Educational Data Analysis for Decision-Making: Performance in the Saber Pro Test among Early Childhood Education Programs in Colombia

Análisis de datos educativos para la toma de decisiones: desempeño en la prueba Saber Pro de programas en Educación Infantil en Colombia

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ABSTRACT

This study applies descriptive and exploratory data analysis techniques to examine the performance of students from 59 undergraduate programs in Early Childhood Education and Pedagogy in Colombia on the 2022 Saber Pro standardized test. Official datasets from ICFES were processed and analyzed using SPAD 5.6 and SPSS 28, focusing on five generic competencies: critical reading, quantitative reasoning, written communication, English, and citizenship competencies. Performance levels were examined in relation to institutional, sectoral, and regional variables. The findings reveal consistently low performance in quantitative reasoning, advantages associated with accredited institutions, and regional disparities. This research highlights the potential of data science tools—such as data mining and statistical visualization—for guiding evidence-based educational strategies and policy-making. It underscores the value of educational data systems as foundations for improving academic outcomes and reducing inequality through informed decision-making.

Keywords: Saber Pro; Educational Quality; Accreditation; Generic Competencies; Early Childhood Education.

RESUMEN

El presente estudio aplica técnicas de análisis descriptivo y exploratorio de datos para examinar el desempeño de estudiantes de 59 programas de Licenciatura en Educación Infantil y Pedagogía Infantil en Colombia en la prueba Saber Pro 2022. Se procesaron y visualizaron datos oficiales del ICFES con herramientas estadísticas (SPAD 5.6 y SPSS 28), evaluando cinco competencias genéricas (lectura crítica, razonamiento cuantitativo, comunicación escrita, inglés y competencias ciudadanas), clasificadas por nivel de desempeño y variables institucionales, sectoriales y regionales. Los resultados revelan tendencias consistentes de bajo rendimiento en razonamiento cuantitativo, así como ventajas significativas en instituciones acreditadas y disparidades entre regiones. Este estudio ofrece evidencia útil para diseñar estrategias de mejora educativa basadas en minería y visualización de datos, destacando la importancia de los sistemas de datos como soporte para la toma de decisiones en política educativa.

Palabras clave: Saber Pro; Calidad Educativa; Acreditación; Competencias Genéricas; Educación Infantil.

INTRODUCTION

The Saber Pro tests, administered by the Colombian Institute for the Evaluation of Education (ICFES),[1] are a key component in evaluating the competencies of higher education students in Colombia. These tests cover critical reading, quantitative reasoning, written communication, English, and citizenship skills, and their analysis provides valuable information on the quality of higher education in the country.[2]

The assessment of competencies makes it possible to evaluate the effectiveness of educational programs, but part of this is because students do not reach the expected levels in these tests, raising concerns about the quality of their education.[3,4] On the other hand, institutions with accreditation tend to perform better on standardized tests, suggesting a positive relationship between accreditation and educational quality. [5,6] Institutional certification improves public perception of institutions and is reflected in better student performance.[7,8]

Analysis of performance on the Saber Po tests shows notable differences between public and private institutions.[9] Although private institutions comprise a high percentage of the programs assessed, their performance shows considerable variability.[10] This variability underlines the importance of investigating the institutional factors that affect performance and the particular characteristics of each educational program.[11] Differences in institutional context can significantly influence students' learning and professional development.[12]

This article aims to contribute to understanding performance in the Bachelor of Early Childhood Education and Early Childhood Education programs through a detailed analysis of the Saber Pro 2022 test results.

METHOD

This study adopts a quantitative approach with a descriptive and exploratory design aimed at analyzing the results of the Bachelor's degree programs in Early Childhood Education and Early Childhood Education in Colombia, according to their performance in the Saber Pro 2022 test. This research focuses on evaluating the generic competencies of students in the five modules of the test: critical reading (LC), quantitative reasoning (RC), written communication (CE), English (IN), and citizenship competencies (CC).

Population and Sample

Data from 31 Early Childhood Education and 28 Early Childhood Education degree programs offered by higher education institutions in Colombia were included. For each program, the average scores obtained by students and the percentage distribution in the four performance levels defined by the ICFES were analyzed, considering the following categories:
- Level 1: 0-125 points
- Level 2: 126-156 points
- Level 3: 157-198 points
- Level 4: 199-300 points

Data Collection

The data from the official results published by ICFES were processed using specialized statistical tools. The test score scale conforms to a normal distribution with a mean of 150 and a standard deviation 30.

Analysis tools

The statistical packages SPAD ver. 5,6 and SPSS ver. 28 were used to carry out the analyses. Techniques included:
- Descriptive analysis: To characterize mean scores and performance levels by module.
- Exploratory analysis: To identify differences and similarities between programs according to their sector (official or private), institutional accreditation, and regionalization.

Classification Variables

The following variables were considered for the comparative analysis:
- Institutional sector: Official or private.
- Accreditation status: Institutional and program.
- Geographical region: The distribution is according to the five main regions of Colombia (Andean, Caribbean, Pacific, Amazonian, and Orinoco).
- Department and municipality: Location of participating institutions.

