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WOMEN AND MEN'S PERFORMANCE IN FACE-TO-FACE, VIRTUAL AND DISTANCE HIGHER EDUCATION IN COLOMBIA¹



Desempeño de mujeres y hombres en educación superior presencial, virtual y a distancia en Colombia

Desempenho de mulheres e homens no ensino superior presencial, virtual e à distância na Colômbia

RECIBIDO: 27 MARZO 2017

EVALUADO: 16 MAYO 2017;
25 JULIO DE 2017

APROBADO: 16 ENERO 2018

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ABSTRACT

This work inquires into the differences in external exam scores by male and female students in face-to-face, virtual and distance higher education in Colombia, in terms of aspects that might explain them. For that purpose, the study considered students' achievements in Colombian national exams Saber 11 and Saber Pro in economic sciences, the answers to a questionnaire and the database of a study conducted by Centro Nacional de Consultoría (2017), all of which served as *evidence corpora*. Results showed higher scores by men in Critical Reading, Civic Competences, Quantitative Reasoning and English tests, and higher scores by women in the Written Communication test in Saber Pro, as well as a strong association between the Biology scores in Saber 11 and Saber Pro; women bear more responsibilities

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RESUMEN

Este trabajo indaga las diferencias de puntajes en pruebas externas en hombres y mujeres en educación superior presencial, virtual y a distancia en Colombia, en relación con algunos aspectos que pueden dar cuenta de ellas. Se indagaron logros de estos estudiantes en los exámenes nacionales colombianos Saber 11 y Saber Pro de programas de ciencias económicas, en un cuestionario y en bases de datos de un estudio del Centro Nacional de Consultoría (2017). Los resultados muestran mayores puntajes de estudiantes hombres en las pruebas Lectura Crítica, Competencias Ciudadanas, Razonamiento Cuantitativo e Inglés, y mayores puntajes de estudiantes mujeres en la prueba Comunicación Escrita en Saber Pro, asociación fuerte entre puntuaciones de Biología en Saber 11 y puntuaciones en Saber Pro, mayor presencia

por

RESUMO

Este trabalho investiga as diferenças nos escores dos testes externos de homens e mulheres no ensino superior presencial, virtual e a distância na Colômbia, em relação a alguns aspectos que podem ser responsáveis por eles. As conquistas desses estudantes são investigadas nos programas nacionais colombianos Saber 11 e Saber Pro, em um questionário e em bases de dados de um estudo do National Consulting Center (2017). Os resultados mostram maiores pontuações de estudantes do sexo masculino em leitura crítica, competência cidadã, raciocínio quantitativo e inglês, e maiores pontuações de estudantes do sexo feminino em comunicação escrita no Saber Pro, forte associação entre os resultados de Biologia no Saber 11 e Saber Pro, maior presença em estudantes do sexo feminino de condições de

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Volumen 12 |

Número 22 |

Enero-Junio |

2018 |

ISSN Impreso |

1909-7433 |

E-ISSN en línea |

2145-308X |

¹ This work derives from the research project **EDUCATIONAL ACHIEVEMENT OF STUDENTS OF ECONOMIC SCIENCES IN FACE-TO-FACE, DISTANCE AND VIRTUAL HIGHER EDUCATION**. This research was commissioned by ICFES, which also financed it within the framework of 2015 Group Invitation. The ideas, opinions, theses and arguments expressed are solely the authors' and do not represent the Institute's point of view.

involving the financial support of children and other relatives; there are similar conditions between male and female students in terms of marital status, their parents' high school education level and a similar judgement about the high quality of the virtual education programs that they are taking. These findings are discussed in relation to different conditions among men and women, and to the possibility of virtual education becoming a more inclusive environment that enables better performance by women in higher education programs in Colombia.

Keywords: Educational achievement, gender gaps, online education, distance education, inclusive education.

en las estudiantes mujeres de condiciones de manutención económica de hijos y otros familiares, y presencia de condiciones similares entre hombres y mujeres en estado marital, nivel educativo secundario de los padres y juicio similar sobre buena calidad de los programas virtuales que cursan. Estos hallazgos se discuten con respecto a diferentes condiciones de hombres y mujeres, y a las posibilidades de la educación virtual y a distancia como facilitador de mejores desempeños de mujeres en la educación superior de Colombia.

Palabras clave: Logro educativo, brechas de género, educación inclusiva, educación virtual, educación a distancia.

apoio econômico para crianças e outros parentes, e presença de condições semelhantes entre homens e mulheres em estado civil, nível de educação secundária dos pais e julgamento semelhante sobre a boa qualidade dos programas virtuais que frequentam. Esses achados são discutidos com respeito às diferentes condições de homens e mulheres, e as possibilidades da educação virtual e à distância como facilitadora de melhores desempenhos das mulheres na educação superior na Colômbia.

