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Spanish universities in the Shanghai ranking in education (2022–2024)

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Abstract

This study examines the methodologies of the Shanghai Ranking from 2022 to 2024 and their impact on the Education category. Using a multiple case study with a qualitative and comparative approach based on documentary analysis, it evaluates changes in the indicators and their influence on the positioning of Spanish universities.
A change toward more quality-oriented indicators is identified, such as the removal of the "Number of papers" indicator and the introduction of "World-Class Faculty" in 2024. However, these methodologies limit the evaluation of disciplines like Education, where local impact and qualitative approaches are essential. The article proposes strategies to balance the production of globally impactful research with local relevance and improving the competitiveness of universities with fewer resources. It concludes that while the changes in the ranking foster global excellence, it is crucial to adapt the indicators to better reflect the contributions of disciplines like Education. Future research directions are also suggested, focusing on the qualitative impact of rankings on local educational development.

Keywords: Science policy, Higher education, ShanghaiRanking, Comparative analysis, Education, Evaluation

1 Introduction

Global ranking systems such as Times Higher Education (THE), QS World University Rankings and the Academic Ranking of World Universities (ARWU) have achieved great popularity and prestige in recent decades and are the main tools for scientific dissemination and awareness of the prestige of universities worldwide. However, the main criticism from the social and humanistic field is that they use metrics designed mainly to evaluate scientific and technical disciplines (Luque-Martínez & Luque-Raya, 2023), which biases the evaluation of the rest of the areas. This structural bias especially affects the Social and Humanities areas, among which is Education, with its direct impact on specific communities and pedagogical training, rather than on the number of citations or international awards obtained. The presence of these valuation parameters justifies the need for an analysis that explores how this methodology affects the positioning and visibility of institutions that excel in this area (Vidal & Ferreira, 2020).

For more than a decade, several researchers (Altbach, 2012; López-Leyva, 2012; Villaseñor-Becerra et al., 2015) have been critically analyzing these university ranking

systems: THE, QS World and ARWU, with the latter, better known as the Shanghai Ranking, being the most prestigious of them all. These authors criticize that these university indexes are marked by elitism, dependence on the Anglo-Saxon world and use of controversial indicators (such as counting Nobel Prizes or Fields Medals), but they particularly criticize the fact that they especially discriminate small universities, those recently created (less than 50 years old), and that they operate under funding models that do not prioritize contextual research, and that only adjust to parameters established by Nordic, Anglo-Saxon or technocratic models.

The objectives of the study are to analyze the evolution of the Shanghai Ranking methodologies between 2022 and 2024 and to evaluate the impact of the current 2024 methodology, in terms of the positioning of Spanish universities, paying special attention to the field of Education.

The impact of the global rankings in the field of Education is relevant due to the unique characteristics of this field, which don't always conform to the predominant metrics designed for technical and scientific disciplines. It is therefore essential to understand how the current 2024 ARWU methodology affects universities and to propose alternatives to address the challenges.

In this framework, the following research questions are established:

1) How did the Shanghai methodologies evolve between 2022 and 2024?
2) What was the role of Spanish universities in this period and what factors could have influenced the results?
3) What specific strategies can universities implement to mitigate the limitation imposed by global rankings in Education?

These questions will not only determine the changes and evolution in the evaluation methodologies used to establish the Shanghai Ranking in recent years but will also analyze how Spanish universities with a below-average budget, small size and where scientists have not been accompanied by policies to support and develop research have managed to join the ranking. A more complex situation, if possible, is occupied by those universities with a great weight in the areas of social sciences, which are not favored by the established metrics, and where the area of interest to us, Education, is located.

2 Theoretical framework

2.1 University ranking systems and the discipline of Education: a general analysis

Szluka et al. (2023) highlight that the indicators of each methodology reflect different priorities, favoring specific types of universities. The top-ranked universities in ARWU and USNews tend to be large and excel in science, technology and medicine, as indicators related to publications and citations have a significant weight in all rankings. On the other hand, the universities with the best performance in rankings like THE and QS tend to be smaller and excel in social sciences. The rankings should be used as complementary tools, not as principal objectives. Limitations are observed in ARWU, THE and QS rankings, related to the mono-dimensional approach of their evaluation, as they prioritize scientific investigation above other missions such as teaching and its social impact. In this sense, ARWU and USNews favor large

universities due to volume-dependent indicators –such as number of publications and citations–, which is a disadvantage for small universities that do not have this scientific production capacity. On the other hand, QS and THE give considerable weight to academic reputation. This introduces a bias which benefits universities with higher historical visibility rather than objectively reflecting their real performance.

Similarly, authors focused on analyzing the impact of the THE system (Tóth et al., 2024) highlight that the positions of universities in the lower ranks of the ranking are highly volatile, partly due to the entry of newly-ranked institutions. Likewise, elements such as academic reputation –difficult to measure for low-ranking universities– have considerable weight in the ranking. This reinforces the bias, again favoring institutions with higher global visibility, regardless of their research performance (Başar & Kalkan, 2024).