RESULTS

According to the results of the Saber Pro Test of the Bachelor's Degrees in Early Childhood Education and Early Childhood Education in Colombia in 2022, the following results are obtained:

Table 1. Distribution of the academic programs under analysis according to different ranking variables

		Number of programmes	%
Sector	Officer	19	32,2
	Private	40	67,8
Institutional accreditation	yes	33	55,9
	No	26	44,1
Programme accreditation	yes	26	44,1
	No	33	55,9
Region	Amazon	1	1,7
	Andean	40	67,8
	Caribbean	11	18,6
	Orinoco	1	1,7
	Pacific	6	10,2
Department_Municipality	Ant_Med	7	11,9
	Atl_Bar	3	5,1
	Bog_Bog	22	37,3
	Bol_Car	3	5,1
	Boy_Tun	1	1,7
	Caq_Flo	1	1,7
	Cho_Qui	1	1,7
	Cor_Mon	1	1,7
	Cun_Chi	2	3,4
	Hui_Nei	1	1,7
	La_Rio	1	1,7
	Mag_San	1	1,7
	Met_Vil	1	1,7
	Nar_Pas	2	3,4
	Nor_Pam	1	1,7
	Qui_Arm	1	1,7
	Ris_Per	1	1,7
	San_Buc	2	3,4
	San_San	1	1,7
	Suc_Sin	2	3,4
	Tol_Iba	1	1,7
	Val_Cal	3	5,1

Table 1 shows that most programs (68 %) in Early Childhood Education and Early Childhood Education are taught in private institutions. Fifty-six percent of the institutions offering these programs are accredited, while only 44 % of these academic programs are accredited. 68 % of the two programs analyzed belong to institutions based in the Andean region, followed by the Caribbean region (19 %) and the Pacific region (10 %). The Amazon and Orinoquia regions each have only one of these two programs. On the other hand, the municipalities that have the most institutions with the two programs studied are Bogotá (37 %), Medellín (12 %), Barranquilla (5 %), Cartagena (5 %), Cali (5 %).

Table 2 shows the average scores in each module of the generic competencies of the Saber Pro Test obtained by those assessed in the Bachelor's Degrees in Early Childhood Education and Early Childhood Education. In all areas, the average is below 150 points, which is the average established by the ICFES. This indicates a below-average performance when considering the average of all those assessed in the Early Childhood Education and Early Childhood Education degrees.

Table 2. Descriptive indicators for the two academic programmes analysed for each module of the Saber Pro test

	Media	Deviation standard	Maximum	Minimum
LC_P	134,9	14,4	181	107
RC_P	123,9	14,6	164	76
CC_P	130,7	12,6	173	104
IN_P	142,8	15,8	202	117
CE_P	138,2	15,6	190	104

However, maximum scores well above 150 points are observed in each test module, implying that these are at level 3 performance, with the maximum score in English (202) being at level 4.

Performance in quantitative reasoning is the lowest, with an average of 123,9 points, a maximum score of 164, and a minimum of 76. While English competences have the highest average score compared to the other four competences, as well as the highest maximum score (202) and the best minimum score (117), English competences have the highest average score compared to the other four competences, as well as the highest maximum score (202) and the best minimum score (117).
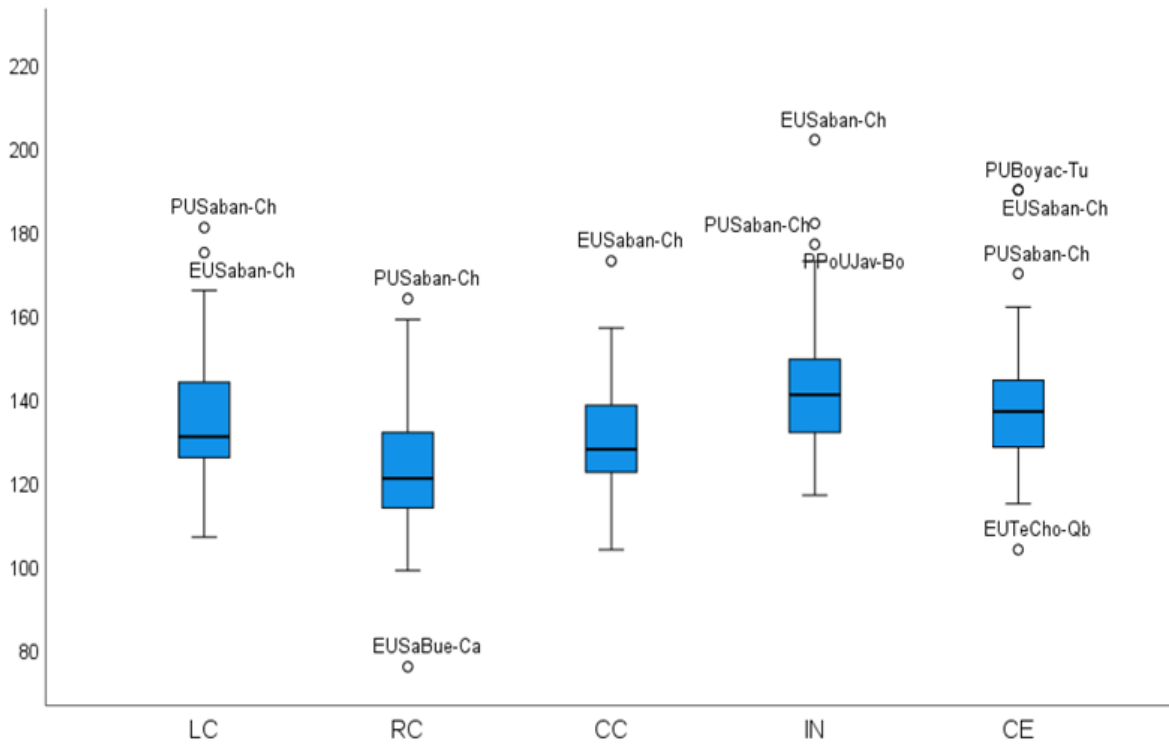