Palavras chave: Escolaridade, disparidades de gênero, educação inclusiva, educação virtual, educação a distância.

PARA CITAR ESTE ARTÍCULO / TO CITE THIS ARTICLE / PARA CITAR ESTE ARTIGO:

Arias-Velandia, N., Rincón-Báez, W. U., & Cruz-Pulido, J. M. (2018). DESEMPEÑO DE MUJERES Y HOMBRES EN EDUCACIÓN SUPERIOR PRESENCIAL, VIRTUAL Y A DISTANCIA EN COLOMBIA. *Revista Panorama*, 12(22), 58-69.

DOI: <http://dx.doi.org/10.15765/pnrm.v12i22.1142>

Panorama |

pp. 58-69 |

Volumen 12 |

Número 22 |

Enero-Junio |

2018 |

ISSN Impreso

1909-7433 |

E-ISSN en Línea

2145-308X |



INTRODUCTION

Opportunities of students in different educational levels are connected with providing enough educational offers, having access to them and remaining in them to accomplish the expected learning (Tomasevski, 2003). Often, men have higher achievements or scores than women in external exams. Ramirez Torrado (2014) reports better female performance in censual external exams of higher education in Colombia only in some special cases: single women with a family income that exceeds five current legal minimum monthly salaries. He also adds that this differentiation does not take place in men's performance in the same exams (Blackman, 2011; Felder, Felder, Muney, Hamrin and Dietz, 1995; Ramirez Torrado, 2014).

In Colombia, the Saber² exams are implemented by ICFES (Colombian Institute for the Promotion of Higher Education), these are external exams that account for the students' academic performance in different educational levels. Along with these exams, students fill out questionnaires with their demographic, social, economic and prior education details, the analysis of which evinces possible performance gaps or differences. Many gaps originate in previous educational levels. One gap shows higher scores by women in reading and writing, and higher scores by men in sciences and

mathematics (Colombia, ICFES, 2016; Colombia, ICFES, 2017; OCDE, 2018). Students' performance in previous levels usually predicts their achievement in posterior educational levels, and some areas provide a key knowledge foundation for others in subsequent educational levels (Conger and Long, 2010; Ramirez Torrado, 2014; Türüt-Asik and Meltem, 2007; Wells, 1985). For instance, the score in biology and languages as a predictor of higher performance in higher education students in economic sciences (Ramirez Torrado, 2014; Arias-Velandia, Rincon-Baez and Cruz, ongoing; Rodriguez Albor, Gomez Lorduy and Ariza Dau, 2014).

In the same direction, scores by all students in the 2015 international PISA-OECD exam showed strong connections between the students' socio-economical level and his/her gender (male or female) (OCDE, 2018). Male students had higher scores than female students, except in countries with higher averages in this exam (OCDE, 2018).

The score of Colombian students in the 2015 PISA exam reflected the same trend (Colombia, ICFES, 2016; Colombia, ICFES, 2017). A historical analysis of this exam's tests shows higher scores by women in reading and by men in sciences and mathematics, with a decreasing trend in the latter (Colombia, ICFES, 2016; Colombia, ICFES, 2017), although this difference is of over ten (10) points (Figure 1).

competence assessment developed with similar training programs.

³ The international exam Programme of International Student Assessment, PISA, takes place every three years in all the member countries of the OECD (Organisation for Economic Co-operation and Development) and in other fifty non-member countries that voluntarily participate. The exam has representative population samples of 15-year-old students in each country in reading, mathematics and sciences. The emphasis of the 2015 exam was sciences (PISA-OCDE, 2016).