To mitigate these limitations in the evaluation of quality and the academic impact, other authors (Docampo & Safón, 2021) present a new methodological proposal: the Paper Affiliation Index (PAI). This system classifies 2,835 journals in 14 Social Science disciplines, highlighting its effectiveness in identifying leading journals in fields such as Economics, Finance and Business Administration. However, in areas such as Education and Psychology, the results are weaker due to the dispersion of journals in multiple fields and problems of homogeneous classification.

The main problem in these two areas lies in the very idiosyncrasy of both disciplines, i.e., in all areas of knowledge an article can be written about training or education in that discipline, but if it is written about how to teach medicine, it can be included in a medical journal, not an education journal. Similarly, most of the people who write about education are educators and trainers who try to publicize their teaching method or an educational innovation or research project in the classroom or how they managed to respond to a given situation, in order to disseminate it among their closest colleagues (local research, in most cases qualitative). These disciplines are strongly influenced by local culture and procedures, which greatly hinders their geographical export and interest in what is done outside the national borders.

On the other hand, Yang and Shao (2024) introduce a methodology based on institutional diversity (diversity-based Author Affiliation Index-AAID) to classify educational journals. This index examines the relationship between institutional diversity and perceived quality of the journals. It measures the quantity and variety of institutions represented among the authors of a journal, considering that high diversity reflects greater academic scope. It is established that journals with a greater diversity of affiliations tend to attract more relevant research. However, the methodology doesn't directly consider the quality of the published content, such that a journal could have high institutional diversity and lack significant or influential publications in the field.

Few articles exclusively analyze the ARWU ranking due to, among other reasons, the annual variation in its indicators. Several authors (Billaut et al., 2010; Safón & Docampo, 2020) analyzed this methodology in 2010 and 2019 respectively, where the halo effect is present in peer review processes and citation practices related to indicators of highly cited researchers (HiCi) and articles published in Nature and Science (N&S), focusing exclusively on research.

2.2 Shanghai Ranking methodology (ARWU) and the positioning of Spanish universities

In the analysis carried out by Gómez-Marcos et al. (2021) on the internationalization of Spanish universities (from ARWU-2016/2020 and the THE-2016/2020), only 29% are present in said rankings, namely the large universities like the Complutense University of Madrid, Barcelona, Navarra, Granada, Valencia and the Polytechnic University of Valencia. This emphasizes the difficulty that smaller universities have in accessing the rankings, an aspect that coincides with studies worldwide (Fassin, 2024).

On the other hand, in the analysis of the presence of Spanish universities in the 2021 ARWU (Luque-Martínez, 2023), it is highlighted that large universities (Barcelona or the Complutense University of Madrid) are highly dependent on personnel indicators (Nobel prizes, highly cited authors), being an advantage to have outstanding personnel, although this is a risk if these indicators are eliminated or vary. In turn, the Polytechnic University of Madrid and the University of Seville depend on the scientific production indicator (PUB); although they all present challenges of publications in journals such as Nature and Science. Regarding the smaller universities, such as Jaén or Lleida, they are less competitive in personnel indicators and more sensitive to the elimination of an indicator.

Finally, from a global perspective in the analysis of the 2004–2016 Shanghai ranking (Docampo et al., 2022), it is noteworthy that the creators themselves modified the HiCi indicator, while in 2014–2015, Clarivate Analytics modified the ranking system by including annual awards from the previous decade and recalibrating the number of awards available by area. Moreover, they carried out a critical analysis of articles present in N&S based on the order of authors and their affiliations, as well as types of publication according to their inclusion in indexes like the Science Citation Index and the Social Science Citation Index. Regarding Full-Time Equivalent (FTE) personnel, the integration of inconsistent or incomplete national data generated anomalies in some countries and specific years, mainly affecting the possible positioning of small universities, an aspect also analyzed by Luque-Martínez & Luque-Raya (2024) in their bibliometric analysis of the Shanghai Ranking (2022).

Previous research concerning the analysis of the ARWU methodology (2004–2023) shows strengths and inconsistencies in the fair application of the indicators to all universities and areas, such as Education. Therefore, there is a need for an updated analysis to understand its impact in specific areas such as Education. This work aims to explore the implication of ARWU 2024 in this field and, as a case study, in Spanish universities.

3 Methodology

3.1 Methodological approach

This study adopts a qualitative, analytical-comparative approach, based on documentary analysis. The methodology focuses on critically analyzing the features and modifications introduced in the ARWU 2022–2024 methodologies (Shanghai Ranking Consultancy, 2022, 2023, 2024) to identify strengths, limitations and effects in the Education category, supported by the application of the induction-deduction for subsequent triangulation (Espinoza-Freire & Toscano-Ruiz, 2015). This approach makes it possible to analyze how the indicators used influence university performance and to propose strategies

to overcome the barriers identified. Within the universe of institutions evaluated by ARWU, Spanish universities were selected as cases of particular analysis, given their contextual relevance and the representation of the area of Education in this ranking. This work is assumed as a multiple case study with a qualitative approach, where Spanish universities are analyzed in relation to the methodological evolution of the Shanghai Ranking between 2022 and 2024.

