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# CAREER DECISION-MAKING LEARNING ACTIVITIES IN STEM: AN INTEGRATED CAPSULE MODEL EARMARKED FOR HIGHER AND VET EDUCATIONS

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## Abstract

Employability after graduation depends on many factors. This paper presents an innovative approach integrating 'professional learning capsules' in curricula. It shows how students should approach career decision-making in complex professional situations, and how higher education institutions and VET schools can contribute to strengthening their learner soft skills of decision-making and judgement. A comparison between the professional programme of Fundacio Universitat Empresa de les Illes Balears in Spain, Reykjavik University and IMT Atlantique in France is presented with recommendations. The development of a course on the reflection of the professional project, composed of capsules all along the curriculum, allows students to think upstream about their choice of first job and medium career perspective. This course, in the form of a continuum for three years with marketing approach, brings student maturity, greater decision-making ability in volatile, uncertain, complex and ambiguous context and reinforce soft skills. This conceptual proposal may assist academic leaders and flexible curriculum designers by identifying learning areas and capsule-like learning activities, as a transferable result in their context. As new prescriptive standards and requirements of career guidance training and decision-making appear for higher education, the approach could contribute to better train students, as future STEM leaders, with rational but also emotional intelligence.

Keywords: career guidance – transition to work – first job – professional project – curriculum development – international comparison in higher education – career decision-making – VUCA career

## 1 INTRODUCTION

As future managers, consultants or technological experts, students in STEM (Science, Technology, Engineering, and Maths) require not only scientific and technical skills, but also soft skills and decision-making abilities to face complex professional situations and environments. This is especially the case in new professional contexts, as seen today with the fourth industrial revolution, but also in the context of the 2020 Covid-19 economic impacts in several countries which had to choose confinement in a strong volatile, uncertain, complex and ambiguous (VUCA) context. In their key to employability, Dacre Pool & Sewell [1] argued that employability after graduation depends on many factors, including subject-specific knowledge, understanding and skills, emotional intelligence, work and life experience, career development, and reflection and evaluation. Students must be self-aware of their weaknesses, their personal qualities to improve, and the strengths that will allow them to face with greater success a world/professional environment that are increasingly VUCA [2]. However, traditional STEM programs do not place enough emphasis on the training of leadership, management, communication and personal development skills despite the recommendations, as assessment criteria, in international standards for accreditation or quality assurance systems.

After a comparison between three universities in France, Spain and Iceland, the proposition is that students will be better prepared for professional practice and their soft skills development thanks to an integrated capsule teaching & learning model, in favour of curriculum flexibility. This paper presents an innovative approach with such 'Professional capsules' tested in Fundacio Universitat Empresa de les Illes Balears in Spain, partner of the DAhoy European project on VUCA decision-making skills (www.dahoyproject.eu). Temporal issues of leaners in career decision-making are then discussed before proposing original capsule-based courses that have been developed for a 3-year STEM programme with specific and progressive learning outcomes.

# 2 INTEGRATED CURRICULA FOR TRANSVERSAL DECISION-MAKING SKILLS

Diploma and graduate STEM qualifications greatly facilitate successful applications for first job offers and wide open career possibilities in many economic fields, especially for graduate engineers who may often exercise their potential as leaders, managers and future decision makers. A career in engineering may be appealing due to the prospect of a good salary and dynamic work environment; however, there may be challenges for students wishing to enter their first job [3].

Most often, students do not understand the reason they need to 'learn to be employable and manage their career' and thus judgement and career decision-making skills are a key of professional and personal development. The survey also revealed that students do not know the perceptions of engineers and they don't identify the motivating factors that contribute to the decision of the first job. They are not aware of reflective needs that the professional project requires and the investigation in terms of network, contact with alumni or professionals. During their years of study, student career choice is often still unclear and undecided, even postpone close to the end of their studies. Graduating engineers face many challenges in their transition from college or master degree to career [4]. Freshmen students struggle to identify career directions, inhabited by stereotypes. Uncertainty and indecision often result from student appraisal of their career kaleidoscope, including volatile opportunities but also uncertainties and ambiguities.