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ISSN Impreso |

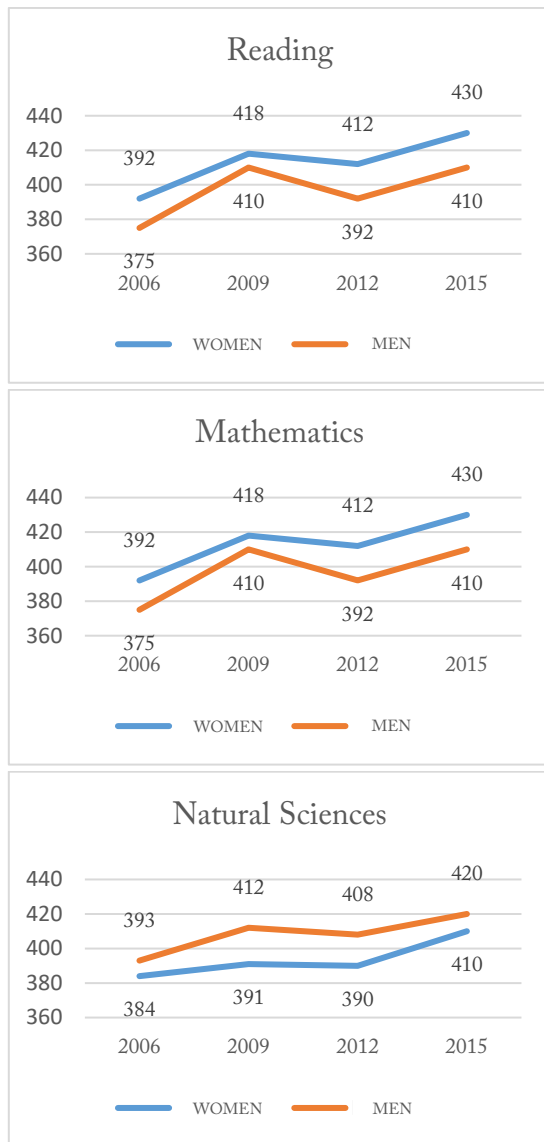
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² The set of Saber exams, **Saber 3, 5 and 9** constitute the basic education exams. Saber 11 is a censual exam that is taken by all students enrolled in Colombian institutions when they finish basic and secondary education. Saber Pro is an exam taken by all students that have taken 75% of their program's credits or study plan in each undergraduate program in Colombia; this exam (Saber Pro) is divided in two parts: the first of which corresponds to a generic competence assessment and is taken by each student, regardless of his/her training (it includes Critical Reading, Quantitative Reasoning, Written Communication, Civic Competences and English); the second part is a specific

Figure 1. Change in scores by students' gender in Colombian students in the three areas of the PISA-OECCD exam from 2006 to 2015.



tests⁴. One suggests that hemisphere differentiation in the brain's maturity results in most people being right-handed, which in males is connected with higher analytical and restructuring capacities – seemingly benefiting performance in areas such as mathematics – while in females it is connected with higher capacities to integrate information and relate it with wider contexts – seemingly benefiting performance in language meaning– (Hederich-Martínez, 2007). Nonetheless, these facts do not consistently apply and they depend on how much children and teens have fulfilled their skills, which may advantage (for better or worse) their reference cultural groups (Hederich-Martínez, 2007).

In the same line of work, a trend in which women show better performance in language and men in mathematics has been recently found, it is based on women's developed skill to integrate information and on men's higher visuospatial skill (Caro-Acero and Casas, 2013). These trends have tried to explain the contribution to gender-based differentiated skills from different genetic configuration patterns (present in certain chromosomes) (Penner, 2008) of hormonal activity (with some tendencies to change skills in people who undertake hormonal treatment following a sex reassignment procedure) (Halpern *et al.*, 2007), and of socialization in men and women (of skills that remain in people despite hormonal changes derived by sex reassignment treatment) (Caro-Acero and Casas, 2013). However, there is a set of other possible explanations to this phenomenon, and it largely agrees with the psychological

identity's genital sexual resource that results in gender identities, which are not addressed by this work because it is limited by the explanation of differences in academic exams scores by students who have identified themselves as men or women.

Panorama | **Source: Colombia, ICFES (2016).**

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Volumen 12 | There are different explanations that account for
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 2145-308X | This limitation is sustained, although some existing works
 extend this difference by questioning the classical
 differentiation between men and women acknowledging the

differentiation theories: men allegedly have higher disposition to solve tasks that imply thinking about new solutions or alternative procedures, while women allegedly have it towards tasks that imply recovery of information in the memory and the use of conventionally accepted media to solve problems (Caro-Acero and Casas, 2013).

Aside from these theories, and in other cases, the differences of gender-based academic performance are explained by institutional, cultural and school factors (Guiso, Monte, Sapienza and Zingales, 2008), a positive association was found between different society's gender equity and gender gap indicators in terms of mathematics and language, although this association is stronger with respect to the global index gender gap (Caro-Acero and Casas, 2013).

As warned, the aforesaid does not exclude – and actually complements – another possible explanation of this achievements, emphasizing more on diverse ways of students' academic socialization in their growth contexts. Machin and MacNally (2005), and Marks (2008) have proposed that adults generate different roles and activity patterns around children and teens, automatically and unconsciously differentiating those meant for boys and for girls throughout its socialization in infancy and teen years. Said dynamics interact with students' perception in their own performance, regulation given to their activity and the perception of having accomplished important things in partial goals in solving certain problems (Caro-Acero and Casas, 2013).