The comparative and reflective analysis is carried out in general (indicators), and in terms of the specific nature of the area of Education and its incidence in Spanish universities. The methodological information from the various evaluations of the Shanghai Ranking (2022–2024) was extracted from its official website (https://www.shanghairanking.com/) and analyzed during the months of October 2025 to February 2025.

The selection of Spanish universities analyzed in this study was not based on deliberate sampling criteria by the researchers, but rather on their inclusion in the Academic Ranking of World Universities (ARWU) in the category of Education during the 2022–2024 period. These institutions were thus considered as case studies by virtue of their appearance in the ranking itself, which reflects the operational definition of the study universe. The objective was to examine how the methodological changes introduced in ARWU impacted the positioning of the Spanish institutions that were effectively evaluated by this system. Consequently, the inclusion of Spanish universities such as Huelva, Alcalá or UNIR in the 2024 list, despite their smaller size or limited international visibility, provided a unique opportunity to reflect on the potential for academic visibility under shifting ranking indicators. This approach aligns with comparative case study logic, where the selection is conditioned by structural inclusion in an international evaluation system.

3.1.1 Documentary analysis

Documentary analysis, based on the guidelines proposed by Bowen (2009), was key to extract information from primary sources, such as official ShanghaiRanking reports, as well as bibliometric databases; and secondary sources, such as relevant academic literature. This method made it possible to identify variations and structural elements in the methodologies applied in 2022, 2023 and 2024.

3.1.2 Analytical-comparative approach

The comparative-analytical approach (Hantrais, 1999) was essential to examine similarities and differences between the indicators used in the different methodologies. This technique was used to evaluate the relevance of each metric for areas such as Education. In addition, areas were identified where indicators may under-represent the local and regional impact of educational research.

3.1.3 Critical analysis

A critical analysis (Kincheloe & Mclaren, 2011) was applied to interpret the findings, in order to reflect on the structural limitations of ARWU. This approach made it possible to contextualize the metrics used and their applicability in the area of Education.

3.2 Methodological triangulation

To guarantee the robustness of the findings, methodological triangulation (Creswell, 2013) was used, integrating diverse sources and perspectives in the analysis, including data comparison, as well as a critical review of the literature on university ranking systems. The triangulation made it possible to corroborate the interpretations and strengthen the validity of the conclusions.

The result of this methodological analysis describes the metrics used in ARWU and offers a reflection on its applicability, limitations and opportunities in the area of Education. This approach provides a basis for developing strategies –from the area of Education and the like– to enable institutions to improve their rankings.

4 Results

The results of the analysis show that the ARWU 2022–2023 methodologies prioritize indicators oriented to scientific and technical disciplines, such as category normalized citation impact (CNCI), number of publications in high impact journals (TOP Journal Papers) and international collaboration (IC). Although these indicators favor global visibility, they present limitations for Social Science areas such as Education. Among the main challenges are the exclusion of contextual research and qualitative approaches, due to the predominance of metrics focused on English-language publications and non-contextualized studies. Likewise, the scarce presence of specific international awards in the field of education and the bias towards international collaboration penalize those institutions that stand out for their local impact.

The first two research questions are answered below; the third is developed in the discussion section, in which the results obtained are integrated and argued.

4.1 ARWU indicators 2022–2023

In terms of ARWU methodologies, in 2022 it included five main indicators: 1) Top Journal Papers (TOP) evaluated the amount of publications in high impact journals, selected through the Academic Excellence Survey (AES), encouraging the production of internationally recognized research; 2) Category Normalized Citation Impact (CNCI) measured the impact of citations adjusted by discipline, ensuring comparability between different areas of knowledge; 3) International Collaboration (IC) calculated the proportion of publications carried out with researchers from other international institutions, highlighting the degree of globalization; 4) Number of Papers (PUB) focused on the volume of publications per institution by discipline, while; 5) Award reflected academic recognition through significant awards given to university staff according to the Academic Excellence Survey (AES). The indicators were applied uniformly to all disciplines, without adaptations for different areas.

In 2023, the methodology maintained the same five indicators. However, adjustments were made to better reflect the characteristics of certain disciplines. In Computer Science and Engineering, 31 conferences were included within the TOP indicator. However, the indicators applied to Education didn't experience modifications. The rest of the indicators remained unchanged (Table 1). CNCI continued to be a central metric

Table 1 Comparison of Indicators between 2022 and 2023

Indicator	2022	2023
TOP	Included, limited to high impact journals	Included, with the addition of key conferences in technical areas
CNCI	Included, measures impact normalized by discipline	Included, without changes
IC	Included, measures international co-authorship	Included, without changes
PUB	Included, measures the total volume of publications	Included, without changes
Award	Included, based on historical weighting	Included, without changes
TO	Included, limited to high impact journals	Included, with the addition of key conferences in technical areas

for assessing normalized citation impact by discipline, while IC and PUB retained their roles in the measurement. Awards maintained its focus on the historical weighting of the awards, allowing the recognition of relevant achievements thanks to their seniority.

Although the general structure of the methodology remains the same between 2022 and 2023, the differences reflect refinements. In 2023, the inclusion of key conferences addressed a 2022 limitation in technical disciplines, while in Education no notable changes were observed.

