DOI: 10.13009/EUCASS2019-853

Attracting young talent to aeronautics

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Abstract
According to the Social Cognitive Career Theory (SCCT), the career and/or academic choices of young people are influenced by personal, cognitive and contextual factors and form gradually more consciously from childhood and primary school, through teenage and secondary school to adulthood and university, as proposed by the Life Span, Life Span Theory. Therefore, to attract young talent to the aerospace sector, we may start at an early life stage and always keep in mind the fours factors from SCCT that help identify and understand the reasons why students pursue a university course: prior experience, social support, self-efficacy, and outcome expectation. From an early age, aerospace can quickly enter the imagination of children, as shown by the story of the "Petit Prince" created by the aviator François Saint-Exupéry in the setting of the Moon. It is imaginative to build wings of wax to fly higher and higher; and tragic if the heat of the sun melts them and causes a fall.
On the one hand, it warns of the risks of flying; on the other hand, it is a story with a tragic end. Without venturing into controversial realism, there is in phantasy world plenty of room for flying machines and travels to space objects. As years pass by, the basic teaching of Science, Technology, Engineering and Mathematics (STEM), even at secondary school level, can lead to some understanding of flying in the atmosphere and traveling in space. Before choosing what studies to pursue in university, young people need prior experiences in the subject, meaning that we should promote the exposure to aerospace matters before university. In this case, it is possible to explain why balloons fly up in air; to build some paper planes, small drones or airplanes; to explain how the earth moves around the sun and the seasons; the motion of the moon around the earth and the moon cycle; the rotation of the earth and the daily cycle. All these kinds of activities can be included in school curricula or only occur in leisure times at school or outside the school with the families since they are crucial to provide students with initial impressions and information. At the same time, social support from parents, educators, and peers should be guaranteed, and these people should be made more aware of the benefits and career opportunities of the aerospace sector. After finishing secondary school, students have a vast and sometimes bewildering choice of university degrees to apply for, even restricting to STEM the options can be numerous and confusing. Therefore, young people should be encouraged by their parents, educators, and peers to pursue careers in aerospace and, for this to happen, on the one hand, the numerous careers in the sector should be spread in terms of their variety, characteristics, work conditions, and education needs. On the other hand, the sector should be promoted as technological advanced, one of the most interdisciplinary branches of engineering, an enabler of a variety of vehicles and, finally, an opportunity to integrate all these technologies in a vehicle that is safe, efficient and environmentally friendly while allowing fast travel to a wide range of destinations, some previously inaccessible. Finally, the fascinating promise of aerospace engineering or related courses must be delivered in a high-quality university or vocational courses that give the necessary knowledge, skills, and ability to reason and work in all these disciplines and their combination.

1. Introduction

"The importance of achieving balance in the supply and demand for Science, Technology, Engineering and Mathematics (STEM) labor has been recognised by policymakers and researchers as one of the key challenges of recent

DOI: 10.13009/EUCASS2019-853

times" [1, p.10]. STEM careers are introduced in the technologically most advanced and potentially most productive sectors of the labour market. Therefore, meeting the future demand for STEM skills is considered a high priority in the European Union, namely: focusing on improving the acquisition of science, technology, engineering, and mathematical (STEM) competence and making careers in these areas more attractive. To ensure the European Union (EU) economic competitiveness, two main issues must be addressed: youth interest in STEM and minorities (e.g., girls) interest and inclusion in STEM.

The global aerospace and defense (A&D) industry recuperated and experienced a solid year as passenger travel demand strengthened and global military expenditure continued to rise.
The sector can be divided into two major areas:

- Aeronautics industry and
- Air transport.

