Nuevos retos educativos en la enseñanza superior frente al desafío COVID-19

En este volumen se presentan los trabajos de investigación e innovación educativa que el Instituto de Ciencias de la Educación ha recopilado, resultado del trabajo que está desarrollando el profesorado, especialmente en el ámbito universitario. En esta ocasión, la pandemia y, por tanto, la tecnología han ocupado gran parte de la temática de los trabajos.

La obra consta de 80 capítulos, organizados en diversas temáticas: 14 aportaciones muestran resultados de investigación sobre la docencia en la Educación Superior antes y durante la COVID-19; 13 están dedicados a Acciones educativas para adaptar la Enseñanza-Aprendizaje a la no presencialidad en la COVID-19; 19 describen Acciones educativas innovadoras en la Educación Superior; 8 textos tratan sobre Acciones de mejora derivadas de la evaluación y de los indicadores de la calidad docente en la Educación Superior; 2 trabajos están dedicados a la Innovación docente en torno a los procesos de enseñanza-aprendizaje inclusivos; 5 textos detallan Acciones de apoyo, orientación y refuerzo al alumnado para la mejora de la formación y de los resultados en la Educación Superior; 17 trabajos versan en torno a Metodologías innovadoras basadas en el uso de las tecnologías (TIC o TAC) en la Educación Superior; 1 trabajo de Investigación e innovación en enseñanza no universitaria para tender puentes con la Educación Superior y 1 trabajo que presenta Investigaciones novedosas sobre docencia universitaria (TFG, TFM y tesis doctorales).

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ABSTRACT

The equal value of women and men in all spheres of life known as gender equality is a fundamental human right, essential to build peaceful and equitable societies. Gender equality has been promoted by the United Nations by adopting international agreements which involve mainstreaming gender at all levels of policies and programs in which education has been regarded as the main vehicle to achieve this goal. In STEM education, great imbalances in awareness of gender inequalities and in gender competence exist. Therefore, the current study aimed (1) to cross-culturally validate the TEGEP scale across country and sex, and (2) compare cross-culturally Greek and Spanish university students’ perceptions of gender self-efficacy for a gender-sensitive future practice. The participants were 205 STEM (science, technology, engineering, and mathematics) university students (136 Greek and 69 Spanish) in their last year of study seeking a degree in secondary education (n = 98 science, 18 technology, 12 engineering, and 77 math) and drawn from seven public universities (six Greek, one Spanish). Results are discussed in terms of identified needs for study programs’ curricular reform.

KEY WORDS: gender equality competence, gender mainstreaming, higher education curricula, STEM fields’ student perceptions, scale validation.

1. INTRODUCTION

For decades, gender equality (GE) has been a worldwide mission. Spain’s efforts in promoting gender equality began in the 1980s. As a signatory country of the United Nations’ (UN) Convention on the Elimination of All Forms of Discrimination against Women (CEDAW) (UN, 1979) and, recently, of the 2030 Agenda for Sustainable Development (UN, 2015), the Government of Spain formally established a number of legislation policies. One of the most influential has been Organic Law 3/2007 on Effective Equality of Men and Women (Spanish Government, 2007), which forces universities to train future professionals to become competent in gender issues by mainstreaming gender in course content and study programs (Art. 24, Point 2).

Similar to Spain, since the 1980s, Greece has been accepting the European Community and international recommendations on gender to guarantee personal, social and professional women rights. The country ratified the CEDAW (1979) through Law 1342/1983 and the Optional Protocol to the Convention (OP-CEDAW) relating to all forms of discrimination against women on December 10, 1999 (Stratigaki, 2006). In addition, the Greek Government enacted its own laws for the protection of women’s labor, family and education rights through Law 1329/83 (BOE, 18/02/1983) which materialized the constitutional imperative of the principle of GE and Law 4443/2016 which guaranteed equal treatment against all types of discrimination. In the 1990s, policies of GE were boosted by the Community Support Framework funds leading to the creation of two institutions (the General
Secretariat for Equality and the Centre of Research for Gender Equality) that helped promote the implementation of GE policies but with a limited understanding of the appropriate GM methods and tools (European Institute for Gender Equality, n.d.).

In all of those mandates, education has been regarded as a vehicle to promote gender equality, and gender mainstreaming as the strategy to achieve this goal. In this regard, higher education institutions play a key role in formulating and mainstreaming GE policies into teaching, research and innovation through the generation of educational processes that favor the acquisition of knowledge, skills, and attitudes/values towards gender awareness. Therefore, they have a major responsibility in promoting and ensuring that all new graduates are well prepared for developing a gender-sensitive future practice.

