



attitude makes the difference

EXECUTIVE SUMMARY

STEM AND THE PYGMALION EFFECT

The Vision of High School Students



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1 INTRODUCTION



1.1 - A SHARED CHALLENGE

The main reason for conducting this study stems from the fact that the number of high school students choosing to pursue majors in **Science, Technology, Engineering and Mathematics (STEM)** is declining year after year. The numbers are falling consistently across European Union countries in the midst of a difficult economic situation with very high youth unemployment, but what makes it even more incomprehensible is the fact that the demand for these types of professionals by businesses is growing and that demand will only continue to grow in the future, widening the gap between supply and demand.

The situation in Spain is particularly painful, with youth unemployment rates surpassing 50% and yet a perplexing 44% decline in the number of matriculations in ICT engineering majors over the last 10 years. At the same time, professionals with degrees in this field are among those in highest demand in the labor market, making this a double-edged problem.

1.2 - A NEW APPROACH: THE PERCEPTION OF YOUNG PEOPLE

Given that the situation explained above has continued to exist for some time now, various studies and reports have been published in recent years to discover the underlying reasons. Most of these studies point to planning, curricula and the methodologies used to teach STEM subjects and to teacher training in terms of their knowledge of both the subject matter being taught and STEM professions. The social image of STEM professions, which ranges from negative to unknown, is another key factor, along with the choice of “easy” options or those which ostensibly require less effort. Sociodemographically, the student’s gender and origin are identified as determining factors.

This body of work highlights the views of almost all stakeholders in the process, particularly those of the experts in different academic disciplines (pedagogy, sociology, psychology) applied to the field of education. However, in order to thoroughly understand the situation, the views of the **protagonists** themselves must be considered, that is, how the **students** go about the **process of choosing a major and the factors that influence their choice** (supports and aids in decision-making process, pressures, confidence in their decision, etc.).

1.3 - OBJECTIVES

everis, in collaboration with the consulting firm **e-motiva** and **Catalonia’s Government’s Department of Education**, has conducted a study with the participation of more than 4,700 students aged 14 to 18 from public and private schools in both urban and rural settings and different socioeconomic backgrounds in order to understand:

- The **variables that have the greatest influence on a student’s decision to choose and not to choose** a scientific, technological or mathematical career path.
- The key elements in the **process of choosing** an educational and professional itinerary: criteria, critical timing, agents and most influential factors.

In doing so, we hope to contribute to **focusing efforts** and enriching the **paths available to students** to encourage European youth to choose STEM majors.

2 KEY FINDINGS



2.1 - IMAGE OF STEM CAREERS AND PROFESSIONS AS ATTRACTIVE BUT EXCESSIVELY DIFFICULT

- For the most part, students have a **positive view of the majors and professions related to engineering and information technology**. 77% consider them to be appealing and prestigious and 66% believe that **they offer good job prospects**. However, the percentage of students who are unaware of this reality is still high.
- Students also take a **positive view of the majors and professions in the fields of Mathematics, Physics and Chemistry**, without any significant differences compared to engineering and information technology.
- The **perception is that it is very difficult to be admitted to and complete STEM studies**.
- The study also showed that **negative gender models still exist in relation to women in technical and engineering fields**.
- A high percentage of students believe that they are **skillful users of ICTs (65%), more than their professors (55%) and much more than their parents (38%)**. However, a vast majority of students (90%) admit that they use ICTs more for social and entertainment purposes than for educational or management applications. The **students who choose STEM fields of study consider themselves to be more skilled in the use of ICTs** than the rest (75% vs 62%).

2.2 - PARENTS AND THE INTERNET: THE DECISION SHAPERS

- **The references recognized by students as most influential** in the process of selecting a course of study are as follows:
 1. **The family**: conversations and consultation with parents (75%).
 2. **Internet**: web pages and social networks (56%).
 3. **School counselors**: guidance from professors acting as school counselors (44%).
- For more informed decision-making, students need:
 1. More information on **educational programs and job prospects** (73%).
 2. Information on the **course contents and professional possibilities** of the different courses of study (68%).
 3. **Communications with practicing professionals** (62%).