## 2.1 Various decision-making factors

Motivation factors for the first job were analysed recently in some STEM HE or VET institutions [5, 6, 7]. Student respondents mostly considered the content of the mission in the job as a primary criterion, followed by job well-being, style of management, culture and matching their core personal values. Other criteria mentioned match across to the career kaleidoscope such as teambuilding, responsibilities and autonomy, position or titles ('prestige job'), location (local/international), training options and lifelong learning, time and style management, facility of career changes to face up difficulties, etc. With six dimensions, Figure 1 lists and structures such different criteria of choice from an annual survey of the integration of young graduates in French so-called 'Grandes Ecoles' (engineering and business degrees at master level).

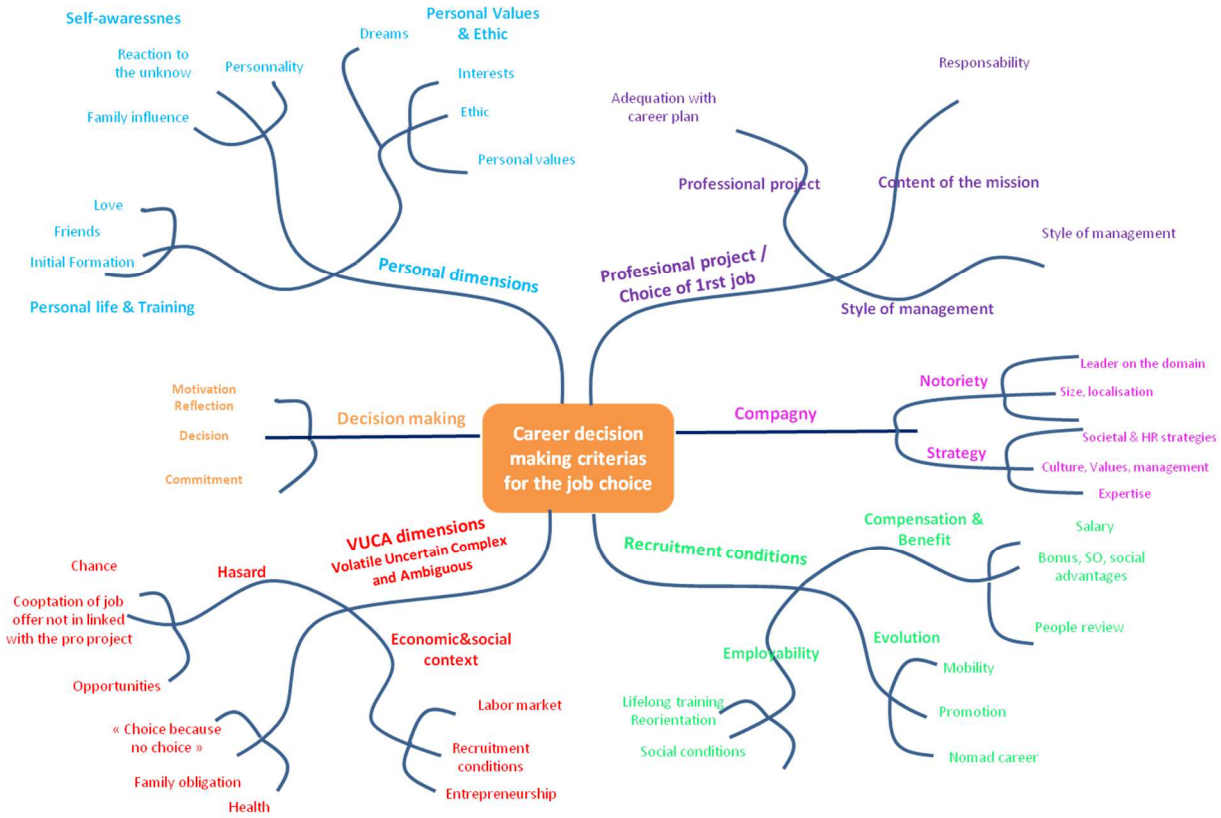



*Figure 1. Criteria of career decision-making for the first job viewed by French students.*

## 2.2 Comparison of career guidance courses

How to reinforce STEM students career decision-making skills, to take good career decisions at right times? To facilitate the learner career decision-making process, a mapping of career guidance courses in three universities is proposed:

- IMT Atlantique, France, has a career-orientation course of 63 hours obligatory for the students, since 2003 included in the three-year curriculum;
- Fundacio Universitat Empresa de les Illes Balears, Spain, created a department of professional insertion which proposes to all students on demand optional collective short courses and offer guidance services;
- Reykjavik University, Iceland, has a career centre which offers individual and optional guidance services.

