Guest Editorial Diversity and Equity in STEM

Abstract— **The aim of this invited editorial is to introduce the first set of articles of the special issue on Diversity and Equity in STEM. The special issue integrates articles on the experiences and good practices focused on the promotion of reducing the gender gap and diversity, submitted and reviewed an open format and also the extended versions of the articles, presented at the special track on Bridging the Diversity Gap in STEM in the Technological Ecosystems for Enhancing Multiculturality Conference (TEEM 2019), held in Leon, Spain, in October 2019, at the Workshop of Engendering Technologies 2019, and at the International Conference on Human–Computer Interaction (INTERACCIÓN 2019), held in San Sebastian, Spain, in June 2019.**

Index Terms— **Diversity, equity, STEM.**

I. Introduction

LACK of diversity and gender inequality is a global problem in many sectors but is especially latent in the fields of Science, Technology, Engineering and Mathematics (STEM), especially at the university level and, therefore, in the labor market. Attracting representative people from all sectors of society that include different cultures, disabilities, ethnic groups, gender or sexual orientation is one of the objectives of the strategic plans, not only of large companies but also of organizations, institutions, and governments. Encouraging women and under-represented minorities to specialize in STEM areas helps to strengthen diversity in the workplace by providing a wide range of ideas, experiences and perspectives essential to scientific excellence [1].

In this context, women are one of the least represented groups in STEM. Although they make up 50% of the population, young women represent only 35% of all students enrolled worldwide in STEM subjects at this level [2]. Several studies show that women are underrepresented in STEM areas in higher education [3]–[6]. This problem is more pronounced at higher levels in both academic and professional contexts. According to the data provided by UNESCO, the participation of women in STEM professions remains low, reaching 28% of men [7]. If other sectors, such as ethnic groups, are also taken into account, the gap is even more pronounced. According to Riley, Slaton, and Pawley [8], there is a lack of inclusive environments in engineering, with a tendency to marginalize women and people of colour.

In recent decades, a large number of studies and initiatives have emerged, at the regional, national and international levels, whose main objective is to reduce the gender gap and promote diversity in the STEM sectors from different points of view [9]–[11].

Therefore, this special issue presents six articles related to experiences that promote inclusive, equitable and diverse education. The topics covered in this special issue will be described below.

II. Experiences and Case Studies

In this section, we will summarize the five experiences and case studies included in the first monographic issue of Diversity and Equity in STEM.

In the article "Gender Differences as Influence Factors to Choose Computer Science as a Professional Career Option," the authors describe a study conducted about the current state of gender differences and factors influencing the search for computer-related careers. The research work was carried out through a survey among high school students, and through the results, it can be observed that the situation is worrying, since students show much less interest in computer-related careers due mainly to a low self-perception of their STEM-related skills.

The next article, "Preparing Biographies of STEM Women in Wikipedia Format, a Teaching Experience," the author highlights the lack of female role models in the scientific-technological field as one of the causes of the gender gap in STEM disciplines. Intending to provide female references in science and technology in university education, she holds a workshop with students on writing biographies of women scientists and engineers for Wikipedia. With this, she not only works on the gender perspective in education but also improves the digital competences of the students.

In the article "European Proposals to Work in the Gender Gap in STEM: A Systematic Analysis," its authors carry out a systematic analysis of the research projects presented in the European Union in the last five years. They point out that there has been a considerable increase in interest in the European Union to enhance female participation in STEM, considering it as a priority, funding numerous proposals that attempt to bridge the existing gender gap. They also present a selection of outstanding results from European projects funded in this area.

In the article "Unplugged Teaching Activities to Promote Computational Thinking Skills in Primary and Adults from a Gender Perspective," the authors highlight the role of schools in promoting teaching and learning strategies for integration and empowerment in STEM skills. In the paper, they describe

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an experience developed with primary school students and their families using "unplugged" or disconnected activities, mainly to awaken children's interest in programming, while promoting gender equity.

Another article, which is entitled "Breaking the Gender Gap in Science, Technology, Engineering and Mathematics," deals with the problem of the lower incorporation of women into STEM careers and the higher probability of taking leave of absence. In this sense, they present a project developed at the School of Engineering of the University of Valencia, called "Girls4STEM" which aims to reverse the current trend and seeks to increase and retain the number of female students in engineering studies. Besides, the work presents, in addition to the actions developed in the project, other preliminary results of a project to promote scientific vocations, which show a positive impact on both enrollment and motivation to choose studies.

Finally, the last article titled "Addressing the Gender Gap in Computer Programming Through the Design and Development of Serious Games," presents a European initiative named CODING4GIRLS. This initiative aims to teach coding through a game design and development process based on design thinking. Thus, students focus on solving complex real-life challenges from a human-centric perspective and using their creativity while learning coding concepts and creating serious games.

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