2.3 - ACTION MUST BE TAKEN EARLY IN GRADE SCHOOL

- **Most students in their early years of high school (aged 14) have already made their decision**: 84.2% have already chosen the educational path they will follow. Only 15.8% report that they are unsure of their choice.
- **32.8% of students** who graduate from high school **decide to pursue scientific, technological, engineering or mathematical courses of study** (STEM university majors or occupational training in ICTs). The percentage does not increase from the 3rd to 4th year of high school (14 to 15 years old).
- **Therefore, either the choice is made somewhere between middle school and the early high school years** or the factors that could have an influence at a later date are not having an impact on the decision-making process.

2.4 - THE PYGMALION EFFECT: SELF-PERCEIVED CAPABILITY AS A KEY FACTOR IN THE CHOICE OF STEM STUDIES.

- The study found that **students' perception of their own capabilities is a key element in their choice.**

45% of students do not see themselves capable of studying Engineering or Computer Science, while 51% do not consider themselves capable of completing a program in Physics, Chemistry or Mathematics, which rules out almost half of the school-aged population and substantially decreases the possibility of convincing more students to choose STEM majors without changing their perspectives and attitudes.

- In fact, **self-perceived ability is the main differentiating factor** in the choice of STEM studies.

80% of students who choose to pursue STEM studies see themselves as capable of studying Engineering or Computer Science and 76% believe they are capable of studying Physics, Chemistry or Math. However, only 50% of those who choose a course of study other than STEM believe they are capable of studying Engineering or Computer Science and only 39% feel they could handle Physics, Chemistry or Math.

- **The perception of subject matter and difficulty also becomes a decisive factor.**

The subjects that rate worst among students are Chemistry, Physics and Technology. More than one-half of students view these subjects very negatively and only one-fourth of students have a positive attitude towards them.

- While more than 90% of students indicate that the **main reason for their choice is vocationally driven** (I like the subject, I like the profession, etc.), and more than 85% cite **usefulness** in the second place (job opportunities, earning potential, etc.), **these are not factors that differentiate STEM students from the rest. The differentiating factor is found in aspects related to the difficulty of the subject matter.** Only 16% of STEM students indicated that their choice was based on the fact that the subject matter was easy for them, compared to 27% of non-STEM students.

Hence, the perceived difficulty of the subject matter (77% of students surveyed perceived them to be very difficult), is a differentiating element despite the fact that most considered STEM studies to be useful in terms of finding a job and recognized the importance of vocation in making a choice.

2.5 - GIRLS AND STUDENTS FROM FAMILIES WITH LOW SOCIOCULTURAL LEVELS SHOULD BE THE PRIMARY FOCUS OF ACTION.

- **The combination of outlook by gender and sociocultural level is devastating:**

44% of students from families with high sociocultural levels choose STEM for their post-secondary studies compared to 24% of students from families at lower sociocultural levels. A difference of 20 percentage points is significant enough that it cannot be explained away by different interests or vocational convictions.

The gender perspective stereotypes decisions. The percentage of boys from high sociocultural backgrounds who choose STEM studies is 51%, compared to 38% of girls.

By contrast, the percentage of girls from low sociocultural backgrounds who choose STEM studies is only 20%. The 31 percentage point difference shows that there is ample room for improvement among these groups.

- **Differentiating factors between boys and girls who choose STEM:**

Within the group of students who choose STEM studies, the differences between boys and girls point to possible reasons why girls shy away from STEM studies, particularly in the fields of engineering and technology. Although girls consider themselves to be less skilled with ICTs and are less attracted to technology and computer studies, the **primary difference lies in the confidence in their own ability to pursue these studies: only 71% of girls who choose STEM studies feel they are capable of studying engineering or information technology compared to 85% of males, despite the fact that the girls have much higher grades.**

These data indicate that there is room for a great deal of improvement in the percentages of students, particularly females students and those from lower sociocultural backgrounds, who could choose STEM studies, since the percentages for males from higher sociocultural backgrounds are quite satisfactory.



3 THE AUTHORS

everis is a multinational consulting firm that offers business and strategic solutions as well as the development and maintenance of technological and outsourcing applications. The company, which operates in the fields of telecommunications, finance, industry, utilities, energy, banking, insurance, public administrations, media and public health, reported €564 million in turnover last year. Currently, the consulting firm has 10,000 professionals working at its offices in Europe, the United States and Latin America.

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e-motiva is a HR consulting firm specialised in strategic management of engagement: climate, leadership, change management, corporate culture and values. We have developed added-value conceptual models to understand attitudes at work and change processes, as well as highly innovative methodologies totally orientated to implement high-impact action plans.

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