For each of these institutions, Table 1 maps the career guidance courses and offers with periods, number of students, pedagogical style, number of hours and credits, faculty staff, a.s.o.

*Table 1. Mapping of career guidance courses in French, Spanish, and Icelandic Universities.*

| Criteria | IMTA (France) | FUEIB (Spain) | RU (Iceland) |
|---|---|---|---|
| Period in the formal programme | 3 years | 3 years | 3 years |
| Number of students | 1,000 | 13,000 | 1,500 |
| Pedagogical training style | Conferences, collective professional workshops, integration and orientation weeks.<br>Personal development (Test, MBTI). | Possibility to contact the career centre online for asking questions.<br>Possibility to take part in workshops. | Possibility to contact the career centre and to have a face to face coaching. Personal tests (VIA) with debriefing. |
| Individual or collective approach | 1- Collective<br>2- Individual face to face coaching if required by a student. | 1- Individual<br>(distance learning advice)<br>2- Collective workshops. | 1- Individual<br>(face to face) |
| Mandatory or optional for the students | Mandatory<br>in the curricula | Optional | Optional |
| Number of hours per students/year | 23 hours per years | 0 to 60 hours/year | 0 to 15 hours/year |
| ECTS | 3 ECTS | 0 ECTS | 0 ECTS |
| Learner assessment | 3 evaluations | No evaluation | No evaluation |
| Expectations of the students | Discovery of the engineer jobs, E-pro-identity, networking, recruitment advice, Job forum | Marketing Professional identity, recruitment advice<br>Job events | Individual coaching, Job fair<br>Mindful development |
| Intercultural students dimensions | The first job starts a linear career/no right of errors | Motivation to create the 1rst job (entrepreneurship). | Choice and time to decide |
| Career centre staff | 1 pilot permanent (HR profile), 10 external consultants | 10 permanent (generalist profile) and external consultants | 3 permanents (psy & orientation profiles) |

## 3 TEMPORAL ISSUES IN CAREER DECISION-MAKING TRAINING

The new model of career guidance focus on assisting learners plan their life using identity and adaptability. Identity means helping people know their strengths, intentions and their story to shape their choices. The students can make the difference between their vocational belief/influences/fears and become more

confident in themselves and adaptability, knowing how to reflect and revise their choices when the time comes. The recommendation to embrace career decision-making [2] become a no-brainer.

Many students tend to delay their implication or show low intrinsic motivation in courses if not linked to a just in time need they have (e.g. right before an internship interview or job fair). To take up the challenge of 'too late' motivational factors, the DAhoy project career decision-making team has set up the 'YOU' continuum that covers a 3-year curriculum, with capsules structured as follows:

- Year 1: '**Yourself'** involves students using self-awareness to define their professional profile and describe their skills properly. Self-awareness of DOTS Model and tool is used, which deals with self-assessment and the ability to identify and articulate motivations, skills and personality as they affect career plans. However, this is not always a logical order to achieve the aims of career planning, even facing VUCA circumstances.
- Year 2: '**Open-mindedness**' involves being open to a variety of career projects. The goal is to help students to become more Opportunity Aware and in workshops, we identify opportunities and build the ability to research them.
- Year 3: '**Up to you'** highlights the fact that if students want to be in control, they will have to be determined to anticipate, take action, commit themselves, make decisions and get off to a challenging start in their work life. Finally, the Transition Learning helps students achieve an understanding of how to seek and secure opportunities.

## 3.1 Capsule model to meet temporal issues in career decision-making training

The training capsule provides guidance regarding the making of strategic decisions by students during the university programme that can be fundamental for their future work itinerary. In terms of image and to improve the attractiveness of related offers in institution courses, a marketing action is carried out. For example, a career focused workshop is turned into a 'capsule' of vitamins to give student perception of strength and become an actor of its future (e.g. in Figure 2 orange colour can accentuate metaphor with vitamin C).




*Figure 2. Capsule idiom*.

The metaphor of 'capsule' in two-part envelope of the capsule allows different learning themes to be linked in one but also to contain and meet career-based learning outcomes. A DAhoy-like capsule is a short Teaching & learning unit with targeted learning outcomes and learning style of 2 hours to 2 days maximum. The capsule model aims to develop various abilities, but with a common gaol, e.g. to:

- identify the talents and competences of each college student to decide their professional project;
- understand the stakes of consequences in the decision-making process.