In connection to the aforementioned, additional questionnaires to the 2015 PISA exam reveal that assessed women tend to see themselves performing

in health-related areas in the future, whereas men in areas such as engineering and information technology. Also, many of their answers reveal stereotypes regarding occupations in science in connection to gender roles (OCDE, 2018). Consequently, the authors of the 2015 PISA exam report recommend socializing agent adults and teachers to show, encourage and exemplify a wide range of future occupations connected with science and technology to both male and female students (OCDE, 2018), explaining possible future occupations to boys and girls and negotiating expectations on roles allocated to men and women with the reference groups and children and teen communities (Machin and MacNally, 2005; Marks, 2008). These actions promote future job expectations and possible higher education paths for students (Hederich-Martínez, 2007).

On the other hand, higher education currently offers different methods or modalities: face-to-face, virtual and distance (Silvio, 2003; Silvio, Rama and Lago, 2004). These differ on how they are conducted in a learning environment and in the teacher-student relationship (Arias-Velandia, Rodriguez-Granobles and Castro-Martinez, 2017). In the face-to-face modality, instructions are provided with teachers and students present at the same time and in a physical space of an educational institution. In virtual education, instructions and learning activities take place in specially designed online platforms, and student-teacher interaction happens in that scenario with simultaneous or deferred activities or meetings using online working resources (Silvio, Rama and Lago, 2004). In distance education, instructions and learning activities use different means and strategies in which teacher and students are not in the same place but engage in frequent face-to-face

meetings intended to remove the barriers imposed by the lack of a direct relationship between teacher and students (Escobar, Calle, Castillo, Jaramillo and Ochoa, 2013; Silvio, 2003; Silvio, Rama and Lago, 2004).

UNESCO has anticipated that virtual and distance educations provide opportunities of higher education to populations that have typically and historically lacked access to it mostly due to economic struggles and difficulties of transportation to educational centers (Silvio, Rama and Lago, 2004). This idea seems to materialize in Colombia due to the fact that people who access virtual and distance education share some of the following characteristics (UNESCO, 2009): having a domestic partnership or married civil status, being the head of family, having one or two people to financially support, having parents with a maximum education level of elementary or high school, paying a tuition ranging between one and three million COP and being employed (Arias-Velandia, Rincon-Baez, Hederich-Martinez and Cruz, ongoing) or being a single mother and head of family (Centro Nacional de Consultoría, 2017).

These illustrate two robust tendencies when comparing higher education in men and women enrolled in Colombian institutions that are similar to other countries: a persistent difference in educational exam results between men and women that shows overall higher scores by male students (World Bank, 2009; Blackman, 2011; Colombia, ICFES, 2016; Colombia, ICFES, 2017; Felder, Felder, Muney, Hamrin and Dietz, 1995; Ramirez Torrado, 2014), and the presence of opportunities in virtual and distance education for people in groups that had failed to access higher education levels in traditional modalities before (Arias-

Velandia, Rincon-Baez and Cruz, ongoing; Rincon-Baez and Arias-Velandia, 2017; Centro Nacional de Consultoría, 2017). Students in virtual and distance modalities coming from these disadvantaged backgrounds are now accomplishing higher results in the Saber Pro exam (Arias-Velandia N., Rincon-Baez, Hederich-Martinez and Cruz, ongoing).

Consequently, this study inquires the tendency of men and women's exam scores in higher education and its association with the scores obtained by students in external completion exams of elementary and high school education in order to examine possible differences or similarities among men and women's academic performance. Moreover, this study also inquires the similarity or difference of perceptions, situations and experiences by male and female students in a virtual education setting, to the extent that it has been designated as a possible mechanism to bridge higher education gaps in countries such as Colombia.

METHODOLOGY

OBJECTIVES OF THE INQUIRY

The objectives of the research were as follows:

1. Characterizing similarities, differences and related aspects among men and women in censal exams at the completion of undergraduate programs of higher education in face-to-face, virtual and distance programs in the same area, in higher education institutions in Colombia.

2. Establishing the association between student scores in elementary and high school external completion exams in the Colombian system and the scores of the same students in undergraduate external completion exams in the Colombian system in the same area in face-to-face, virtual and distance programs.
3. Characterizing similarities and differences among the conditions, perceptions and activities reported by virtual programs students enrolled in the Colombian institution with the highest number of students in this modality in 2017.