Figure 1. Distribution of program averages in each module of the Saber Pro Test

Figure 1 shows that the highest average of 202 was obtained by the Early Childhood Education program at EUSaban-Ch, followed by the Early Childhood Education program at the same university, PUSaban-Ch, and the Early Childhood Education program at PPoUJav-Bo.   In all the areas evaluated, the programs of the University of La Sabana - Chía (EUSaban-Ch and PUSaban-Ch) are among the best averages, well above the rest of the Early Childhood Education and Early Childhood Education programs belonging to other universities. On the other hand, the Early Childhood Education program at the University of San Buenaventura - Cartagena (USaBue-Ca) has the lowest average of all the areas, which was in quantitative reasoning (76 points).

Table 3. Descriptive indicators for the two academic programmes analysed for each module of the Saber Pro test by sector						
		Module	Media	Standard deviation	Maximum	Minimum
Sector	Officer	LC_P	137,8	15,7	166	109
		RC_P	124,6	13,2	145	99
		CC_P	131,6	13,8	157	104
		IN_P	138,0	11,8	155	117
		CE_P	139,1	15,1	162	104
	Private	LC_P	133,5	13,8	181	107
		RC_P	122,5	15,3	164	76
		CC_P	130,2	12,2	173	115
		IN_P	145,1	17,1	202	121
		CE_P	137,8	16,0	190	115

Table 3 and figure 2 show the distribution of the averages of the programs grouped according to the sector

to which the institution belongs: official or private. The official sector shows higher average scores than the private sector, with the exception of the English module, where the average score in the private sector is higher (145,1 > 138,0).

In the box plots (figure 2), it is striking that it is in the private sector where there are averages that are extreme values because they are mainly high compared to the rest of the values in each module of the test. Moreover, these values belong basically to students from two universities, USaba-Ch and UBoyac-Tu. Also, in the private sector, a high variability in the averages is observed, indicating that early childhood pedagogy and early childhood education programs obtained appreciably better average scores than others. In other words, in the private sector, there are programs with excellent performance in the Saber Pro test and others with poor performance. The highest scores in the different areas of the Saber Pro Test were obtained by the USabn-Ch programs.
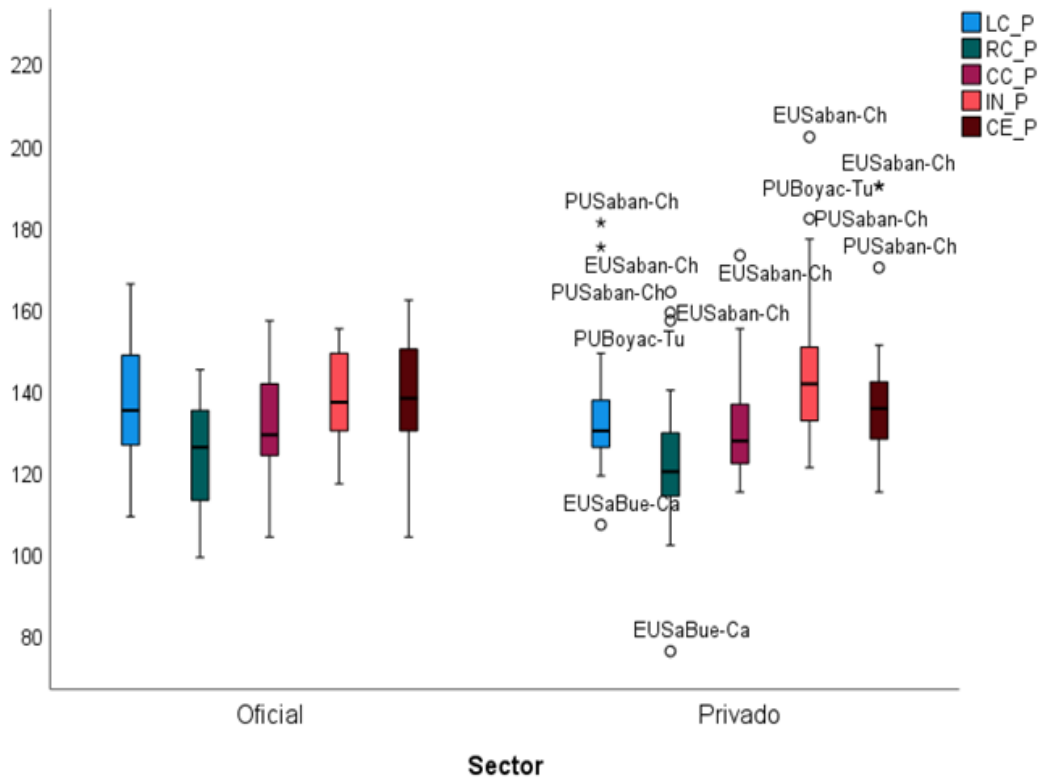