4.2 Behavior of the Shanghai Ranking in Spanish universities (2022–2024)

Regarding the second research question, the data from the Shanghai Ranking in Spanish universities (2022 and 2023) is shown in Table 2.

The Q1 indicator measures the proportion of publications in the top quartile of scientific journals, reflecting the perceived quality of research and correlating it with academic relevance and visibility. As for CNCI, between 2022 and 2023, the average suffered a slight decrease of one point (−1.0), although with high dispersion among universities: some increased their impact significantly, while others showed notable setbacks. With regard to international collaboration, an average decrease of 7.8 points is shown (2022 and 2023), which is worrisome from a bibliometric perspective. The TOP indicator (2022–2023) shows an average decrease of 11.2 points, indicating a drop in the overall competitiveness of Spanish universities, since no university managed to publish in high impact journals during 2023, hence value 0 in the TOP factor shown in Table 2.

Table 3 shows interesting results for the year 2024 with the presence of small universities, such as Huelva.

Regarding the data shown in the faculty quality indicator, the universities of Huelva (22.4), Alcalá (12.9) and Alicante (7.9) have significantly lower values compared to consolidated universities (Autonomous University of Madrid or Barcelona), whose scores exceed 30 points. In academic production, extremely low values appear for Huelva, Alcalá, Alicante and Córdoba, close to zero; but in research quality, the small universities present moderate values: Huelva (20.3), Alcalá (18.4) and Alicante (26.7). These are low numbers compared to the leading universities, although they meet acceptable standards in their areas.

In relation to the second research question, the changes or variations observed in each indicator are shown in Fig. 1. Blue bars represent 2022 values, while orange bars

Table 2 Universities present in the Shanghai Ranking (2022 and 2023)

Spanish Universities	Q1-2022	Q1-2023	CNCI-2022	CNCI-2023	IC-2022	IC-2023	TOP −2022	TOP-2023
Autonomous University of Madrid	33.3	35.5	82.2	82.9	67.6	61.8	21.7	0
University of Barcelona	40.4	43.6	71.0	73.1	64.2	65.7	17.7	0
Autonomous University of Barcelona	35.5	38.2	70.0	68.8	65.8	70.6	12.5	0
Pompeu Fabra University	29.4	29.0	82.5	73.7	64.9	61.8	12.5	0
University of Castilla–La Mancha	29.0	35.2	72.3	80.5	53.8	61.9	25.0	0
University of Salamanca	30.2	35.2	79.9	80.5	79.9	61.9	17.7	0
University of Seville	30.6	38.2	76.4	70.8	76.4	55.3	21.7	0
University of Granada	34.1	42.3	68.6	66.1	68.6	58.4	12.5	0
University of Oviedo	32.6	33.6	79.2	77.6	79.2	62.9	0.0	0
University of Valencia	37.2	42.6	74.4	70.1	74.4	60.7	0.0	0
University of Valladolid	30.2	33.6	76.4	73.9	76.4	69.8	12.5	0
University of Zaragoza	27.2	32.2	76.3	70.5	76.3	50.9	12.5	0
UOC Universitat Oberta de Catalunya	33.7	38.2	89.5	90.5	89.5	66.8	0.0	0
Universitat de Lleida	21.1		78.3		46.9		12.5	
University of Girona	21.1		73.6		53.4		12.5	
University of La Laguna	23.3		77.2		53.0		12.5	
University of Málaga	25.8	31.2	63.2	64.3	44.1	48.5	12.5	0
University of Murcia	29.4	34.2	72.8	73.7	55.1	52.8	0.0	0
University of Santiago Compostela	23.8		61.0		51.1		12.5	
University of the Balearic Islands	17.9		66.2		60.8		17.7	
University of the Basque Country	33.7	35.2	71.4	72.7	45.9	47.7	0.0	0
University of Vigo	21.7		59.8		50.3		17.7	
Complutense University of Madrid		38.8		63.6		53.4		0
University Jaume I		31.6		80.5		56.0		0
Rey Juan Carlos University		28.6		68.9		58.3		0
University de Cádiz		22.6		78.9		54.8		0
International University of La Rioja (UNIR)		28.6		64.0		62.7		0
National University of Distance Education (UNED)		28.2		73.1		54.1		0
University of Almeria		25.8		73.4		49.8		0
University of Extremadura		26.2		77.0		50.2		0

Values obtained for Spanish universities in the different indexes analysed by the Shanghai Ranking

correspond to 2023. A positive change is indicated when the 2023 bar is longer than that of 2022; a negative change when it is shorter. The graphs illustrate shifts in four key indicators: Top Journal Papers (TOP), International Collaboration (IC), Category Normalized Citation Impact (CNCI), and the proportion of publications in Q1 journals.