As experimentation, the University of the Balearic Islands this model for two years. The results are positives: per year, the career centre receives 5,600 solicitations, among 13,000 students. But the capsule, mainly formative and thus on compulsory, is intended for the Master-level students. The idea is that students can make appropriate decisions and have a purpose that allows him to build his future. The career centre organises 2 to 7 capsules per months mainly the 1st semester for senior students. Each capsule session can receive at least 7 participants and a maximum of 25 participants. The capsule session can be a conference or a workshop/hands-on course depending on the speaker. The timing depends on the theme and the speaker (2/3 hours). Attendance is not mandatory, but the students sign the attendance sheet. The teacher will interact with the students, to know what their skills, competencies, what moves them and what objectives they have regarding their professional future.

As strengths, the marketing approach has a positive effect on students. There is a varied offer of sessions such as a training catalogue. The student can register online quickly. As weaknesses the student registers but does not necessarily present to the session because he/she does not have the obligation to participate. Absenteeism is therefore present and it is a cost to the career centre. Sometimes the student does not register but he comes to class. The organisation then becomes difficult.

To keep registrations going and rich in these observations, we've come up with the following solutions, echoed in Figures 3, 4 and 5:

- The title of the capsules are to be attractive (ex: instead of 'CV and cover letter', the title of the capsule could be 'Make the difference with a good resume and a cover letter');

- The layout of the capsules (and therefore the professional project) is to be thought out and presented at the start-up with a guidance counsellor;
- A mix of collective and individual pedagogical sequence could be considered;
- Mandatory capsules (especially for the E-identity) and optional capsules (especially personal development) are to be implemented;
- Presentism is to be required and a written inscription could be recorded in the student's folio;
- The specific courses 'Manager', 'Expert', 'Entrepreneur', 'Consultant' could be given as examples to encourage career vocations among students;
- ECTS credits are to be allocated, as capsules meet graduate outcomes and transversal skills, if the student justifies a frame of capsules during the studies, with a staggering time (and an accumulation of capsules at the end of the course);
- A step point is to be made early to enhance the cross-cutting skills acquired. Ideally at the end of the course, an oral on the skills acquired is performed with the guidance counsellor. A synthesis is written in a lifelong passport or folio for formal recognition of learning.

## 3.2 Skills for career decision-making

The European DAhoy project motto is 'good decisions at right times'. DAhoy is grounded in a clearer understanding of the perceptions and expectations of students and fully aligned with the strategic VUCA challenges of the partners to accelerate pedagogical innovations. As a major outcome, seven decision skills are proposed for VUCA training [8]: D1 Recognise and qualify the VUCAlity of a family of situations, D2 Analyse VUCA situations, D3 Make judgement in VUCA situations, D4 Face complexity of VUCA situations, D5 Organise and implement actions in VUCA situations, D6 Take responsibilities in the decision process in VUCA situations, and D7 Learn from his/her experience of VUCA situations. Regarding the career decision-making, each skill is specified for each capsule in the new program and the criticality level: 'high level', 'medium level', 'low level', 'no representation'.

A formative evaluation improves the judgement skills on the part of the students. For each year of YOU programme, evaluations have been created with decision objectives and formal deliverables. The YOU method can thus be quickly integrated as a ready-to-go toolkit in career training courses with evaluation and accreditation, to allow any university to implement it more easily and autonomously.

# 4 SYLLABUS FOR CAREER DECISION-MAKING TRAINING

## 4.1 YOU Year 1: Self-awareness to begin professional project reflection

If considering a 3-year curriculum (but the approach can be transferred to 4, BSc, or 2, MSc level), during the first year of their curriculum, students learn how to develop their professional profile, use their online profiles relevantly and cautiously, and build up their skills portfolio. Besides, they gain the set of skills they need to interact with corporate staff. Students thus gain in self-confidence and develop the ability to adjust their education and training to their aspirations, thanks to the capsules presented in Table 2 syllabus and Figure 3 pedagogical programme.