Figure 2. Distribution of program averages in each module of the Saber Pro Test according to the sector to which their institution belongs

In the critical reading module, the official sector programs with average scores above 150 are: PUAntio-Me (166), PUDiFJC-Bo (163), and EUPedNa-Bo (157). And from the private sector: PUSaban-Ch (181), EUSaban-Ch (175). In quantitative reasoning, no program obtained an average of more than 150 points, while in the private sector, the following programs were found: PUSaban-Ch (164), EUSaban-Ch (159), and PUBoyac-Tu (157). In citizenship skills, in the official sector, only PUAntio-Me obtained an average of more than 150 points (157). In contrast, in the private sector, there were EUSaban-Ch (173), PUSaban-Ch (155), and PPoUJav-Bo (154).

In the area of English, in the official sector, PUAntio-Me (155), EUAtlan-Ba (153), EUMagd-SM (153), and PITP-Pe (151) stand out. In the private sector, the number of universities with an average above 150 points is higher: EUSaban-Cho (202), PUSaban-Cho (182), PPoUJav-Bo (177), PUNorte-Ba (173), PUBoyac-Tu (171), EUEBosq-Bo (164), E1UniMin-Bo (159), EUSaBue-Cl (156), ECafam-Bo (155), EUNAB-Buc (151).

In written communication, the programs with the best average in the official sector are PUAntio-Me (162), PUDiFJC-Bo (158), PITP-Pe (158), PULlano-Vi (157), and EUPedNa-Bo (155). For the private sector, EUSaban-Ch (190), PUBoyac-Tu (190), EUSaban-Ch (170), and EUSAGil-SG (151).

The programs with the lowest average scores are in critical reading for the official sector: EUTeCho-Qb (109) and PUGuaji-RH (117). For the private sector: EUSaBue-Ca (107), PFULLib-Bo (119). In quantitative reasoning, the programs with the lowest average performance are, in the official industry: EUTeCho-Qb (99), PUGuaji-RH (107), PUAJC-Cl (110), PUQuind-Ar (110), PUAmazo-Fl (111). In the private sector: EUSaBue-Ca (76), PFULLib-Bo (102), PIAFIC-Ca (109), PCURaNu-Ca (110), PCUL-Ba (111).

The lowest averages in official sector programs for citizenship competencies are EUTeCho-Qb (104), PUGuaji-RH (110), and PUAmazo-Fl (118). In the private sector: PIAFIC-Ca (115), PCURaNu-Ca (115), PCUL-Ba (116),

PCUIber-Bo (116), EUSaBue-Me (116), P2CUIber -Bo (116), P1CUIber-Bo (119), P1UMinut-Bo (119).

In the English module, the lowest performance, on average, was in the official sector in EUTeCho-Qb (117) and the private sector in PUIber-Bo (121). For written communication, the lowest averages were in the official sector in EUTeCho-Qb (104) and PUAmazo-Fl (118) and in the private sector in PIAFIC-Ca (115) and PCUIber-Bo (115).
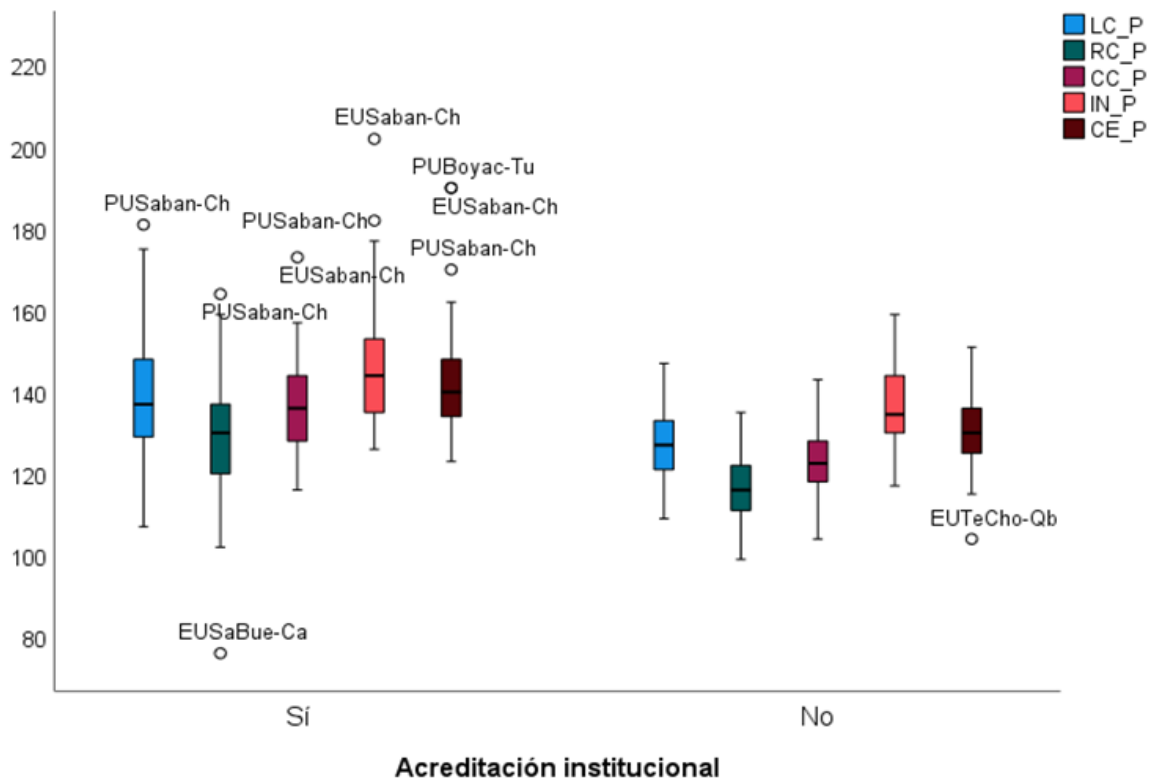