As shown in Fig. 1, Spanish universities present heterogeneous trends across these indicators. The TOP indicator experienced a general decline, with all institutions showing null values in 2023. CNCI results varied considerably, with some universities—such

Table 3 Spanish universities present in the Shanghai Ranking in the area of Education

Spanish Universities	World-class faculty	World-class output	High quality research	Research impact	International collaboration
Autonomous University of Madrid	23.5	0.0	36.8	39.0	6.0
National University of Distance Education	34.1	0.0	31.2	36.1	5.8
University of Valencia	10.0	9.4	44.6	33.7	6.0
UOC University Oberta de Catalunya	12.9	0.0	38.0	43.2	6.9
Autonomous University of Barcelona	4.6	0.0	39.5	34.7	7.1
Complutense University of Madrid	16.6	0.0	41.1	30.2	5.3
University of Barcelona	0.0	0.0	43.7	34.7	6.6
University of Granada	0.0	0.0	44.0	36.5	6.4
University of Salamanca	6.0	0.0	34.7	39.7	6.8
University of the Basque Country	15.9	0.0	38.0	33.6	4.9
International University of La Rioja	15.9	0.0	27.1	31.1	5.8
University of Castilla–La Mancha	0.0	0.0	34.9	41.5	6.2
University of Huelva	22.4	0.0	20.3	33.6	6.8
University of Oviedo	5.6	0.0	34.7	36.4	6.7
University of Seville	0.0	0.0	40.4	33.1	5.3
University of Valladolid	6.5	0.0	33.6	36.0	7.1
University Jaume I	0.0	0.0	30.6	37.9	5.5
University of Alcalá	12.9	0.0	18.4	33.6	6.3
University of Alicante	7.9	0.0	26.7	33.3	5.4
University of Cordoba	8.6	0.0	27.1	33.8	6.1
University of Málaga	0.0	0.0	34.7	31.0	5.2
University of Murcia	0.0	0.0	35.5	35.0	5.9
University of Zaragoza	0.0	0.0	34.9	34.2	5.4

as Santiago de Compostela and the UOC—showing notable improvements, while others declined. Regarding IC, most universities experienced a decrease in international collaboration. The Q1 indicator reveals a mixed performance, with moderate increases in institutions such as Valencia and La Laguna, and stagnation or decline in others. These variations reflect divergent institutional strategies, disparities in resource allocation, and differences in publication practices, as well as the structural challenges faced by the field of Education in the context of global bibliometric evaluation systems.

5 Discussion and conclusions

Analysis of the Q1 indicator data shows an average increase of 4.1 percentage points between 2022 and 2023, which is significant in a highly competitive environment. However, individual results show variability, with slight decreases or stagnation, suggesting unevenness in the ability to compete at the global level.

As for CNCI (2022/2023), the uneven behaviour could be related to variability in scientific visibility strategies, such as the selection of high-impact journals. This indicator highlights the importance not only of publishing in quality journals, but also of choosing relevant topics and fostering collaboration that generates greater reach and citation.

Regarding international collaboration, the observed decline may be influenced by several factors, such as mobility restrictions due to the COVID-19 pandemic and the