*Table 2. YOU* Year 1*'* Yourself' *syllabus, Mandatory (M), Optional (O), Collective (C), or Individual (I).*

| **Y**OU **capsules** | Pedagogical objectives | M/O | C/I | DAhoy skill and level of criticality [8] |
|---|---|---|---|---|
| 'Self-confidence, the top ten of the skills'<br><br>'Self-awareness test' | Emotional intelligence skill rooted in the ability to recognise one's own. Emotions according to Goleman, [9]. The assignment for this topic is to apply at least one positive habit over the course to cultivate a positive mindset. This personal development is the first step of management leadership attitude.<br>Decision tools: VIA characters test | M<br><br>O | C<br><br>I | D3 Make judgement /Medium |
| 'Make the difference with a good resume and a cover letter.' | The outcome is the creation of a professional identity (including one's e-identity), and students are also introduced to the process of personal branding.<br>Decision Tools: QQOQCP | M | C & I | D5 Organise & implement actions /Medium |

| | | | | |
|---|---|---|---|---|
| 'Keys to make my future more valuable' | Using mind maps to decipher job postings. Decision tools: mind mapping for horizontal vision. | M | C | D5 Organise & implement actions /Medium |
| 'Learn to manage your feelings of failure to achieve success' | Positive mentality and setting out arguments competitively, considering the opportunities near. Self-motivation is about the ability to motivate oneself and others. Decision tool: diagram KJ | M | C | D6 Take responsibilities in the decision process /Low |
| 'Professional project: let's start!' | Scenarios of orientation and career paths. Know and use your values and aspirations even before finalising a favourite professional project. | M | C | D1Recognise & qualify the VUCAlity /Medium |
| 'Competencies portfolio' | A portfolio of evidence knowledge, skills that will be updated throughout their curriculum and later in their work life. Pedagogic Tool: Self-analytical thinking is co-constructed and shared in peer learning session. | O | I | D5 Organise & implement actions /Low |
| 'Testimonies of alumni and professionnal managers' | Testimonies of alumni to discover the engineer and manager jobs. Decision tools: Reality of the labour market | O | C | D3 Make judgement /Low |
| 'Coaching' | Coaching in face-to-face feedback, help students to gain in maturity, reinforcing strengths, skills, character, feelings, and motivations. Decision tool: individual action plan with SMART objectives. | O | I | D3 Make judgement /High |
| Evaluation | Pitch E-identity Decision tool: Feedback of professionals | M | I | D6 Take responsibilities /High |
| Certification | 2 ECTS | M: 20H O: 10H | | |