According to the European Commission, Aeronautics is one of the EU's critical high-tech sectors on the global market: the EU is a world leader in the production of civil aircraft, including helicopters, aircraft engines, parts and components, and the EU has a trade surplus for aerospace products, which are exported all over the world.
The European aeronautics industry develops and manufactures civil and military aircraft, helicopters, drones, aero-engines, and other systems and equipment [2]. The industry work involves designing components and systems and generating CAD models and drawings; work such as fluids analysis or thermal analysis; manufacturing the technology, developing and testing it; and supporting the products in service. Big manufacturing companies include Airbus, Boeing, and Bombardier, who design, manufacture and build aircraft, and Rolls-Royce, General Electric and Pratt and Whitney, who design, manufacture and build engines. Safran Landing Systems, Cobham and QinetiQ are other big names. There is an extensive network of smaller suppliers who support big companies. Productivity is considerable, and despite high employment costs, the sector is quite profitable [2]. A sizeable share of value added is spent on research and development (R&D), which is reflected in an increasing number of patent applications [2]. According to the AeroSpace and Defence Industries Association of Europe (ASD), employment in ASD Industries reached 543,000 direct units in 2016. Specifically, aeronautics provides more than 540,000 jobs and generated a turnover of close to EUR 150 billion in 2016 [3].
At the same time, Europe has one of the most liberalized and integrated air transportation markets in the world. The single aviation market created by the European Union (EU) was subsequently expanded to the European Common Aviation Area (ECAA). Over 40 percent of seats are offered by LCCs, which is the highest among all world regions. Air transport supports 12.2 million jobs and generates $823 billion within European economic activity. That is 3.3% of all employment and 4.1% of all GDP in European countries in 2016. Forecasts suggest that in 2036 aviation could see over 7.7 billion passengers and support 97.8 million jobs and $5.7 trillion in economic activity worldwide [4].
The total impacts – including those from the operations of the air transport sector itself, the impact of the air transport sector's procurement of inputs of goods and services from its supply chain, and the impact of employees of the air transport sector and its supply chain spending their wages – mean the air transport sector supported 12.2 million jobs and contributed $823 billion to GDP in Europe [4].
Air travel in Europe is expected to continue to grow at about 3.4% per year over the next two decades. This increase will, in turn, drive growth in the economic output and jobs that are supported by the air transport industry over the next 20 years. Oxford Economics forecasts that by 2036 the impact of air transport and the tourism it facilitates in Europe will have grown to support 18 million jobs (49% more than in 2016) and a $1.6 trillion contribution to GDP (a 90% increase) [4].
Every person directly employed in the aviation sector and tourism was possible because aviation supported another 4.7 jobs elsewhere in Europe. The aviation sector in Europe directly employed an estimated 2.6 million people in 2016 [4].

- Five hundred nineteen thousand of those people (20% of the total) were in jobs for airlines or handling agents (for example, flight crew, check-in staff, maintenance crew, reservations, and head office staff).
- Another 166,000 people (6.5% of the total) worked for airport operators (for example, in airport management, maintenance, security, and operations).
- 1.5 million jobs (57%) were on-site in airports, at retail outlets, restaurants, hotels, etc.
- A further 341,000 people (13%) were employed in the manufacture of civil aircraft (including systems, components, airframes, and engines) – what we have referred in this Careers Kit as Aeronautics Industry.
- Air navigation service providers employed an additional 77,000 people (3%).

According to the Air Chief Marshal Sir Stephen Dalton, President Royal Aeronautical Society, "the availability and continuous development of skilled workers is the lifeblood of any industry wanting to maintain and increase its market share and to remain a leader in the fiercely competitive global marketplace (…) Furthermore, as a generation reaches retirement, it is vital to attract more people into the industry and highlight the rewarding careers that aerospace offers, from designing, manufacturing and maintaining complex civil and defense aircraft and equipment, to the management

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of global programmes and operations – a career in aerospace and aviation offers a truly global experience" [5, p.4]. Consequently, the EU should target not only STEM but also promote youth interest in the A&D industry. Inspiring young people into engineering plays a vital role in building awareness about the opportunities in the sector; however other jobs categories such as air traffic controllers, ground handlers or MROs should also be highlighted. Therefore, is essential to provide accurate information about the careers in the A&D sector, in order to help increase the number of young people persuing aerospace careers. In this article, we will focus on how to promote youth interest in STEM and, specifically, in the A&D Sector.