TYPE OF STUDY AND DESIGN

This study is case-based exploratory, cross-sectional and retrospective; it combines the use of primary and secondary sources (Hernandez Sampieri, Fernandez Collado and Baptista Lucio, 2010) according to the models of evidence-based education (Paramo and Hederich-Martinez, 2014). Aimed at characterizing the inquiries on data (secondary sources) and questionnaires (primary sources) applied to male or female students enrolled in face-to-face, virtual and distance programs in Colombia.

undergraduate students in face-to-face, virtual and distance programs in the area of economic sciences (including economics and related cores, administration and related cores, accounting and related cores) in higher education institutions in Colombia, who presented said exams in 2012, 2013 and 2014. The information was completed with information from sociodemographic variables from the same data base of the students and from an online questionnaire completed by current students in the same programs. This procedures are conducted with the aforementioned exams implemented by ICFES (Colombian Institute for the Promotion of Higher Education) in the universe of students of the aforementioned levels in the Colombian formal educational system.

Additionally, a relation was established between student scores in external completion exams of face-to-face, virtual and distance programs in the area of economic sciences and the scores of the same students in the elementary and high school external completion exams. A characterization of similarities and differences in conditions, perceptions and activities by men and women was also drafted based on an external assessment study of the virtual education model implemented by the Colombian institution with the highest number of students in this modality in 2017.

INFORMATION COLLECTION SOURCES AND PARTICIPANTS

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ISSN Impreso

1909-7433 |

E-ISSN en línea

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The development of this study involved a characterization of similarities, differences and related aspects in sensual external exams applied to

The study used the following information sources with its participants.

*FTP-ICFES' System Data Bases of the Saber Pro exam for 2012, 2013 and 2014*⁵. ICFES' publicly-available data bases containing the results of the exams or generic competence modules of the Saber Pro exam and its questionnaire of socio-demographic data on students who take the test. The bases for the exams of 2012 to 2014 were refined and reduced to 10,338 Economic Sciences students (economics, administration, accounting and similar) in higher education institutions that offer the same programs in face-to-face and traditional or virtual distance, according to what is registered in the National System of Higher Education Information (Colombia, Ministerio de Educación Nacional, 2017).

Connection keys among FTP-ICFES' System Data Bases of the Saber Pro exam for 2012 to 2014, with the same set of students in the FTP-ICFES' System Data Base for the Saber 11 exam. Information was cross-referenced to establish the possible relations between students' scores in Saber Pro and in different exams presented in the Saber 11 exam.

Online questionnaire for students in economic sciences programs, 2016 and 2017: questionnaire answered by 773 students in economic sciences programs in 2016 in enrolled in sixth semester or above. The questionnaires provided information regarding the amount of men and women, and how many reported being heads of family, working condition (employed, unemployed), area of work and other data⁶.

Quantitative registry and analysis data of the study "Assessment of the Virtual Model Education of Politecnico Granacolombiano", compiled by Centro Nacional de Consultoria (Centro Nacional de Consultoría, 2017). This data base was developed as an external assessment study on the virtual education model of Institucion Universitaria Politecnico Granacolombiano in 2017, which registered quantitative information on conditions, perceptions and activities in a sample of 868 students enrolled in the virtual modality⁷.

ORGANIZATION STRATEGIES AND INFORMATION ANALYSIS

Descriptive analysis was conducted on the scores of the 10,338 male and female students. The following were calculated: 1) the percentage of male and female students in face-to-face, virtual and distance programs who took the Saber Pro exam in the economic sciences area; 2) the factorial plane representation of scores by men and women in the same group of students (point cloud multivariate exploratory analysis in the factorial plane); and 3) the average of scores by men and women in the five generic competence modules of the Saber Pro exam.

Likewise, correlations were obtained for students' results in the Saber 11 exam and the overall Saber Pro score. The *Online questionnaire for students in economic sciences programs* was used for univariate descriptive analysis corresponding to the percentage of male and female students that reported being heads of family.

⁵ Access: <http://www.icfes.gov.co/item/1861-investigador-el-icfes-actualizo-ftp-para-facilitar-acceso-a-sus-bases-de-datos>

⁶ Available in <https://goo.gl/forms/gLxKOnoIAt8nXOr73>

⁷ This study's materials may be consulted by contacting the author of the study.

On the other hand, the Quantitative registry and analysis data of the study “Assessment of the Virtual Model Education of Politecnico Grancolombiano” (Centro Nacional de Consultoría, 2017) allowed to independently process descriptive data in SPSS 20, resulting in major socio-demographic and economic variables of the students, their families and their perceptions on the quality of the virtual modality studies.

RESULTS

STUDENTS’ RESULTS IN THE SABER PRO EXAMS BETWEEN 2012 TO 2014 IN COLOMBIA

More women than men took the Saber Pro exam (Table 1.). Out of the students’ total, 61% are women, and out of these, 44% are enrolled in face-to-face or distance programs, in contrast with 27% of the men enrolled in the same modality.

Table 1. Percentage of men and women in economic sciences programs per modality who took the ICFES-Saber Pro exam in 2012, 2013 y 2014.