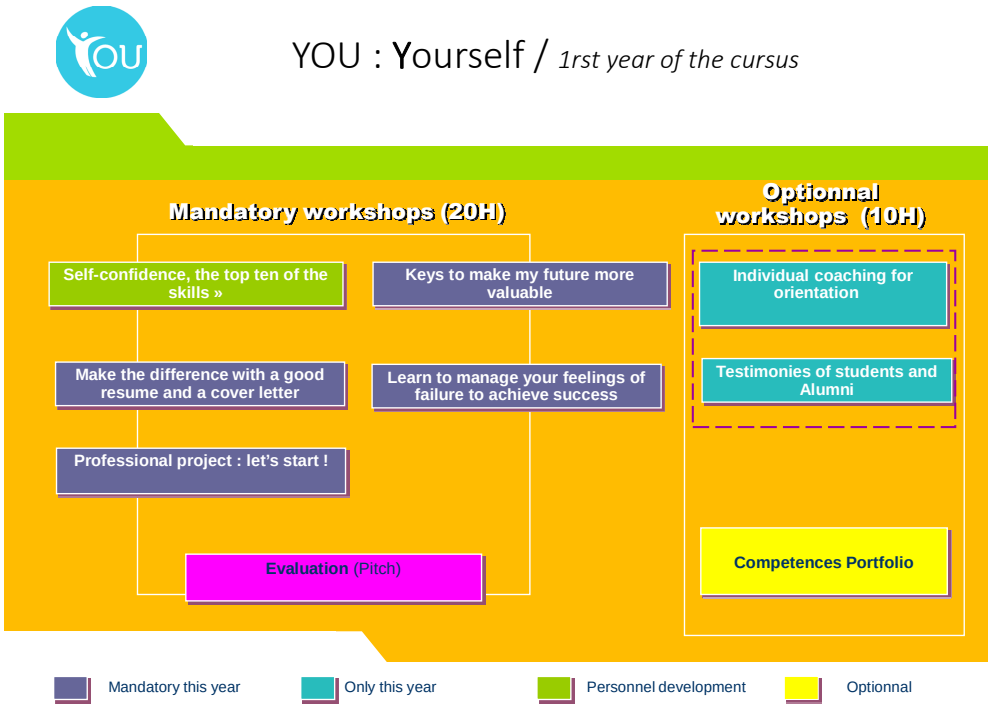



*Figure 3. YOU Pedagogical program for 1st year*

## 4.2 YOU Year 2: Open-mindedness and choice

During the second year of their curriculum (before their final year), students plan their career for a variety of situations, and update their professional profiles and skill portfolios, as seen in the capsules of Table 3 syllabus and Figure 4 pedagogical programme. Students are now capable of anticipating and learning from failures. There is indeed a huge amount of training opportunities and career prospects, but all are uncertain, changeable, complex and ambiguous. The student's corporate network is expanding and is used to make selected contacts and open options in the 'hidden market'.

*Table 3. YOU Year 2 'Open-mindedness' syllabus, Mandatory (M), Optional (O), Collective (C), or Individual (I).*

| Y**O**U capsules | Pedagogical objectives | M/O | C/I | DAhoy skills and level of criticality [8] |
|---|---|---|---|---|
| 'Personal Brand: become visible on social networks' | E-identity on linkedIn and networking. Decision tools: experiences of professionals, recommendations. | M | C | D4 Face complexity /Medium |
| 'The job interview a great opportunity is in your hands!' | Recruitment tools. Students compare recruitment company processes and sharpen their arguments in a competitive approach. Decision tools: comparison, simulation play roles. | M | C & I | D4 Face complexity /Medium |
| 'How to speak eloquently in public to enchant your interlocutors' | Oral Communication. Communication is significant in the engineering professional role and in studying communication, students learn various non-verbal and verbal communication tools, how to ask good questions and how to listen actively. Decision tool: Feedback and analysis | M | C & I | D6 Take responsibilities in the decision process /Medium |
| 'Do you want to understand the world around you? – Well, this is marketing' | Personal marketing and open-minded about other practices. Presentation Skills focus on oral presentation techniques where attention is given to body language, oral performance, and visual presentation. | M | C | D3 Make judgement /Medium |
| 'Job Casino' | Choice of professional scenarios with '6 huts' decision method. Students are encouraged to consider the range of their possibilities, and how they may start taking actions or set up a business. Tool: DAhoy card games [2]. | M | C | D2 Analyse VUCA situations /Medium |
| 'Testimonies of alumni and professionals' | Testimonies of alumni to discover the engineer and manager jobs. Decision tools: reality of the labour market. | M | C | D3 Make judgement /Medium |
| 'Coaching' | Coaching in face-to-face feedback, help students to gain in maturity, reinforcing strengths, skills, character and motivation. | O | I | D3 Make judgement /High |
| 'Visits of companies' | Company's visits in small groups to discover the reality of the labour market. Decision tool for entrepreneurship. | O | C | D3 Make judgement /Medium |
| 'International career' | Working all over the world. | O | C | D2 Analyse situations /Low |
| 'PhD or not? ' | Following the studies to become an expert or not? | O | C | D2 Analyse situations /Low |
| 'Mindfull management ' | Stress management and self-awareness for a better knowledge of their choices (personal leadership). | O | C | D5 Organise & implement actions /Low |
| Evaluation | Vision of the professional project to decide about the 1st job (and not internship). | M | I | D5 Organize & implement actions /High |