2. Conceptual Framework

Significant career development takes place during adolescence. Adolescents begin to clarify their career identity [6], develop an awareness of vocational interests and realities, and undertake career-related tasks, such as career planning and career exploration, as they increasingly think about their future career [7]. Social Cognitive Career Theory (SCCT) is a recent career theory that intends to unify common elements from previous career theorists, such as Super, Holland, Krumboltz, and Lofquist and Dawis, in order to create one framework to understand the (1) development of vocational interests, (2) making (and remaking) occupational choices, and (3) achievement of varying levels of career success and stability [8].
According to SCCT [8], three social cognitive variables play a significant role in vocational development: self-efficacy, outcome expectations, and goals [8, 9, 10]. SCCT has guided some of the inquiry on the pursuit (or avoidance) of science, technology, engineering, and mathematics (STEM) activities and academic majors. Findings indicate that individual SCCT variables, for instance, self-efficacy, are good predictors of STEM interests, goals, persistence, and performance [11, 12, 13, 14, 15, 16, 17] and most studies, have been focusing on women and minorities, given their underrepresentation in STEM fields [18].
The interests and goals influence Students' career choices through the development and interplay between the individual, environment, and behavior [8; Figure 1]. SCCT proposes that a wide range of individual and environmental factors contributes to a person's learning experiences that serve as a basis for developing self-efficacy and outcome expectations. According to Soldner, Rowan-Kenyon, Inkelas, Garvey, & Robbins [19, p. 314] self-efficacy are beliefs about one's own personal capabilities, which are hypothesized to affect academic and vocational decision-making by attenuating the judgments a student makes about his or her likelihood of surmounting obstacles that may lie in the path leading to attaining the desired career. Outcome expectations, or a person's anticipated results of performing one or more certain behaviors, shape vocational development differently [19, p. 314]. Positive future expectancies are hypothesized to motivate individuals to look past proximate situations, particularly challenging ones so that they can maintain focus on the attainment of long-term desires [19, p. 314]. These self-efficacy and outcome expectations, individually or in concert, lead to the generation of interests and goals. Goals are the intentions to engage in a given activity. Then, according to Rogers and Creed [20, p. 163] "in turn, these social cognitive variables stimulate career choice actions (…) such as career planning and career exploration, which are necessary for the young person to make progress towards identified career goals". Moreover, immediate environmental influences, such as social support and career barriers, can also affect self-efficacy's influence on an individual's interests, goals, and performance.

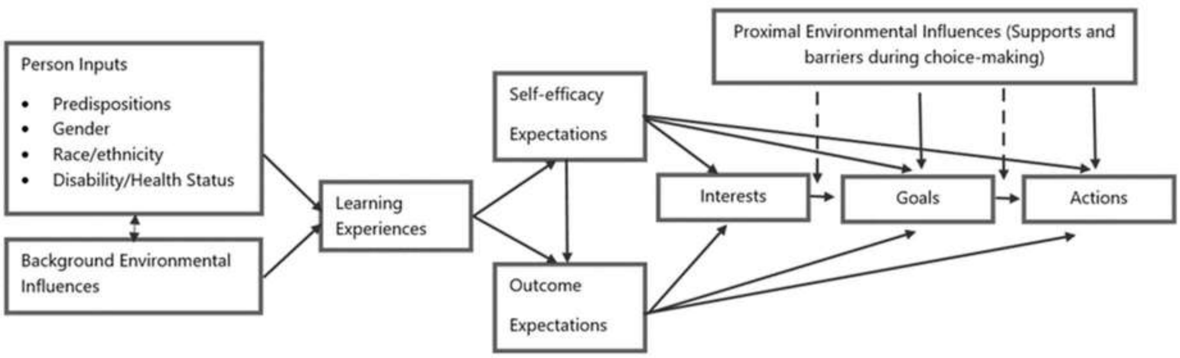

Figure 1: Model of social cognitive influences on career choice behavior [9].

Self-efficacy has been identified as a major influence on student performance and persistence (e.g., [21]). Among students in STEM programs self-efficacy beliefs have been found to influence academic performance (e.g., mathematics) and key indicators of academic motivation, including choice of activities and goals, persistence (e.g., graduation rates), and positive emotions [17, 22]. Self-efficacious students participate more readily, work harder,

DOI: 10.13009/EUCASS2019-853

persist longer, and have fewer adverse reactions when encountering difficulty than students who doubt their capabilities [23]. Hackett and Betz [24] further proposed that self-efficacy has additional positive effects on educational and career decision-making, an assertion supported by research by findings from Multon, Brown, and Lent (1991) [25] showing self-efficacy to predict both college-major choices and academic performance. Consequently, in order to attract young talent to the aerospace sector we may ground in Lent, Brown, and Hackett's [8, 9, 10] SCCT to examine the manner in which young people develop and elaborate on career and academic interests, select and pursue choices based on interests, and perform and persist in their occupational and educational pursuits on the aerospace sector.

3. Promoting youth occupational and educational pursuits in STEM and A&D sector

Given the importance of STEM skills in the future, it is essential that teachers, educators, policymakers and the community, in general, make a conscious effort to promote youth interest in STEM.