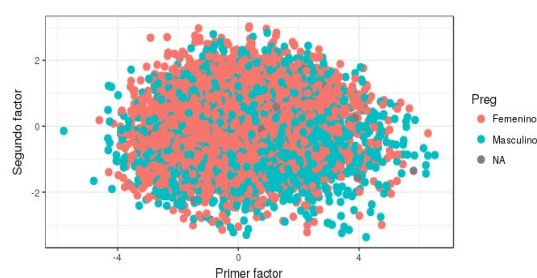
	<i>Men</i>	<i>Women</i>	<i>Total</i>
Face-to-face	12%	17%	29%
Distance	25%	41%	66%
Virtual	2%	3%	5%
Total	39%	61%	

Source: Arias-Velandia, Rincon-Baez and Cruz (collaboratively).

On the other hand, Figure 2 illustrates that male students’ scores tend to be among the highest (right

side of the plane) and female students’ scores are among the lowest.

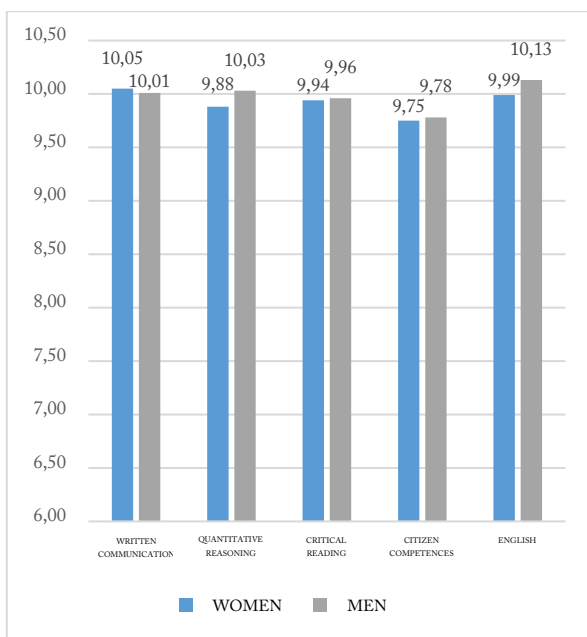
Figure 2. Factorial plane representation of students’ scores in Saber Pro exams in 2012, 2013 and 2014 according to gender.



Source: Arias-Velandia, Rincon-Baez and Cruz (collaboratively).

Likewise, the average score of the study’s last three years, led to the finding that male average scores are higher than women’s (Figure 3) in the Citizen Competences, Critical Reading, Quantitative Reasoning and English. Women’s scores are higher in Written Communication.

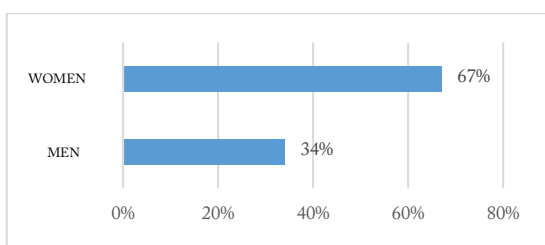
Figure 3. Male and female score averages in the competence modules of the Saber Pro exam in 2012, 2013 and 2014.



Source: compiled by the authors

Inquiring with students enrolled in these programs in the participant institutions, using the *Online questionnaire for students in economic sciences programs*, it was found that the proportion of female students that are heads of family (and who probably are responsible for the family's financial sustenance) almost doubles that of male students who share this condition (Figure 4). Students' scores in the Saber 11 exam in biology and language show significant correlations with the overall score of students in the Saber Pro exam (Table 2).

Figure 4. Percentage of male and female students that are heads of family.



Source: Arias-Velandia, Rincon-Baez and Cruz (collaboratively).

Table 2. Correlation between scores in the ICFES-Saber 11 exam and the unified score in the ICFES-Saber Pro exam in 2012, 2013 and 2014.

Tests in Saber 11 exam	Correlation with the overall score of Saber Pro
English language	0.242
Biology	0.364*
Mathematics	0.197
Philosophy	0.25
Physics	0.183
Chemistry	0.253
Language	0.337*

Source: Arias-Velandia, Rincon-Baez and Cruz (collaboratively).

HIGHER EDUCATION INSTITUTION RESULTS IN THE VIRTUAL MODALITY

Table 3. Amount and percentage of surveyed students.

	Amount	Percentage
Men	748	40.4
Women	1,104	59.6
Total	1,852	100

Source: compiled by the authors based on data from Centro Nacional de Consultoria, Colombia (2017).

Data on *conditions* shows that almost 89% of men and 85% of women use their own computer for academic tasks. Economic conditions between men and women are similar in some respects, including the number of people they live with and their civil status (single, married or domestic partnership).