However, across countries, higher education (HE) programs are failing to prepare future professionals a gender-sensitive practice (GENTE, 2018; Miralles-Cardona, 2020; Kitta & Cardona-Moltó, 2021; Zippel et al, 2016). This lack of preparation, as reported by Ferreira et al. (2015), may be because of: (a) the education of university students takes place in complex organizations that are autonomous and difficult to change, (b) the vagueness and weakness of current gender equality mainstreaming policies (Weiner, 2000), and (c) androcentrism still prevailing in academic thinking (García-Pérez et al., 2014; Lombardo & Mergaert, 2013). These reasons help explain why education for GE has not emerged as a priority in HE curricula and why it is practically absent in all HE degrees (González-Pérez, 2017; Verdonk et al., 2009; Verge et al., 2018; Weiner, 2000) the result being that graduates finish their career preparation without the necessary gender awareness, knowledge, and skills to develop a gender-sensitive professional activity.

In the European context, Mazur (2009) compiled an overview of comparative research projects on gender equality and observed that GM implementation is clearly understudied. Most of this research has been conducted at national level (e.g. Beveridge et al., 2000; Roggeband & Verloo, 2006) and the few studies that compare a set of countries (Eveline & Bacchi, 2005; GENTE, 2018; Verloo & Pantelidou-Maloutas, 2005) have come to agree that there is a great variability in gender mainstreaming conceptualization and practice. Moreover, there is a lack of instruments not only to measure implementation but to monitor progress. Research conducted at various Spanish and Greek universities support these statements (e.g. Aguilar et al., 2010; Kitta & Cardona-Moltó, 2019; Larrondo & Rivero, 2019; Maidou et al., 2019; Valdivieso, 2016; among others) reaffirming that gender mainstreaming is poorly developed and monitored.

Bearing this in mind, measuring self-efficacy for GM implementation is increasingly a necessity at all levels. Self-efficacy has been measured using various instruments and scales (e.g. Tschan- nenn-Moran & Woolfolf-Hoy, 2001; Tsigilis et al., 2010), but consensus has not been reached about their composition and nature. There seems to be unanimity in that such instruments have to be specific to the construct and multidimensional. Since no specific instrument for measuring gender equality competence has been found in the literature, this study sought to address this gap.

This study reports on the initial testing and adaptation of the TEGEP scale (Teacher-Efficacy for Gender Equality Practice) (Miralles-Cardona et al., 2021) to be used with STEM students. The study aimed, first, to confirm the construct validity of the scale and its factor invariance across country and sex and, second, to explore and compare STEM student’s level of GE competence at the end of their study programs in two different countries, Greece and Spain.
2. METHOD

A survey approach was used in the current study. The questionnaire used was based on the original version of the TEGEP (Miralles-Cardona et al., 2021) that was written in English and adapted into Greek; thus, the Greek data could be compared with Spain’s data.

2.1. Participants and context

The participants in this study were undergraduate and graduate STEM university students enrolled in seven public universities (six Greek, one Spanish) seeking a degree in secondary education. In all these institutions gender equity/equality of opportunities is considered a transversal competence as can be cross-checked in their respective degrees’ mission but, in practice, courses in study programs are free of gender equity issues (Kitta & Cardona-Moltó, 2019; Miralles-Cardona, 2020). Seventy-five percent (75%) of the respondents had not received any previous training in gender (82.4% Greek and 68.1% Spanish); however, when asked about the importance they attach to gender training their rating was 7.13 (SD = 2.54) out of 10 (6.07 Greek and 8.18 Spanish).

Convenience sampling procedures were used to select participants. Greek students were invited to participate in an online survey (Google forms) via email or Facebook in the academic year 2018-2019. The respondents made up Sample 1, which was composed of 136 last-year undergraduate STEM students (n = 63 math, n = 32 physics and n = 41 chemistry) from six Greek public universities. They were between 21-30 years old (M = 22.03, SD = 1.48), mostly males (70%) and Greek (97%). Sample 2 was drawn from the University of Alicante (UA), Spain. It was composed of STEM field students enrolled in six of the 19 specialties (biology and geology, civil constructions, economy, computer science, sanitary processes, and technology) of a master’s degree in secondary education at the College of Education. Data was collected in the 2018-2019 Spring semester. Students completed the survey during one of required course in their degree program. Participation was voluntary and anonymous. After obtaining permission from the institution and informed consent from participants, students who were present in class on survey administration day completed the survey. Sample 2 consisted of 69 graduate students from the STEM fields of science (n = 25, 36%), technology (n = 18, 26%), engineering (n = 12, 18%), and math (n = 14, 20%). They were between 22-52 years old (M = 30.54, SD = 6.42), homogeneously distributed by sex (54% males), Spanish (100%), and full-time students (73%). Only a minority reported having taken any elective course with a gender perspective or said they had previous knowledge on gender issues (6%).