3.1 Enhance learning experiences through changes in curriculum and pedagogies

Changes in curriculum and pedagogies are crucial to increase students' opportunities to learn and practice STEM topics necessary to perform tasks successfully. This will ensure student's mastery experience, one source of self-efficacy on STEM. Interventions that target mastery experiences may include problem-solving experiences involving proximal goals since these can be achieved more quickly and result in higher performance that can raise self-efficacy more rapidly than distal goals [26].
Sanders [27] stated that STEM education should be project-based and integrate technology on the education program, in such a way students can learn how to solve real-world technology and engineering problems using knowledge of science and mathematics.
Therefore, STEM curricula should include engineering experiences, since, according to English and Kind [28, p.2], "such experiences can develop young students' appreciation and understanding of the various roles of engineering in shaping societies and how it can contextualize mathematics and science principles to enhance achievement, motivation, and problem-solving." Besides that, engineering can also bridge the learning experience across different subjects from languages to arts or history.
STEM pedagogical approaches must be altered from traditional ones, in order to support student learning. Therefore, STEM educators should:

- "Implement instructional strategies that integrate the teaching of STEM in a way that challenges students to innovate and invent" [29, p.256];
- "Use problem-based and project-based learning with a set of specific learning outcomes to support student learning" [29, p.256];
- "Create meaningful learning opportunities provided context learning is delivered using applied and collaborative learning" [29, p.256];
- "Require students to demonstrate their understanding of these disciplines in an environment that models real-world contexts for learning and work" [29, p.256];
- "Provide students with interdisciplinary, multicultural, and multi-perspective viewpoints to demonstrate how STEM transcends national boundaries providing students a global perspective" [29, p.256];
- Promote engineering design and problem-solving— (scientific/engineering) the process of identifying a problem, solution innovation, prototype, evaluation, redesign —as a way to develop a practical understanding of the designed world;
- Promote inquiry—the process of asking questions and conducting investigations—as a way to develop a deep understanding of nature and the designed world;
- Develop with grade-appropriate materials and encompass hands-on, minds-on, and collaborative approaches to learning [29, p.256];
- Address student outcomes and reflect the most current information and understandings in STEM fields [29, p.256], and
- Use appropriate technologies such as modeling, simulation, and distance learning to enhance STEM education learning experiences and investigations [29, p.256].

As reported by Marginson, Tytler, Freeman, and Roberts [30, p 110] "many countries with strong STEM agendas and results have a well-developed curriculum focus on innovation, creativity, and reasoning, accompanied by a strong

DOI: 10.13009/EUCASS2019-853

commitment to disciplinary knowledge. Concerning school curricula, teaching, learning and educational policy and organisation could usefully address elements such as:

- Robust disciplinary frameworks, noting that disciplinary thinking and disciplinary literacies are central to creative problem-solving in STEM-related learning and work.
- At the core of learning, methods of problem solving, inquiry, critical thinking and creativity, all of which can enhance both students' attitudes to, and practical competencies, in STEM fields.
- Design tasks into school science and mathematics curricula, in order to support the development in students of problem-solving skills, flexibility in thinking, and awareness of engineering design activities.
- Consideration of the inclusion of the visual and performing arts alongside strategies and programs designed to enhance the orthodox STEM-related disciplines, as in the successful STEAM policy in Korea.
- Development of assessment regimes that support the commitment to problem-solving, inquiry-based approaches, critical thinking, and creativity".

However, in order to implement these pedagogical practices, educators' have a crucial role. As Bell [31, p. 75] sustains, for learners to become STEM literate, STEM teachers should get all the conditions needed (materials, training, partnerships and others) to contribute with better STEM arrangements, involving all STEM counterparts and leading to the creation of an interdependent, cooperative and symbiotic curriculum. Actually, "teacher's perception of STEM, their knowledge, and understanding of that knowledge, is intrinsically linked to the effectiveness of STEM delivery in their classroom practice" [31, p. 61]. Also, educators may also apply the principle of social persuasion by providing effective verbal supports as well as genuine, appropriate, and realistic feedback, so that students can learn to try on new career roles, explore more options, and overcome both internal and external career barriers [32].
In addition, a variety of informal and complementary learning activities could be promoted among students and STEM educators, in a way to connect them with the STEM community and workforce, such as:

- Teach youth at science summer camps or after-school programs;
- Getting students to join STEM-related clubs, namely Space and Aeronautics Clubs;
- Promote and support students' participation in science fairs and competitions;
- Create job shadow opportunities
- Promote visits to Aerospace Companies or
- Give them books and magazines on STEM topics.