| | | | | |
|---|---|---|---|---|
| Certification | 2 ECTS | M: 20H O: 10H | | |

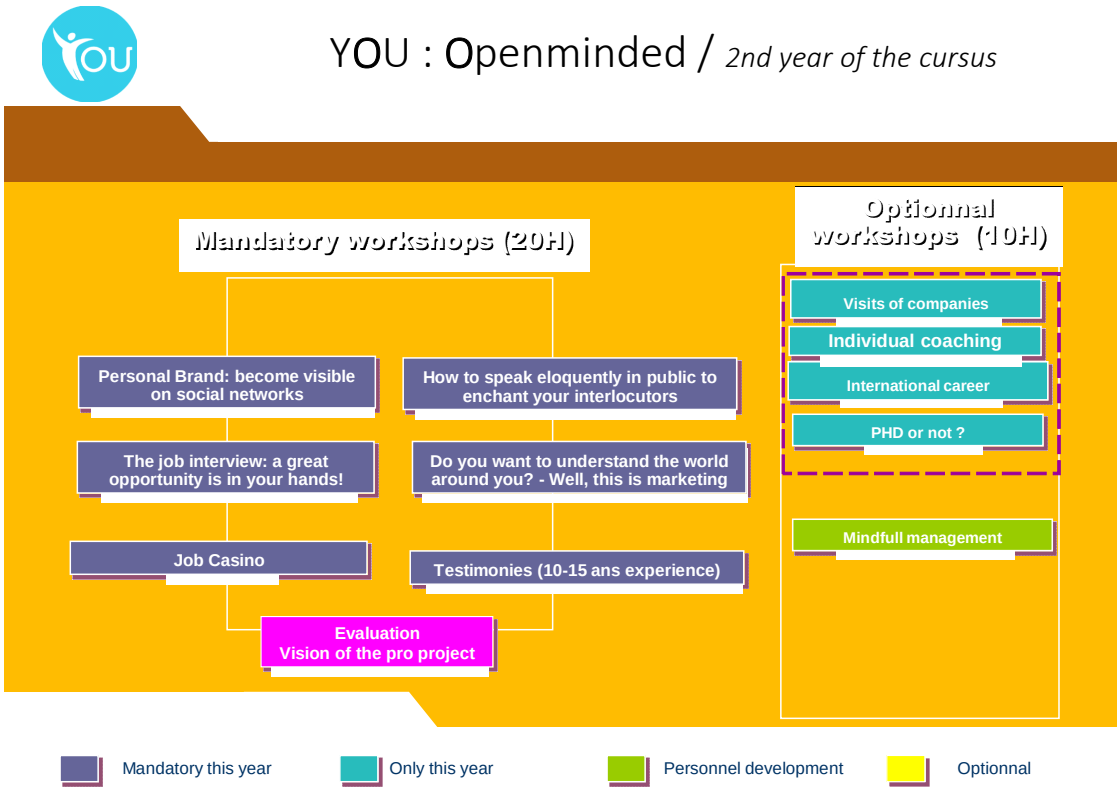



*Figure 4. YOU Pedagogical program 2nd year*

## 4.3 YOU Year 3: Orientation to become an actor of his path (Up to you!)

During the final year of their curriculum, students make up their minds about a work field and devise a strategy for their trajectory, factoring in the changeable, uncertain, complex and ambiguous environment. Support includes setting out a personal action plan ('Smart Action Plan') and managing unforeseen circumstances, as seen in the capsules of Table 4 syllabus and Figure 5 pedagogical programme.

*Table 4. YOU Year 3 'Up to you' syllabus, Mandatory (M), Optional (O), Collective (C), or Individual (I).*

| YOU capsules | Pedagogical objectives | M/O | C/I | DAhoy skill and level of criticality [8] |
|---|---|---|---|---|
| 'Negotiation compensation and benefit' | Salary negotiation and hiring conditions.<br>Decision tools: comparison, salary survey. | M | C | D2 Analyse situation /High |
| 'My future as…' | Professional project is formalised with MECE (Mutually, Exclusive, Collectively, Exhaustive) tools. | M | C & I | D3 Make judgement /High |
| 'Leadership and social management' | Interpersonal leadership and social behaviour cover how to interact positively with others and how leadership affects productivity, looking at, e.g. leadership theories, dysfunctional teams and empathy. | M | C & I | D2 Analyse VUCA situation /Medium |
| 'Teamwork<br>Team building' | Teamwork refers to the social ability to work with other people e.g. engineers, stakeholders, or customers. The students reflect on what leads to effective teamwork and personal effort with others. | M | C | D2 Analyse VUCA situation /Medium |

| | | | | |
|---|---|---|---|---|
| | | | | |
| ’Engineering roles ’ | A better understanding of the engineering professional role. Students learn more about the practice by interviewing an engineer alumni or professional manager (job, role, interaction, impacts, etc…) to have an understanding vison. | M | C | D3 Make judgement /High |
| ‘Testimonies of alumni and pro people’ | Testimonies of alumni to discover the engineer and manager jobs.<br>Decision tool: analysis of the labour market | M | C | D3 Make judgement /Medium |
| ‘Coaching’ | Coaching in face-to-face feedback, help students to gain in maturity, reinforcing strengths, skills, character, feelings, and motivations | O | I | D3 Make judgement /High |
| ‘Storytelling/how to sell yourself telling your story’ | Communication to create a start-up with storytelling technic. Decision tools: pitch to convince bankers and partners. | O | C & I | D4 Face complexity /Low |
| Turn quickly your idea into a real business | Lean StartUp1: To test to become entrepreneur | O | C & I | D6 Take responsibilities /Medium |
| ‘Lean StartUp!’ | Lean StartUp to create a business plan. | O | C & I | D6 Take responsibilities /Medium |
| Evaluation | Recruitment simulation with 2 professionals (HR and Manager for 2 points of view) | M | I | D6 Take responsibilities /High |
| Certification | 2 ECTS | M: 20H O: 10H | | |