Yet, women must incur in additional expenses to finance their tuition more often (65% of women). Also, 57% of women stay in the same place after graduation, between 65% and 67% have children and between 60% and 65% are financially responsible for their children.

Although more women earn a salary of one million COP (116 women and 55 men), more men earn a salary of five million COP (3 women and 12 men). The highest educational level achieved by their parents is similar for both men and women: 71% of men and 70% of women report mothers who graduated elementary and high school. Likewise, 60% of men and 61% of women report the same numbers for their fathers' educational level.

Students' perception (men and women) assesses teachers, class content, services provided by the institution, as well as welfare services, and the university center that covers their needs (Table 4). The only difference between men and women is virtual modality's advantage of offering enough time for family needs, this was mentioned by 209 women (75%) out of 277 people who believe this to be true.

Positive opinion of the service provided by the institution	78%	79%
Positive opinion of the wellbeing services provided by the institution	74%	73%
Positive opinion of the institution's technological services	78%	82%
Positive opinion of the institution's Service Centers	84%	84%

Source: compiled by the authors based on data from Centro Nacional de Consultoria, Colombia (2017).

In the activities reported in the week prior to the inquiry, men and women agree on the type of paid activities: 25% of men undertook paid activities the week before, and 20% of women did them; 83% of men and 84% of women reported doing these activities between 8 and 12 hours a week; and 85% of men and 90% of the women did them 3 and 6 a week. Also, 71% of men and 73% of women mentioned that sending an e-mail was the most frequent online activity in the past week.

DISCUSSION

The results of this study may be synthesized in the following findings:

1. Male students get higher scores than female students in four out of five tests (Critical Reading, Quantitative Reasoning, Citizen Competences and English) of the Saber Pro

Table 4. Students' perceptions with similar percentage between men and women.

<i>Assessed aspect</i>	<i>Men</i>	<i>Women</i>
Positive opinion of teachers	89%	90%
Positive opinion of class content	93%	88%

undergraduate education completion exam from 2012 to 2014 in economic sciences. Two of the tests (Biology and Language) of the Saber 11 elementary and higher education completion exam in this same group of students show higher correlation with the combined score of the four tests with higher scores by male students in Saber Pro.

2. *In the previous group of students and in the set of students in the virtual modality in the institution with the highest number of students in this modality in Colombia, female students usually assume financial support and dedicate time to their children and relatives in their household more frequently than men.* The women in this group double their male peers in terms of being heads of family and, more often, they report having additional expenses to their tuition, having to stay in their place of origin, having children, being financially responsible for their children and relatives, belonging to groups with lesser income, and appreciating the possibility of having time for their family matters that comes with the virtual modality.
3. *In the set of students in the virtual modality in the institution with the highest number of students in this modality in Colombia, male and female students report (without differences among them) good conditions to study, diverse marital statuses and few hours of working time.* Both male and female students report high usage of the computer in academic tasks and frequent usage of e-mail, equal parts of them are married, single or in a domestic partnership, 60% to 70% of them have parents with elementary education, show high appreciation for their institution's virtual system (in terms of teachers, content, services, wellbeing and

service centers), as well as a 3 to 12 working hours a week.

Overall, the results match the trends of gender gaps or male-female gaps (Caro-Acero and Casas, 2013; Conger and Long, 2010; Marks, 2008). These gaps are usually documented at the beginning of the higher education process (Caro-Acero and Casas, 2013), and in academic-related promotion opportunities (Cuenca, 2016). However, these have also been documented in student achievement external exam scores (World Bank, 2009; Caro-Acero and Casas, 2013; Colombia, ICFES, 2017; OECD, 2016; Ramírez Torrado, 2014; Rincon-Baez and Arias-Velandia, 2017; UNESCO, 2009), to the extent that they draw different explanations or theories concerning the differences in performance, as it was presented in the introduction (Caro-Acero and Casas, 2013; Halpern, and others, 2007; Hederich-Martinez, 2007; Penner, 2008).

Nonetheless, although possible influences of different dispositions by men and women towards the ease or difficulty in certain types of tasks cannot be discarded (a topic that is not in the study's evidence) (Halpern *et al.*, 2007; Hederich-Martinez, 2007), the highest amount of evidence supports theses regarding an academic socialization that is differentiated between that taught to men and to women (Conger and Long, 2010; Felder, Felder, Muney, Hamrin and Dietz, 1995; Machin and MacNally, 2005; Marks, 2008; OECD, 2016; OECD, 2018; Penner, 2008; Ramirez Torrado, 2014; Wells, 1985). One of the reasons is that, although the typical differences of higher performance in mathematics by males and in linguistic competences by males is sustained (Caro-Acero and Casas, 2013), the results obtained by

this study show that male students also have an advantage in the Critical Reading test (which groups reading comprehension competences) and that women students have better performance only in the Written Communication test (which groups text writing competences), and that the difference with the average by males is just of 0.4.