In particular, Chan, Yeung, Kutnick, and Chan [33] suggested that a variety of school activities such as inviting engineering professionals to interact with students at school, arranging visits to engineering companies, and student club activities on engineering or technology can foster more realistic perceptions of students on the discipline.

3.1.1. Elementary level intervention

From an early age, aerospace can easily enter the imagination of children, as shown by the story of the "Petit Prince" created by the aviator François Saint-Exupéry in the setting of the Moon. It is imaginative to build wings of wax to fly higher and higher; and tragic if the heat of the sun melts them and causes a fall. On one hand, it warns of the risks of flying; on the other hand, it is a story with a tragic end. Without venturing into controversial realism, there is in phantasy world plenty of room for flying machines and travels to space objects.
The literature suggests that engaging elementary and middle school students have the most significant impact on closing the STEM educational gap [34]. Several studies give evidence to this statement.
In Stevens et al. [35], the development, delivery, and outcomes of a culturally driven STEM program, iSTEM, aimed at increasing engagement in STEM learning among 3rd-8th-grade students. Furthermore, tackling an early age is important given that it then allows them to pursue a STEM (or A&D) career after secondary school [35]. Results indicate that the program has been successful in engaging students in iSTEM as well as increasing their interest in STEM and their scientific beliefs.
The works presented in Khanlari [36] and Khanlari and Mansourkiaie [37] show that robotics helps students to learn STEM subjects and it promotes students' interest toward STEM.

John, Sibuma, Wunnava, Dubosarsky, and Anggoro [38] propose a problem-based curriculum for three- to five-year-old children, with an explicit focus on engineering problems. They find that this affects the engagement of the children but also the self-efficacy of the teachers.
Engineering design problems were introduced in kindergarten by Tank, Rynearson, and Moore [39] and showed that young children could engage in the stages of engineering design processes and learn to use engineering language.
Malone et al. [40] brought engineering design challenges to kindergarten, incorporated in drama, dance, visual arts, and physical education. They investigated the effects on the understanding of what engineers do and of technology and found significant increases.

DOI: 10.13009/EUCASS2019-853

3.1.2. Secondary level intervention
Before choosing what studies to pursue in university, young people need prior experiences in the subject, meaning that we should promote the exposure to aerospace matters before university. As years pass by, the basic teaching of STEM, even at secondary school level, can lead to some understanding of flying in the atmosphere and traveling in space and students interest to pursue careers in the aerospace sector.
Tseng, Chang, Lou, and Chen [41] showed that combining project-based learning with STEM increases effectiveness generates meaningful learning and influences student attitudes in future career pursuit. Students are positive towards project-based learning with STEM.
In order to specifically promote aerospace engineering, the ALLIES partnership has focused upon the design and development of wind tunnels that are donated to secondary schools. The wind tunnels have proven to spark interest in aerospace-related phenomena among the secondary students. The most recent ALLIES effort focuses upon the design of a wind tunnel that can be fabricated using materials, parts, and components available in most regions of the world, such that disadvantaged schools can easily replicate a wind tunnel [42].
Also, Learn&Fly project, currently in progress, has a double complementary objective: one the one hand it aims at addressing underachievement in the basic skills of maths, science and literacy through more effective, innovative teaching methods using the world of aeronautics as inspirational theme; on the other hand it aims at supporting schools (especially teachers) to tackle early school leaving (ESL) and disadvantage, by providing information and materials about career opportunities in the aeronautics field and different education/training paths available to embrace them. Learn&Fly is being implementing in Spanish, Portuguese and Poland Schools, and will make the pupils' interest rise towards STEM related subjects, including those leading to a career in the aerospace sector, and will follow up by supporting their career decisions, in a context where teachers, parents and professionals work together to ensure a positive environment for a proper human, social and professional development of the younger generations.