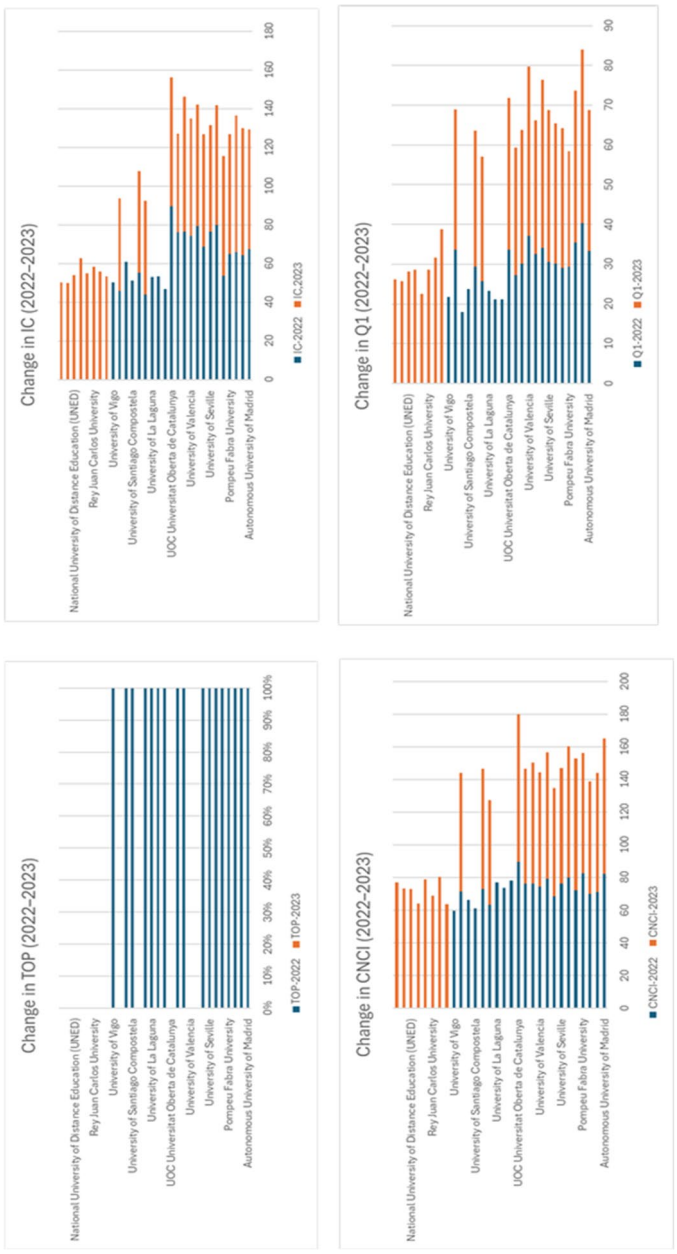

Fig. 1 Variations 2022–2023 by indicator

possible prioritization of national projects. Even so, it is essential that Spanish universities invest in programs that promote these collaborations to increase their impact and knowledge transfer (teaching and research mobility programs, participation in international projects, promotion of joint undergraduate or graduate programs with foreign universities).

The TOP indicator between 2022 and 2023 showed a drop in the global competitiveness of Spanish universities, perhaps due to changes in the evaluation methodologies of the rankings, an increase in the quality and quantity of institutions competing internationally, or the irruption of the Asian world. From a university management point of view, the loss of positions in these rankings can have a negative effect on reputation and the ability to attract talent and funding.

Regarding the personnel quality indicator, the figures indicate that the new universities have a staff with less international projection, probably related to the institutional size and their historical focus on teaching rather than on high-impact research. However, inclusion in the ranking is an opportunity to attract external academic talent and consolidate development programs for local talent and teaching staff at these universities, which could improve this indicator.

The academic production of some universities highlights a clear limitation in the volume of publications and projects considered to be of high global relevance and suggests that educational institutions face difficulties in terms of infrastructure and funding for research. To improve, they could prioritize the creation of specialized research centres and encourage publication in high-impact journals. Even so, these small universities have achieved a systematic and discrete presence in terms of scientific publications in WoS (Table 4), with the universities of Jaume I and Alicante standing out.

Research impact is one of the most homogeneous indicators among the small universities, with values close to 33.6 for Huelva and Alcalá, and 33.3 for Alicante. This shows that, despite their lower volume of scientific production, the published works have resonance in Education. To move forward, they could intensify their participation in international research projects and increase the number of open access publications.

The international collaboration indicator reflects a limited connection with global networks. The values for Huelva (6.8), Alcalá (6.3) and Alicante (5.4) are significantly below the average of the main Spanish universities, suggesting less integration in international research networks. This deficit can be explained by a lower capacity to establish strategic alliances due to limited resources or lack of international tradition. To improve, these universities should prioritize international agreements, participate in programs such as Erasmus + and Horizon Europe (Álvarez-Díaz et al., 2023), as well as in Latin American thematic networks, a common cultural space with Spain.

The presence of the universities of Huelva, Alcalá, Alicante and Córdoba in the 2024 Shanghai Ranking represents a step towards their internationalization and academic visibility, although they present low values. The inclusion of these universities could lead to significant advances in research impact and quality, and they could consolidate their position if they design specific strategies to strengthen their weak points. The difference with large universities should not be interpreted as a weakness, but as an opportunity to find a differentiated niche in the academic context.

Table 4 Scientific publication in WoS by university (2019–2023)

University	Education & Educational Research					Education, Scientific Disciplines					Education, Special
	2019	2020	2021	2022	2023	2019	2020	2021	2022	2023	
University of Córdoba	43	54	74	87	55	10	3	4	6	3	0
University of Huelva	19	50	55	52	41	5	8	8	16	4	0
University of Alcalá	26	41	49	36	38	6	5	8	12	1	1 (2019), 3(2021), 1(2022), 1(2023)
University of Alicante	81	74	63	82	81	0	0	0	0	0	0
University of Jaume I	79	66	56	64	57	7	9	6	20	4	0

While methodological updates aim to promote research quality, they still fail to reflect the diversity and contextual richness of educational research.

5.1 Limitations and opportunities of the ARWU 2022 and 2023 indicators in Education

The TOP measures the number of articles published in high impact journals, favoring the production of high-quality research, encouraging Education researchers to prioritize publications in renowned journals. However, this focus presents limitations since many studies centered on qualitative methodologies are not usually published because of their quantitative bias. This marginalizes studies that, although relevant, don't fit into the profile of these journals.

The CNCI evaluates the influence of research by measuring citation impact adjusted by discipline. This focus highlights research in Education which has an impact within its field; although this indicator may present disadvantages by prioritizing English-language research or recognized international contexts, excluding other studies. The comparison with disciplines with higher citation indexes, like Health Sciences or Physics and Chemistry, can also put Education at a disadvantage by presenting a more contextualized and less universal impact.

The IC indicator measures the proportion of internationally co-authored articles, enriching research in Education with diverse perspectives which propose more inclusive and global educational solutions. This approach addresses transnational issues such as educational equity, inclusion and pedagogical innovation in the use of ICTs, and media skills training, among others. However, institutions in developing countries face barriers in these collaborations due, among others, to economic and language limitations.

The PUB indicator focuses on the total volume of publications, which identifies academic productivity. This focus helps universities that contribute the most in the category of Education. However, prioritizing quantity over quality can have negative consequences. Furthermore, institutions centered on pedagogical quality and practical teacher training may find themselves at a disadvantage, especially in countries where educational research has an applied approach rather than a theoretical one.

