services to becoming fully responsible for their work in order to satisfy the needs of others. This change in service direction has strong implications that may require a change in attitude and work methodology to successfully accelerate career growth in the tech market.

2 METHODOLOGY

2.1 Improving self-awareness and self-esteem

Before trying to engage students to introduce and further develop soft skills and interpersonal competences, it is important to improve their self-awareness and self-esteem. In this sense, the seminar begins with a discussion of the general competences developed within formal STEM education that complement the general and specialized knowledge provided by STEM degrees (Fig. 2).

Then, the concept of change in the direction of service (from user to service provider) is used for group discussion to help students visualize the need to undertake a change in the work methodology and attitude. These discussions are conducted through several key questions aimed to identify the main differences related to the tasks undertaken in the academy (as students) and the work in the labour market (Fig. 3). These discussions are used to help students envisage the need to further develop instrumental competences. An introduction to these skills is planned in other seminars within Engine4STEMers “Grow to your career academy”: interviews, meetings, time-management, effective communication, basic interpersonal skills, positive attitude, career planning or self-management, among others.

In order to further introduce the instrumental competences and the need to further develop them, a set of case studies has been developed based on early-career “to do” and “not to do” situations [4]. These cases are constructed around situations that
young graduates may have to face in their first jobs: work overload, poor supervision, unclear responsibility, poor communication, or interpersonal conflicts. Students discuss the likely causes that may have led to these undesirable situations and how a proactive attitude, soft skills, and interpersonal competences could have prevented the conflict.

2.2 Long-term career evolution

Finally, the seminar ends by introducing the need for long-term career planning. Discussions on formal and informal job performance evaluation lead to the concept of professional reputation, which is related to the evolution of professional competence (Fig. 4). The young graduates’ career progresses as their comprehensive competence level evolves from a junior role to senior expertise. In this sense, the key competences are presented as Personal and Professional Development Techniques (PPDT), conceived as accelerators of experience, which aim to help a young graduate to reach senior roles faster and with higher levels of competence (Fig. 4).

3 CONCLUSION

Mastering the soft skills and competences required to develop a successful professional career in today's fast-changing tech labour market may require years. Some of them can only be properly developed along with the development of experience, working on real projects, and facing real situations. In this sense, STEM academic programs should motivate students to self-manage their professional careers and to develop the tools required to do so. This short article has presented an innovative approach for this purpose.

REFERENCES