3.2 Promote contextual support for STEM disciplines and aerospace occupations

Positive parental, teacher, classmate, and school relationships are hypothesized to improve academic outcomes generally (e.g., [43, 44, 45]) and specifically affect children's perceptions of their math and science abilities and attitudes [46, 47, 48]. Rice, Barth, Guadagno, Smith, and McCallum [49] found that parents, teachers, and friends are all important social support agents for establishing positive self-efficacy and attitudes in math and science across distinct adolescent school settings.
Parents, teachers, school counselors and friends should increase their influences towards STEM careers in multiple ways, such as, become better informed about the need for science literacy in all students; learn more about STEM careers to better advise underserved students on science courses needed for pursuing college majors that lead to STEM career after completing high school or higher education; and present importance of taking high school science and mathematics courses to prepare for future STEM careers, among others. At the same time, social support from parents, educators, and peers should be guaranteed to students interested in the aerospace sector, including these people should be made more aware of the benefits and career opportunities of the aerospace sector.
A number of STEM initiatives in Europe involve schools linking with local communities, specifically families. Family perspectives on STEM influences students. Families correlate with students' self-efficacy in relation to learning STEM, and influencing STEM interest and career paths.
For instance, according to Sheehan Hightower, Lauricella and Wartella [50, p.3] "in Australia interventions focused on families have proven productive in two ways. First, the family as a site for developing positive attitudes to STEM. Students can be encouraged to orient to STEM careers by providing families with information about productive futures in STEM professions. This may involve the provision of resources to careers teachers, who then disseminate those materials to families via students, or it may involve direct contact with parents through school events. Second, the family as a pedagogical medium. There have been a number of primary school programs focused on families, including 'family maths' and 'family science' initiatives, whereby schools organise activity nights in which parents and children explore mathematics or science activities together. Part of this is the design of science and mathematics activities to do at home. Such activities are especially important for families without a history of professional participation in STEM" [50, p. 3].
Also, when parents have occupations in STEM-related areas, it can trigger early interest on these subjects [51]. Dabney, Chakraverty and Tai [51] found that family involvement in science facilitated doctoral students in physical sciences' early interest in the area.
Still, not all students have support from their families, or some even don't have families, so the role of formal education, including teachers and counsellors becomes crucial.
Also, when promoting contextual support to students in STEM, we must:

- Emphasize role models, whereby students are introduced to people working in and enthusiastic about STEM, with whom they can relate;

DOI: 10.13009/EUCASS2019-853

- Include explicit values in the curriculum, because students tend to reject STEM-related careers not only due to low self-efficacy, but also because they perceive a person-environment misfit, for instance in incompatibility with communal-oriented goals such as helping society [52]. Individuals and groups evaluate each other on two main dimensions: competence (agency) and warmth (communality), with stereotypes about women aligning low competence with high warmth [53]. Through self-efficacy, competence is increased, but it is important to also keep communal goals, by changing the perception of STEM careers as lacking communality
- Include information about STEM and A&D careers in the school curriculum so they can have into consideration and imagine themselves in the numerous possible career opportunities;
- Explicit scaffolding of students to take on and value science ideas, as critical in learning science.

3.3 Build awareness and spread information about STEM disciplines and aerospace occupations among young people

It is crucial to show young people how STEM skills can be applied to different occupations and attract employers. Therefore, promotion and awareness of STEM disciplines and aerospace occupations among young people and all community becomes a key factor when talking about attraction to the aerospace sector.
Some practices can be:

- Awareness campaigns to enrich public understanding of career opportunities in Aerospace Sector and their nature, tasks, responsibilities, education needed, progression prospects, working conditions among others;
- Promote the sector aerospace sector as technological advanced, one of the most interdisciplinary branches of engineering, an enabler of a variety of vehicles and, finally, an opportunity to integrate all these technologies in a vehicle that is safe, efficient and environmentally friendly while allowing fast travel to a wide range of destinations, some previously inaccessible;
- Alert young people to the diversity of possible future career paths, requiring from 9th grade (e.g., baggage handler) to masters studies (e,g Aviation Meteorologist Specialist) as education requirement for entry levels;
- Create strategies at school to involve families in STEM and in promoting positive attitudes to STEM and aerospace careers;
- Educate educators, such as teachers, career counsellors and other relevant educational bodies on how to promote student’s persistence in STEM and on choosing aerospace careers, not only, but specially when finishing secondary school, because students have a wide and sometimes bewildering choice of university degrees to apply for and even restricting to STEM the options can be numerous and confusing;
- Promote the interaction of students with STEM and Aerospace professionals as role models, through testimonials sharing in school events, web-based presentations or others – this does not only builds awareness about the opportunities in STEM and Aerospace, as it also increases students’ vicarious experience, one of the four sources of self-efficacy crucial for developing STEM interest and choice.
- “Career advice that includes images of people working in STEM-related careers, delivered through information workshops for careers teachers, and mathematics and science teachers” [54, p. 91] and
- “The inclusion, in curriculum resources, of images of people working in STEM-related careers” [54, p. 91] and specifically aerospace careers.