Figure 3. Distribution of program averages in each module of the Saber Pro Test according to whether their institution is accredited or not

			Media	Standard deviation	Maximum	Minimum
Table 4. Descriptive indicators of the two academic programs were analyzed for each module of the Saber Pro Test according to whether their institution is accredited or not						
Institutional accreditation	yes	LC_P	140,5	15,9	181	107
		RC_P	128,3	16,7	164	76
		CC_P	136,6	12,3	173	116
		IN_P	148,0	17,4	202	126
		CE_P	144,5	16,2	190	123
	No	LC_P	127,8	8,3	147	109
		RC_P	116,7	7,6	135	99
		CC_P	123,2	8,6	143	104
		IN_P	136,2	10,7	159	117
		CE_P	130,2	10,6	151	104
Programme accreditation	yes	LC_P	139,4	16,7	181	117
		RC_P	127,0	14,9	164	102
		CC_P	133,9	14,7	173	110
		IN_P	146,7	18,1	202	121
		CE_P	141,5	16,0	190	118
	No	LC_P	131,3	11,4	166	107
		RC_P	120,2	13,9	157	76
		CC_P	128,1	10,2	157	104
		IN_P	139,8	13,3	173	117
		CE_P	135,6	15,0	190	104

As for the institution's accreditation, as in the program certification, the results are shown in table 4, figure

3, and figure 4. If the program is taught in an accredited institution, it tends to have a higher average in each module of the Saber Pro test than if the institution is not accredited. For each module, the average is higher in academic programs belonging to accredited institutions. This trend holds whether the program is accredited, although the differences are less marked than whether the institution is accredited. Among the non-accredited programs with the best average among those evaluated, PUBoyac-Tu and PUAntio-Me stand out, see figure 4.
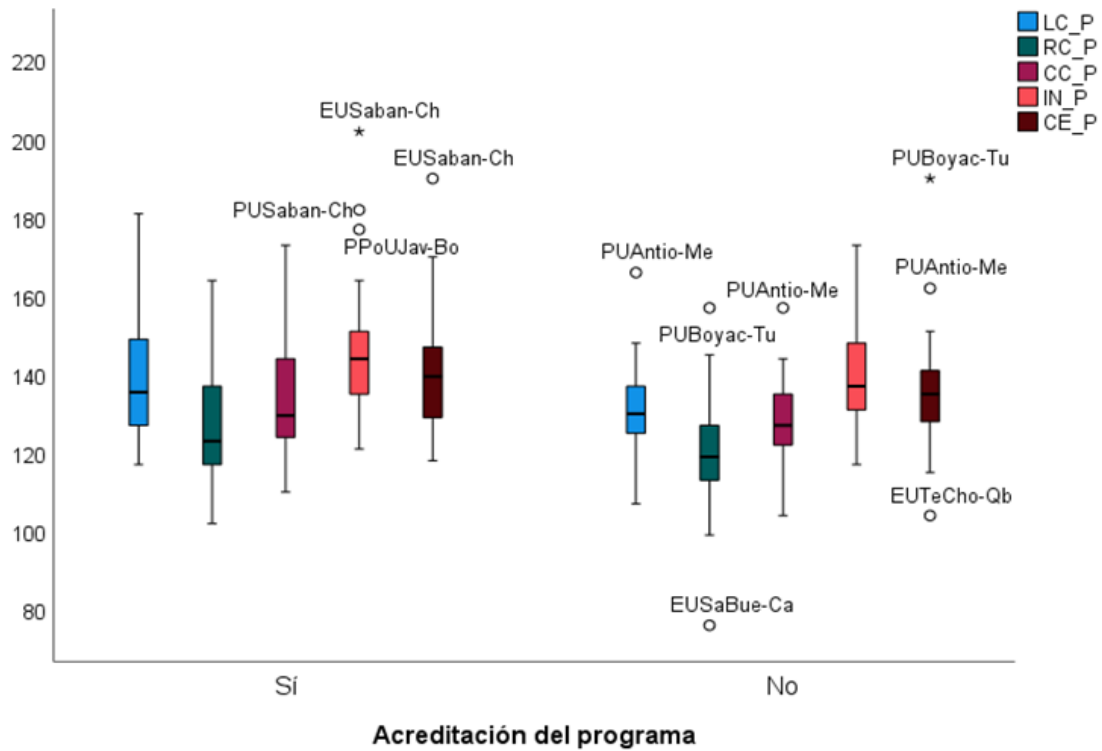