The Awards indicator measures academic recognition through significant international awards. However, Education has no relevant international awards compared to disciplines such as Medicine or Physics. This focus favors institutions with access to global academic networks, which may exclude those in emerging regions who make significant contributions but are less visible on an international level.

The 2023 methodology of the Shanghai Ranking presents a solid evaluation framework, although its indicators reflect biases towards metrics prioritizing the global quality and impact over local and contextual relevance. Although indicators like TOP and CNCI are useful for measuring the influence and quality of research, they are insufficient for application in the category of Education. Likewise, indicators like IC and Award promote international collaboration and global recognition but pose significant barriers for institutions with limited resources.

5.2 Analysis of changes in the 2024 methodology

In 2024, the methodology changed significantly by reorganizing the indicators into five categories with new weightings and the inclusion of additional metrics. The World-Class

Faculty category (20%) added indicators like Highly Cited Researchers (HCR), Leadership, and Editor, with leadership and individual contribution prevailing. World-Class Output (15%) maintained focus on high-impact publications, while High-Quality Research (15%) introduced Q1 Journal Papers (Q1), prioritizing publications in first-quartile journals. Research Impact (20%) continued using CNCI, and International Collaboration (30%) significantly increased its weighting, emphasizing the importance of collaboration. A notable change in 2024 was the elimination of PUB, reflecting a shift towards quality instead of quantity of publications. Moreover, the indicators related to academic awards were replaced by leadership metrics, such as Leadership and Editor.

5.2.1 Impact of the 2024 methodology in Education: critical analysis

The 2024 methodology reorganizes the indicators in thematic categories. In this analysis, we evaluate the impact of each category in the field of Education, considering advantages, limitations and possible implications.

The World-Class Faculty category, with a weighting of 20%, includes indicators such as Highly Cited Researchers (HCR), Leadership, Editor and Laureate, which evaluate individual recognition and leadership. From a general perspective, these indicators benefit universities with scholars recognized for their research and their participation in leadership roles in journals or international associations.

However, the Education category suffers as a result of these criteria, as it has fewer highly cited researchers and relevant awards compared to other disciplines. In addition, indicators such as Leadership and Editor tend to favor institutions in countries with access to global academic networks, leaving at a disadvantage those that produce relevant research but fail to position themselves in these roles of international visibility. Furthermore, first-quartile journals indexed in the categories of Education & Educational Research, Education or Special Education, are mainly published in English or Chinese-speaking countries.

The World-Class Output category (representing 15% of the total) focuses on the Top Journal Papers (TJP) indicator which measures the quantity of publications in high impact journals. The production of "high quality" research (determining quality according to indicators that do not consider qualitative or locally relevant studies) continues to be encouraged, providing global visibility to the institutions that publish in these journals at a high cost per publication. However, the limitations of this indicator are similar to those of 2023 –local, innovative research based on qualitative methodologies is not published in high impact journals–, making it a challenge for universities to achieve a ranking in this category where the relationship between the volume of researchers and the possibility of internal or external funding (payment of APC in high impact journals) is more accessible in large and prestigious universities.

Similar to the above is the High-Quality Research category (15%), which introduces the Q1 Journal Papers (Q1) indicator. This measures the number of publications in first-quartile journals, encouraging publication in the most prestigious journals in the field. However, this approach may exclude research due to an applied or regional focus. In Education, many qualitative journals don't achieve Q1 status, marginalizing this research despite its pedagogical value. In this sense, most of the journals indexed in the categories related to Education (Web of Science) are fundamentally related to the use

of educational technologies and informatics with a more techno-pedagogical purpose rather than an educational one.

The Research Impact category (20%) continues to use the CNCI indicator to evaluate the influence of research. This indicator provides an objective measure of citation impact, adjusted by discipline, although Education is again penalized as local or regional research gets fewer international citations. Moreover, prioritizing citations in English excludes relevant publications in other languages.

The International Collaboration category (30%) measures the proportion of publications published in international co-authorship, although this is not always feasible, especially for universities located in countries with fewer resources, language limitations or low funding.

In short, the 2024 methodology introduces a more qualitative approach by assessing aspects such as academic leadership. These changes represent an advance towards global excellence but also pose challenges. The indicators prioritize theoretical and generalizable research, leaving applied or local studies, which are fundamental for teacher training and the development of educational systems adapted to specific contexts, at a disadvantage.

Although categories such as Research Impact and International Collaboration offer opportunities to highlight the global influence of research in Education, a more balanced approach that values regional relevance and practical pedagogical innovation is needed, ensuring that the ranking is inclusive and representative of the diversity of contributions in the field of education.

5.3 Opportunities and disadvantages of methodologies for the area of education (2023–2024)

The 2023 and 2024 methodologies promote quality in research through indicators which measure publications in high-impact journals, such as Top Journal Papers (2023) and World-Class Output (2024). This approach encourages Education scholars to prioritize high-quality research by increasing international visibility, although this is difficult given the small number of educational journals in the first quartile and the strong presence in Anglo-Saxon countries. In addition, the use of the CNCI indicator makes it possible to measure the impact of research adjusted by discipline, recognizing that although contributions in Education generate fewer citations than other scientific disciplines, they can be recognized for their influence in the field.