3.4 The importance of employer branding

According to Amber and Barrow [55, p. 187], employer branding is the package of benefits which is provided by an employer during employment. After some years of research, Backhaus and Tikoo [56] defined employer branding as "the process in which an identifiable and unique identity as an employer is built." Actually, employer branding has been recognized as a competitive advantage to attract and retain talent [57]. More recently, Sivertzen, Nilsen, and Olafsen [58] proposed that employer branding is “the development of an organisation's image and reputation as a prospective employer” and would affect its ability to retain employees. Employer branding has different non-financial outcomes such as lower recruitment costs, attracts more qualified applicants and lower employee turnover [56, 59, 60]. Therefore, this a potential strategy for companies in the Aerospace Sector.
For instance, Airbus is investing in innovative recruitment practices, such as Twitter accounts to talk to potential recruits. Besides that, in 2014, EADS became the Airbus group, creating a unique and authentic employer brand, by using storytelling with the campaign "Make It Fly." Thus, Airbus uses storytelling as an employer branding strategy

DOI: 10.13009/EUCASS2019-853

by presenting their own story through an infographic video and by a video for those who participated in the "Fly your ideas," a competition for the future aerospace workers, which indirectly shows their commitment to innovation and a culture of mentorship. This strong strategy placed Airbus as the 8th Most Attractive Employer across Europe and 1st in France.
Similarly, Rolls-Royce provides financial support to approximately 400 Ph.D. students, an innovative way to build a network of top talent. Of these, 25% of the graduates are recruited, with many more connections built [61].

4. Promote youth persistence in their educational pursuits on the aerospace sector

SCCT framework also explains the processes through which students become attracted to, and subsequently, decide to remain in (or leave) STEM fields [62]. Lent et al. [62] have recently tested an integrative model cross-sectionally that, among other things, can give some explanation to the interplay among interest and satisfaction as these variables relate to both initial and subsequent educational and occupational choices. Navarro et al. [63] have also examined this model, but longitudinally, at two time points, finding that support and self-efficacy were each good predictors of academic satisfaction and that satisfaction alone significantly predicted intended persistence. Afterward, Lent et al. [64] tested relations among the variables at three points in time. The findings suggest that the SCCT framework offers potential for explaining the processes through which students adjust to the STEM field of engineering. There was general support for an integrative model predicting satisfaction with, and intentions to persist in, engineering majors over time.
Consequently, even though more research has to be done, the present studies support the utility of efforts to design and test theory-based educational interventions based on SCCT framework.

4.1 University and vocational levels in the aerospace background

The fascinating promise of aerospace engineering or related courses must be delivered in a high-quality university or vocational courses that give the necessary knowledge, skills, and ability to reason and work in all these disciplines and their combination (PARE, 2018).
European universities offer a wide choice of high-quality aerospace education, with comprehensive curricula and strong collaboration (PARE, 2018). Once students finish secondary school, it is possible to choose a great variety of aerospace degrees across Europe. In Europe, aerospace education is usually structured in a three-year bachelor's degree in aerospace engineering, with exceptions such as the Spanish case, which offers a four-year degree. Once students have finished these studies, they can choose a later specialization with a two-year Master in various disciplines within the aerospace sector. In Europe, many universities offer studies in aerospace engineering, with bachelor, masters and doctoral programs. Within these masters, it is possible to choose several specialisations such as airports, propulsion systems or aerospace structures. Besides, other types of masters offered provide the opportunity of enlarging knowledge in other disciplines related to the aerospace sector such as space flight or energetics. The trend in recent years is studying a Degree in Aerospace Engineering, in which students acquire knowledge about the basic principles of aerospace technology and engineering sciences and, then, students continue their training with a master, which provides them the opportunity to specialize in a specific area of the aerospace field.
On the other hand, aviation is an extensive sector, and, for that reason, it is difficult to cover all the areas related to the aerospace industry in the study programs offered by the universities. Therefore, depending on the university, the degrees in aerospace engineering cover different disciplines within the aviation sector, such as airports, management or air navigation. After analyzing the degrees offered by the different universities, the areas that have been considered are the following ones:

- Aircraft: this area is related to the basic operation principles of an aircraft
- Airport: this area refers to the airport processes and its operation mode
- Propulsion: it refers to the basic principles of the aircraft engines system 25% 58% 14% 3% four years three years two years five years Chapter 10 19
- Science/materials: this area is focused on the mathematic principles of the aircraft performance as well as the study of aerospace structures and materials
- Management: it refers to all the business management within the aviation sector
- Navigation: this area is focused on air traffic management
- Systems: this area is related to aircraft systems such as avionics and electronic systems.