Figure 4. Distribution of programme averages in each module of the Saber Pro test according to whether the programme is accredited or not
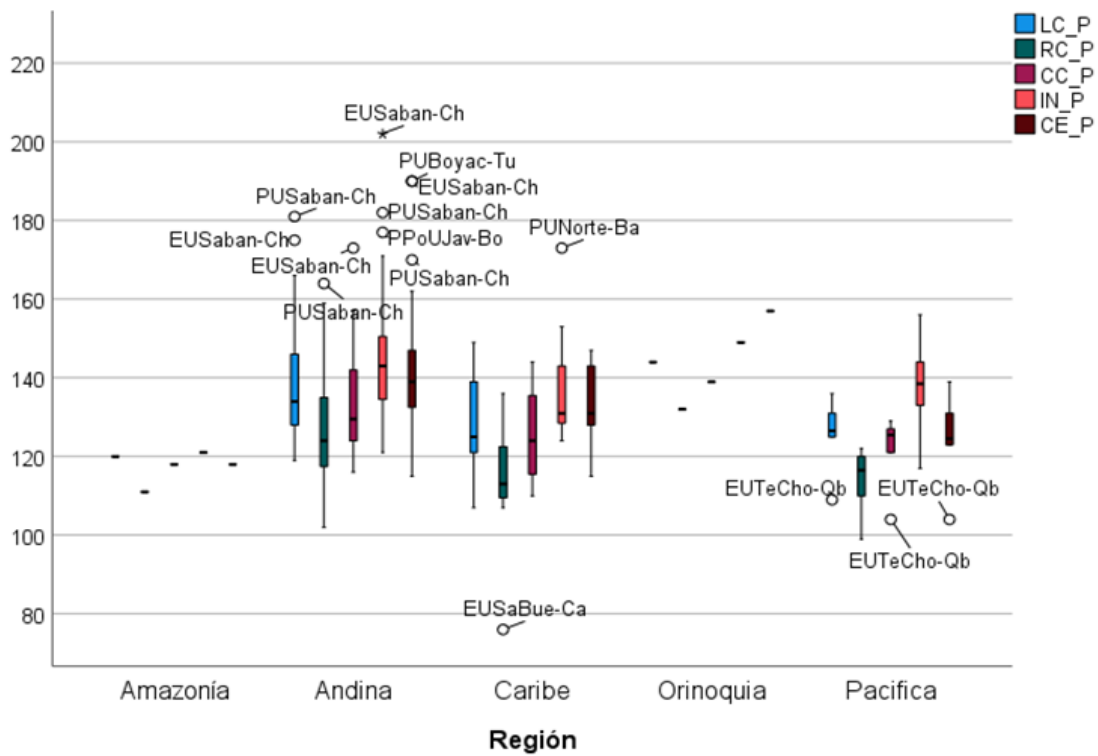

Figure 5. Distribution of programme averages in each module of the Saber Pro test according to the region of location

		Module	Media	Standard deviation	Maximum	Minimum
Región	Amazon	LC_P	120	–	120	120
		RC_P	111	–	111	111
		CC_P	118	–	118	118
		IN_P	121	–	121	121
		CE_P	118	–	118	118
	Andina	LC_P	138,2	14,5	181	119
		RC_P	127,2	13,5	164	102
		CC_P	133,5	12,7	173	116
		IN_P	145,5	16,0	202	121
		CE_P	141,6	15,9	190	115
	Caribbean	LC_P	128,6	13,6	149	107
		RC_P	114,0	16,3	136	76
		CC_P	125,6	11,3	144	110
		IN_P	137,2	15,6	173	124
		CE_P	133,7	10,1	147	115
	Orinoco	LC_P	144,0	–	144	144
		RC_P	132,0	–	132	132
		CC_P	139,0	–	139	139
		IN_P	149,0	–	149	149
		CE_P	157,0	–	157	157
	Pacific	LC_P	125,7	9,1	136	109
		RC_P	114,0	8,4	122	99
		CC_P	122,0	9,3	129	104
		IN_P	137,8	13,0	156	117
		CE_P	124,3	11,6	139	104

Table 5. Descriptive indicators of the two academic programmes analysed for each module of the Saber Pro test according to the region in which they are located

In the Amazon and Orinoquia regions, only one of the programs is analyzed; see table 5 and figure 5. The Andean region has some programs and institutions with the highest test averages. The Bachelor's Degree in Early Childhood Education at the Universidad de Los Llanos is the only program in the Orinoquia region, and it also presents higher averages than the average of the programs in the Andean region, see table 5. On the other hand, the Pacific and Amazon regions (with only one program) are the headquarters of institutions with early childhood education and pedagogy programs that tend to present the lowest averages in the Saber Pro test.