This study – differences in men and women’s scores aside – found that Biology (a core area in science training in elementary education) is the area in Saber 11 with the highest correlation with posterior scores by the same students in the Saber Pro in which average male scores are higher than women’s. This fact coincides with the report of the PISA international exam report, in which students from countries below the international mean (such as Colombia) show larger score differences in sciences between men and women (OCDE, 2016), which also matches the report that states that in science evaluations, the differences or gaps tend to grow as the educational system progresses, and are explained by factors in which educational institutions have control of (World Bank, 2009; Morgan, Farkas, Hillemeier and Maczuga, 2016; Wells, 1985).

Additionally, this study’s data of female students in virtual and distance education elucidates that women tend to assume the role of caretakers deriving from financially supporting their children and relatives, a fact that is usually associated with a disadvantage in language, sciences or mathematics tests scores (Caro-Acero and Casas, 2013). According to a series of previous studies, socialization spaces and formal basic education fail to encourage women’s appreciation of scientific tasks or occupations, in exchange for caretaking roles in the home, all of which result in low results

in external evaluations even before accessing higher education (World Bank, 2009; Blackman, 2011; Colombia, ICFES, 2016; Colombia, ICFES, 2017; Felder, Felder, Muney, Hamrin and Dietz, 1995; Ramirez Torrado, 2014; OECD, 2016; Machin and MacNally, 2005; OCDE, 2018). Likewise, the model by Arias-Velandia, Rincon-Baez and Cruz (ongoing) demonstrates that having economic dependents reduces a student’s performance in the Saber Pro exam. This variable is so robust, that Arias-Velandia and Rodriguez-Granobles and Castro-Martinez (2017) concur that it also impacts student desertion in face-to-face and virtual higher education programs.

Options such as distance education, and virtual education particularly, could contribute to closing gender gaps. Prior research has reported a trend to close gaps in terms of presence of students with higher scores based in geographical areas in which it was unusual to find students with high scores (Arias-Velandia, Rincon-Baez and Becerra, 2018; Türüt-Asik and Meltem, 2007). This could happen with gender gaps as well: Türüt-Asik and Meltem (2007) affirm that this is happening with time in several Turkish regions, and the study by Centro Nacional de Consultoria (2017) states that the gap is closing among students enrolled in virtual education in Colombia in terms of the results achieved in competences apart from those evaluated with academic exams, such as future income or the likelihood of being unemployed in the future (with similar findings by OECD, 2018; Ramirez Torrado, 2014; Silvio, 2003). Said study shows that an aspect that is highly emphasized by students in the virtual modality is that it has demanded more “self-discipline” in their studies (Centro Nacional de Consultoria, 2017), as proposed by several studies on metacognition and

self-regulation in learning, which have not found relevant differences between men and women (Azevedo and Cromley, 2004; Dabbagh and Kitsantas, 2005; Devolder and Tondeur, 2012; Hederich-Martinez, Camargo-Uribe, Lopez-Vargas and Rincon-Camacho, 2016).

In conclusion, the differences in male and female performance which have been characterized for formal and higher education in several countries (OCDE, 2018; Ramírez Torrado, 2014) also seem to take place in Colombia in virtual and distance education. However, the evidence points to a decrease in the initial disadvantage or difference between men and women in these modalities, since there is a larger number of high-performers coming from conventionally disadvantaged groups, especially regarding future income or employability (Centro Nacional de Consultoría, 2017). Therefore, this aspect should be further developed from different concepts of educational accomplishment by examining them from different related variables, such as exam scores, maximum educational level, access to certain jobs after graduation, employability or increase in income (Cuenca, 2016).

ACKNOWLEDGEMENT

This work was possible thanks to ICFES' external funding of educational research, in the framework of 2015 Group Invitation. We thank the institutions and students that participated in said study; as well as the unconditional support extended by the Research, Development and Innovation Department at Institucion Universitaria Politecnico Grancolombiano, and by the Research Directorate at Corporacion

Universitaria Minuto de Dios, Sede Virtual y A Distancia (UVD).

We express our gratitude to Centro Nacional de Consultoria for allowing Institucion Universitaria Politecnico Grancolombiano to access the data base of the study it conducted there. Likewise, to Juliana Valentina Arias-Stöckler (Capacity Zürich, Zürich, Switzerland) and Carla Ramirez Torrado (University of Kassel, Kassel, Germany) for reading the drafts and for their technical advisory.

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2018 |

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2145-308X |

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