2.2. Research instrument

The Spanish original version of the Teacher-Self-Efficacy for Gender Equality Practice (SEGEP) scale (Miralles-Cardona et al., 2021) was used to collect data from the Spanish participants, and a Greek adapted version (the TEGEP-G) from the Greek. All the sections of the instrument were first translated into Greek by the author whose native language is Greek, but who is fluent in English. A native Spanish speaker PhD student in education, who is fluent in English, checked the content and quality of the translation. Finally, an expert on gender issues, proofread the translated Greek version of the instrument, and corrections were agreed by the authors to ensure maximum similarity with the original instrument.

The scale, inspired by Rands’ (2009) principles for the development of gender equality (increase awareness and knowledge about gender, develop critical skills to think about inequalities in complex ways, exercise gender-sensitive attitudes/values), UNESCO learning objectives for gender equality.
(UNESCO, 2017), and self-efficacy as a core aspect of Bandura’s social-cognitive theory (1997), consists of 22 items distributed in three subscales: Efficacy in Gender Knowledge and Awareness (9 items), Efficacy in Implementing a Gender Perspective (9 items), and Efficacy in Developing Gender Attitudes (4 items). Item statements begin with the expression ‘I can…’, ‘I am confident…’, or ‘I am…’ and are answered using six-response anchors ranging from “strongly disagree” to “strongly agree.” Higher scores on the TEGEP indicate a very positive participants’ perception of self-efficacy in implementing a gender perspective. In the current study, the TEGEP scale had very high reliability (alpha coefficient was .94 Greek and .95 Spanish samples) and .91, .93, and .89 vs .89, .93, and 85 for the subscales, Greek and Spanish, respectively. Previous studies (Miralles-Cardona et al., 2018) using early childhood and elementary student teachers samples have noted that the scale is reliable and valid (Miralles-Cardona et al., 2021). The scale allows obtain individual scores by item, factors, and a total score.

2.3. Data analysis

Scale adaptation and validation involved performing several analyses: (1) exploratory factor analysis (EFA) to identify the number of factors in the adapted version; (2) single-group and multi-group confirmatory factor analyses (CFA) to verify factor stability in the total sample and factorial invariance across subsamples; (3) reliability analyses as well as a descriptive-comparative analysis to compare participants’ self-efficacy to implement a GE practice across country and sex (ANOVA 2x2). Statistical analyses were run using SPSS-26 and AMOS-23 versions.

3. RESULTS

3.1. Construct validity and factor invariance across country and sex

Single-group and multi-group confirmatory factor analysis (CFA) suggested a scale consisting of 22 items and a construct with three dimensions positively and statistically correlated ($p < .01$) that explained 66% of the total variance in both samples. The 22-item three-factor model was confirmed by a CFA, whose model-fit indices suggested that the proposed three-factor model is valid, $\chi^2(228) = 574.62$, $\chi^2/df = 2.52$; RMSEA = 0.08, CFI = .89 y TLI = .89, and reliable (alpha’s Cronbach of .94) thus confirming an adequate construct validity of the TEGEP. In addition, the study provides data in support of its factor invariance across country and sex (see Table 1) indicating that the three-factor structure is stable and equivalent in all groups. Consequently, although the SEGEP three-factor model provides a modest fit to the dataRMSEA < .08, and ΔCFI and ΔRMSEA by country and sex < .01), in light of all the evidence (validity, reliability, and factor equivalence), the authors concluded that the TEGEP has adequate psychometric properties to measure self-efficacy for implementing a GE practice, in Greek and Spanish female and male STEM fields’ students. In addition, these findings support the distinction between the three indicators of ability, knowledge, and attitude as inherent elements of the competency required for practicing a sensitive-gender-committed education.

Table 1. Goodness-of-fit indices of factor invariance across country and sex for the 22-item three-factor model.

<table>
<thead>
<tr>
<th></th>
<th>$\chi^2$</th>
<th>df</th>
<th>$\chi^2/df$</th>
<th>TLI</th>
<th>CFI</th>
<th>RMSEA</th>
<th>ΔCFI</th>
<th>ΔRMSEA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall (N = 205)</td>
<td>574.62</td>
<td>228</td>
<td>2.52</td>
<td>.887</td>
<td>.888</td>
<td>.086</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Country</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Greece (n = 136)</td>
<td>544.40</td>
<td>228</td>
<td>2.39</td>
<td>.856</td>
<td>.858</td>
<td>.101</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3.2. Respondents’ perceptions of self-efficacy for a gender-sensitive practice

Respondents from both countries reported a moderate level of self-efficacy in knowledge and awareness of gender ($M = 4.46$ vs $4.09$), in skills for implementing a gender perspective ($M = 4.37$ vs $4.35$) and in developing gender attitudes ($M = 4.54$ vs $4.81$), as can be seen in Table 2. However, the perceived efficacy in gender knowledge was significantly higher in Greek than in Spanish STEM students respondents ($p < .01$), while the latter felt more competent than Greek STEM students respondents to develop values and attitudes in relation to gender ($p < .01$). These results are congruent with the findings of studies by Pendergast’s et al. (2011), which identified that students in their formative period tend to report high levels of self-efficacy for future practice, despite lack of experience.