DISCUSSIONS

The overall average for all competencies is below the ICFES average of 150 points.[1] In particular, the quantitative reasoning module reported the lowest performance, with an average of 123,9 points. This result is worrying and highlights the need for academic programs to review and strengthen their teaching and assessment methodologies in this area.[13] In contrast, English language competencies showed better performance, with scores reaching 202 points, suggesting that some programs are achieving positive results in this area.

When analyzing the results by institutional sector (official vs. private), it was observed that programs in the official industry tended to obtain higher average scores than those in the private sector, except for the English module. This pattern suggests that official institutions may implement more effective pedagogical strategies for developing generic competencies.[14] However, it is essential to note that within the private sector, there are outstanding programs, such as those at the University of La Sabana, whose averages significantly exceed those of other programs.

Institutional accreditation is also related to performance.[15] The data indicates that programs taught in accredited institutions have higher averages in each module assessed. This trend reinforces the idea that accreditation can be an important indicator of educational quality.[16] Non-accredited programs with higher averages, such as PUBoyac-Tu and PUAntio-Me, show that there are exceptions to this general trend.

The results suggest several implications for teacher education in Colombia. First, the low average score in quantitative reasoning indicates an urgent need to review and adapt educational curricula to address existing deficiencies in this area.[17] This may include implementing active methodologies and using educational technologies to improve mathematical understanding among students.[18,19]

Furthermore, it is essential to promote a culture of accreditation among educational institutions.[20] The positive relationship between accreditation and performance indicates that institutions should focus on achieving and maintaining recognized quality standards.[21] This effort will not only strengthen the generic competencies of students but also contribute to increasing the prestige and public confidence in Colombian higher education.

Finally, it is crucial to address the identified regional disparities in performance. Institutions in the Andean region showed higher overall performance than those in areas such as Amazonia and Orinoquia. This underlines the need to implement differentiated education policies tailored to the specific needs of each region[22] to ensure equitable and high-quality education throughout the country.

CONCLUSIONS

This analysis reveals significant performance patterns in Colombia's Early Childhood Education and programs. The results underline the importance of addressing the deficiencies identified, especially in quantitative reasoning, and encouraging institutional accreditation as a means to improve educational quality. It is hoped that this study will serve as a basis for future research and for the formulation of effective educational policies.

BIBLIOGRAPHICAL REFERENCES

1. Instituto Colombiano para la Evaluación de la Educación. Saber PRO [Internet]. ▫ Pruebas ICFES. 2021 [citado 22 de diciembre de 2024]. Disponible en: https://pruebasicfes.com.co/saber-pro/

2. Ministerio de Salud y Proyeccio Social. Caracterización de los resultados del examen Saber Pro en los programas de Fonoaudiología en Colombia en los años 2018 – 2022 | Revista Perspectivas [Internet]. [citado 29 de octubre de 2024]. Disponible en: https://revistas.ufps.edu.co/index.php/perspectivas/article/view/4022

3. Díaz Monroy LG, Morales Rivera MA. Análisis estadístico de datos multivariados. 2012 [citado 22 de diciembre de 2024]; Disponible en: https://repositorio.unal.edu.co/handle/unal/79916

4. Franco Tolosa LF, Rubio Mendoza HA, Rojas Quevedo DG. El papel de la evaluación de competencias en los procesos de formación docente: análisis de las pruebas SABER PRO para Licenciados de Psicología y Pedagogía, Licenciados en Español y Lenguas Extranjeras en la Universidad Pedagógica Nacional. ReponameRepositorio Inst Univ Pedagógica Nac [Internet]. 2014 [citado 22 de diciembre de 2024]; Disponible en: http://repository.pedagogica.edu.co/handle/20.500.12209/2570

5. Caracterización de los resultados del examen Saber Pro en los programas de Fonoaudiología en Colombia en los años 2018 – 2022 | Revista Perspectivas [Internet]. [citado 22 de diciembre de 2024]. Disponible en: https://revistas.ufps.edu.co/index.php/perspectivas/article/view/4022

6. Mangin JPL, Mallou JV. Analisis Multivariable Para Las Ciencias Sociales [Internet]. 2003 [citado 22 de diciembre de 2024]. Disponible en: https://dialnet.unirioja.es/servlet/libro?codigo=320226

7. Portocarrero-Sierra L, Restrepo-Morales JA, Arias-Calderón JE, Portocarrero-Sierra L, Restrepo-Morales JA, Arias-Calderón JE. Evaluación del impacto de la acreditación de alta calidad en las instituciones públicas de educación superior de Colombia. Form Univ [Internet]. diciembre de 2020 [citado 22 de diciembre de 2024];13(6):37-50. Disponible en: http://www.scielo.cl/scielo.php?script=sci_abstract&pid=S0718-50062020000600037&lng=es&nrm=iso&tlng=es