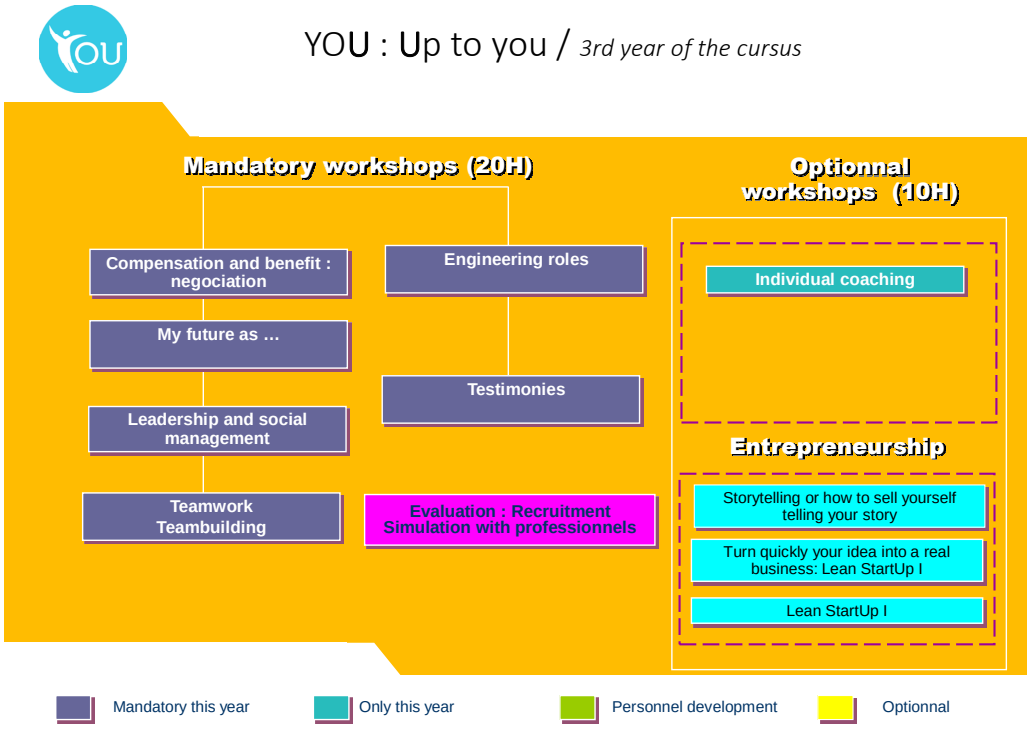



*Figure 5. YOU Pedagogical programme 3rd year*

## 5 CONCLUSION AND PERSPECTIVES

Students have a strategic importance on having a challenging job, teamwork, independence, opportunities for development, and a very participative management style. Thus, the innovative capsule programme structure proposed to facilitate student career preparations, both from a technical and managerial perspective, to enter the engineering profession; more fully understanding the various options available to them for decision-making considering a career kaleidoscope. The proposed model has several benefits. It is integrative in formal curricula, flexibly thanks to the capsule model. Curricular introduction can be incremental and iterative. Developing transversal skills, as decision-making for careers, is the key of the lifelong career management and the acquisition of leadership dimensions. It is important to train the students with a balance regarding work, health, relationships, and what brings happiness and joy daily. It also covers building skills and knowledge continuously throughout the life of an individual. The DAhoy skills [8] are used to build the programme on decision-making. The likelihood of realising expressed ideals in the first job may be more objectively questioned, or analysed quantitatively and qualitatively, when bringing in industry and former students as proposed in this model. Personal aspects such as self-confidence, values, decision-making abilities, stress related to subjects, career choices and personal anxiety, along with key skills and attributes necessary for a successful STEM professional, may also be emphasised in career counselling.

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