However, the contents themselves are not sufficiently determinant when persisting (or not) in an academic course. In particular, the Partnership of a European Group of Aeronautics and Space Universities - PEGASUS is a good practice

DOI: 10.13009/EUCASS2019-853

not only for the networking it promotes but also, because of the branding it gives to the A&D sector. PEGASUS (www.pegasus-europe.org) has been formed from an initiative taken by the four main French Grandes Ecoles involved in aerospace to attract the best students and also to offer highly relevant educational and research programmes. As indicated by PEGASUS [65] "coordinated change, exchange of staff and students and innovation will be required to achieve these objectives."
In addition, institutions delivering vocational training have a major role in A&D qualifications, as they open doors to different career opportunities in the A&D industries. The European Aerospace Cluster Partnership (EACP) has mentioned that "When new ideas are transformed into innovative products, a highly qualified workforce is needed to produce and maintain these creative products. In the aviation sector, in particular, basic and vocational training must, too, respond to these challenges. Also, there are European safety requirements defined by EASA that must be met by all actors. Thus, in light of the existing variety of vocational education systems in Europe, addressing these challenges is particularly difficult." [66].
Still, it is crucial to highlight that all universities and vocational training institutions delivering education to young people in the A&D sector may consider the importance of having educational interventions based on the SCCT or other theories to ensure students' academic satisfaction and persistence. For instance, some interventions could be to incorporate:

- Programs on college campuses that invite students to bring to life what they have learned in the classroom;
- STEM-focused career planning and exploration programs as suggested by Belser, Prescod, Daire, Dagley, and Young [67], as it may support STEM retention. According to Belser, Shillingford, Daire, Prescod and Dagley [68] other researchers have reported similar results with generic undergraduate career planning courses.
- Academic and social support programs that are organized by the institution and designed to meet the needs of students can help provide pathways to student success in college [69; 70].

Also, students should be encouraged to try new things and even make mistakes in a supportive and innovative environment.
The literature about student's persistence in STEM-related courses is recent, and future research should be conducted to understand the key determinants behind the phenomenon.

5. Conclusion

In sum, to promote youth occupational and educational pursuits in STEM and A&D sector and having in consideration the SSCT national and European agendas should create policies that focus on:

- Enhancing learning experiences through changes in curriculum and pedagogies, to enable students' mastery experiences (opportunities to practice STEM effectively) and social persuasion (active verbal supports as well as genuine, appropriate, and realistic feedback) which influences self-efficacy and outcome expectations.
- Promoting contextual support for STEM disciplines and aerospace occupations, because perceived career supports from family, school community members, classmates, and role models have particularly strong associations with engineering and STEM self-efficacy;
- Investing on STEM-focused vocational guidance and, specifically, on interventions that are based on the four sources of efficacy: mastery experiences, vicarious experiences, social persuasion, and physiological reaction [71].

In addition, building awareness of STEM disciplines and A&D occupations among youth and employer branding of A&D companies are essential factors to take into consideration when talking about promoting STEM and, specifically, A&D occupations.
Once students have been attracted to A&D related courses, another issue arises youth persistence in their educational pursuits on the A&D sector. Besides the importance of the contents of the courses, again, social support from parents, peer and faculty members plays a crucial role. Still, more research has to be done, in order to discuss this phenomenon.
A European STEM policy could provide a coherent framework for identifying and articulating STEM-specific strategies and programs across all levels of education, including primary and secondary schools, vocational institutions, higher education, and research. For instance, European Schoolnet is at the forefront of the debate on how to attract more people to science and technology to address the future skills gap that Europe is facing and has been involved in more than 30 STEM education initiatives, financed through European Schoolnet's Ministry of Education members, industry partners, or by the European Union's funding programmes. However, these initiatives have to be reflected on national policies, instead of being isolated tentatives to reach the European goal (European Schoolnet, 2017).

DOI: 10.13009/EUCASS2019-853

Future research needs to include teacher professional development where implementable frameworks for integrated STEM education and associated curriculum resources are available [72] and to study the promotion of STEM in the European context, the "E" in STEM (which often appears ignored in reports on promoting STEM skills, ACARA, 2015) and the promotion of A&D related courses and occupations, specifically.

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