8. González-Campo CH, Murillo-Vargas G, García-Solarte M, González-Campo CH, Murillo-Vargas G, García-Solarte M. Efecto de la acreditación institucional de alta calidad sobre la gestión del conocimiento. Form Univ [Internet]. abril de 2021 [citado 22 de diciembre de 2024];14(2):155-64. Disponible en: http://www.scielo.cl/scielo.php?script=sci_abstract&pid=S0718-50062021000200155&lng=es&nrm=iso&tlng=es

9. Cayon E, Correa JS, Sarmiento-Sabogal J. Does Attending a Public or Private University Make a Difference for Students in Colombia. Int Rev Manag Mark [Internet]. 29 de marzo de 2017 [citado 22 de diciembre de 2024]; Disponible en: https://www.semanticscholar.org/paper/Does-Attending-a-Public-or-Private-University-Make-Cayon-Correa/c76ce465cac19f2acb123110c2fd0599d9d83ce5

10. Saber Pro: Public vs. Private Universities | Elicit [Internet]. [citado 22 de diciembre de 2024]. Disponible en: https://elicit.com/notebook/72cdb85b-fc94-42a6-a7d3-da53a751f0ba#18139cb5c6b9c7d095f82174b48e2706

11. Caracterización de los resultados del examen saber pro 2020 en una universidad de frontera | Saber, Ciencia y Libertad [Internet]. [citado 22 de diciembre de 2024]. Disponible en: https://revistas.unilibre.edu.co/index.php/saber/article/view/9466

12. Duk C, Blanco R, Zecchetto F, Capell C, López M, Duk C, et al. Desarrollo Profesional Docente para la Inclusión: Investigación Acción Colaborativa a través de Estudios de Clase en Escuelas Chilenas. Rev Latinoam Educ Inclusiva [Internet]. 2021 [citado 22 de diciembre de 2024];15(2):67-95. Disponible en: http://www.scielo.cl/scielo.php?script=sci_abstract&pid=S0718-73782021000200067&lng=es&nrm=iso&tlng=es

13. Castellanos JJP, Medina NAZ, Redondo AL, Torres JPS. Caracterización de los resultados del examen Saber Pro en los programas de Fonoaudiología en Colombia en los años 2018 – 2022. Rev Perspect [Internet]. 13 de diciembre de 2022 [citado 16 de diciembre de 2024];7(S1):363-73. Disponible en: https://revistas.ufps.edu.co/index.php/perspectivas/article/view/4022

14. Castro M, Ruíz JV. La educación secundaria y superior en Colombia vista desde las pruebas Saber. Prax Saber [Internet]. 16 de septiembre de 2019 [citado 23 de diciembre de 2024];10(24):341-66. Disponible en: https://revistas.uptc.edu.co/index.php/praxis_saber/article/view/9465

15. Rincón-Báez WU, Plaza GEB, Arias-Velandia N. SABER PRO 2018 POR CAPÍTULOS ASCOLFA-II. Bol Estad [Internet]. 2019 [citado 23 de diciembre de 2024]; Disponible en: https://editorial.com.co/ascolfa/index.php/boletin/article/view/17

16. Relationship between citizen competences, accreditation of institutions and academic programs | Revista Guillermo de Ockham [Internet]. [citado 23 de diciembre de 2024]. Disponible en: https://revistas.usb.edu.co/index.php/GuillermoOckham/article/view/4786

17. Análisis de los puntajes obtenidos en la prueba Saber Pro por los estudiantes de la Universidad de Pamplona, Colombia, durante el año 2020 | Mundo FESC [Internet]. [citado 23 de diciembre de 2024]. Disponible en: https://www.fesc.edu.co/Revistas/OJS/index.php/mundofesc/article/view/1237

18. Valencia Velasco FK, Guevara Vizcaíno CF. Uso de las TIC en procesos de aprendizaje de matemática, en estudiantes de básica superior. Dominio Las Cienc [Internet]. 2020 [citado 23 de diciembref de 2024];6(3):157-76. Disponible en: https://dialnet.unirioja.es/servlet/articulo?codigo=7539684

19. Salas REM, Bucheli MVBGV. Metodologías activas que mejoran el aprendizaje en la Educación Superior. UTE Teach Technol Univ Tarracon [Internet]. 2021 [citado 23 de diciembre de 2024];93-111. Disponible en: https://revistes.urv.cat/index.php/ute/article/view/3154

20. González A. Evaluación de la Educación Superior: Entre el discurso y una cultura de la calidad. TEPEXI Bol Científico Esc Super Tepeji Río [Internet]. 5 de enero de 2023 [citado 24 de diciembre de 2024];10(19):13-9. Disponible en: https://repository.uaeh.edu.mx/revistas/index.php/tepexi/article/view/9730

21. Analysis of the quality accreditation in industrial engineering programs and the results in the standardized national tests, in Colombia [Internet]. [citado 24 de diciembre de 2024]. Disponible en: https://www.scielo.cl/scielo.php?script=sci_arttext&pid=S0718-50062020000100127&lng=en&nrm=iso&tlng=en

22. Alejos GMC. Retos y semblanzas de las políticas educativas: una perspectiva integradora. Soc Innova Sci [Internet]. 31 de agosto de 2022 [citado 24 de diciembre de 2024];3(2):4-5. Disponible en: https://socialinnovasciences.org/ojs/index.php/sis/article/view/97

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