Table 2. STEM students’ perception of efficacy for a gender equality practice by country and sex

<table>
<thead>
<tr>
<th>Efficacy in …</th>
<th>Greece</th>
<th>Spain</th>
<th>Effect</th>
<th>$F$</th>
<th>$p$</th>
<th>Dir</th>
<th>Eta squared</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender Knowledge &amp; Awareness</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>4.53</td>
<td>0.96</td>
<td>4.30</td>
<td>0.93</td>
<td>C</td>
<td>7.14</td>
<td>.008*</td>
</tr>
<tr>
<td>Male</td>
<td>4.44</td>
<td>1.02</td>
<td>3.88</td>
<td>0.79</td>
<td>S</td>
<td>3.11</td>
<td>.079</td>
</tr>
<tr>
<td>Total</td>
<td>4.46</td>
<td>1.00</td>
<td>4.09</td>
<td>0.88</td>
<td>CxS</td>
<td>1.33</td>
<td>.251</td>
</tr>
<tr>
<td><strong>Implementing a Gender Perspective</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>4.32</td>
<td>0.97</td>
<td>4.46</td>
<td>0.86</td>
<td>C</td>
<td>0.01</td>
<td>.973</td>
</tr>
<tr>
<td>Male</td>
<td>4.38</td>
<td>1.12</td>
<td>4.23</td>
<td>0.85</td>
<td>S</td>
<td>0.31</td>
<td>.579</td>
</tr>
<tr>
<td>Total</td>
<td>4.37</td>
<td>1.08</td>
<td>4.35</td>
<td>0.86</td>
<td>CxS</td>
<td>0.91</td>
<td>.342</td>
</tr>
</tbody>
</table>

Note: $\chi^2$ = Chi-squared; $df$ = Degree freedom; CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; RMSEA = Root Mean Squared Error of Approximation.
The data also revealed that perceived self-efficacy in developing gender attitudes differed across sex and country. In fact, the effect of the interaction (country x sex) was statistically significant ($p < .01$), suggesting that while female Spanish STEM students rated significantly higher than their male peers their own efficacy in developing gender values, female Greek STEM students showed a lower disposition to develop gender attitudes/values than their Greek male peers. This finding seems a bit contradictory if one takes into account that women tend to suffer the consequences of gender discrimination more often than men (Institute for Women and Equal Opportunities, 2019), while males tend to underestimate gender privilege. In light of these results, it is crucial that educators support STEM field students in increasing awareness and understanding of gender issues and in improving opportunities to challenge them.

### 4. DISCUSSION AND CONCLUSION

The present study, whose final purpose was explore and compare STEM fields’ students’ perceptions of GE competence at graduation in Greece and Spain, contributed to the advancement of knowledge by providing a valid and reliable instrument to measure students’ perceptions of self-efficacy for a GE practice. The TEGEP scale is composed of three independent but related subscales that assess awareness, attitudes and skills for developing a gender-sensitive professional practice. Given that the TEGEP has been shown to be invariant across country and sex, the instrument allows to make gender competence comparisons of STEM fields’ students and future professionals’ from Spain and Greece. The instrument is also useful for identifying training needs and proposing curricular improvements to reduce the gap between GM policy and practice in Spanish and Greek higher education. Furthermore, the study warns of relatively high levels of self reported efficacy for GE, which considering their professional inexperience alerts to an unrealistic perception of their ability for developing a gender-sensitive practice. Providing future STEM fields’ graduates with learning opportunities and scenarios to critically reflect on the inequalities associated with gender is essential to identify discrepancies and imbalances that will undoubtedly contribute to reducing ill-founded optimism or ignorance in relation to gender issues and the existing imbalances in regards to gender.

The findings should be evaluated with the necessary caution. First of all, all the variables are self-reported, so it is impossible to know the extent to which social desirability could influence participants’ responses. Secondly, the fact that the sample was composed of last-year students of a limited number of institutions does not guarantee that the results can be generalized to other programs and institutions. Therefore, future studies that replicate this research study with a broader and more diverse
group of STEM fields’ studentss from different institutions, degrees, regions and countries would be desirable. Finally, it is important to note that the study only provides information about the respondents’ feelings of efficacy in general terms; that is, without taking into account modulating variables such as prior training in gender, motivation, or commitment to gender issues, so future studies should investigate how these variables can influence perceptions of efficacy for a sustainable gender equality practice and empirically document the findings.

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5. REFERENCES