Another common point is the emphasis on international collaboration (IC) which underlines the importance of establishing international relationships. This indicator fosters the creation and strengthening of cooperation networks between different countries, facilitating the resolution of global educational problems. Lastly, both methodologies strengthen the positioning of Education as a relevant discipline. Although the 2023 and 2024 approaches have their differences, these advantages reflect a continuity in the benefits that the ranking can bring to the development and visibility of the educational field.

Both the 2023 and 2024 methodologies present common disadvantages that affect the field of Education, due to the generalizing nature of their indicators, such as the priority focus on research published in high-impact journals (Top Journal Papers 2023 and World-Class Output 2024). Although these metrics promote academic quality, they tend

to exclude qualitative, local or innovative studies published in journals in other quartiles. This marginalizes studies that are internationally less visible yet essential for improving Education Sciences.

Other shared challenges are the dependency on the CNCI indicator, which prioritizes the impact of citations adjusted by discipline, as previously mentioned, and international collaboration which can also be a barrier for institutions located in countries or areas with fewer resources. Likewise, in both methodologies, the benefit is maintained for other disciplines with a greater number of international awards or highly cited researchers, such as Physical–Chemical Sciences or Health Sciences.

These common disadvantages reflect a structural bias towards metrics designed for disciplines with a clear scientific and generalizable orientation, negatively affecting access to these rankings for small universities or those from developing countries. This suggests the need to adapt the metrics to the particularities of each category.

With regard to the first research question, the ARWU methodology underwent significant changes between 2022 and 2024, showing a trend towards prioritization of qualitative indicators, although there is still a marked positivist vision. The elimination of the PUB indicator in 2024 marks a turning point, prioritizing quality over the volume of publications. This benefits universities with strategies based on high-impact research, especially those which publish in first-quartile journals. However, this transition introduces barriers for areas such as Education, where qualitative research tends to be less visible in high-impact journals. In addition, the greater weight given to IC reflects a commitment to globalization. While this fosters international academic networks, it penalizes universities with locally applied research. Lastly, the World-Class Faculty indicator (introduced in 2024) provides an interesting dimension to the ranking by assessing the individual prestige of the teaching staff. However, this metric favors universities with resources to attract or train renowned academics, generating structural inequalities between institutions (Viana et al., 2024).

The performance of Spanish universities in the Shanghai Ranking between 2022 and 2024 (question 2) was heterogeneous, reflecting differences in resources, strategies and approaches. The large universities (Barcelona and the Autonomous University of Madrid) have maintained outstanding positions due to their competitive capacity in international metrics such as publication in high-impact journals and participation in global networks. Meanwhile, smaller universities like Huelva, Alcalá and Alicante, which entered the ranking in 2024, face limitations (Luque-Martínez, 2023). Their entry suggests specific advances, such as the quality of publications, but its low values in indicators such as World-Class Faculty and International Collaboration reflect the need to strengthen internationalization and talent-attraction strategies. In disciplines like Education, the results show that the current ranking indicators do not fully capture the local impact nor the qualitative focus of a lot of research.

Lastly, regarding question 3, Spanish universities should adopt diversified strategies to improve their performance in the ranking without compromising their educational mission. First, they should encourage strategic publication in high impact journals (Q1 Journal Papers), while maintaining a presence in media that value local and qualitative approaches. This will not only improve quality indicators but also the social relevance of their research (Bustos-González, 2019). Second, they should strengthen international

networks through collaborative projects and participation in global consortia, which could increase the International Collaboration score (Bonilla-Calero et al., 2024); and they should invest in staff development and stability, promoting international recognition (award nominations, leadership in journals and scientific associations) (Posca-Cohen, 2024). Finally, universities should implement institutional visibility programs that highlight their strengths, helping them to compete on an equal footing in a system designed for technical and scientific disciplines.

The methodological changes of ARWU introduced in 2024 show a transition towards metrics which assess quality, although they present challenges for disciplines like Education (Luque-Martínez & Luque-Raya, 2024). Although Spanish universities have achieved significant advances, gaps remain between big and small institutions, especially in the areas of internationalization and academic prestige. To address these limitations, institutions must balance compliance with the ranking indicators with the promotion of research relevant to their local contexts. This focus will not only allow the improvement of their global positioning but also guarantee significant impact in their communities. The evaluation of universities must go beyond traditional global metrics, recognizing the diversity of academic contributions.

5.4 Limitations and recommendations

One of the main limitations of this study is its dependency on bibliometric data from international systems like Web of Science and Scopus. These databases prioritize publications in English and in high-impact journals, under-representing relevant research in languages other than English or in local contexts. This is especially significant in the field of Education.

Another limiting aspect is the generalizing character of indicators used in the Shanghai Ranking, such as World-Class Faculty or International Collaboration. These indicators are mainly designed to evaluate scientific and technical disciplines, introducing a bias which does not accurately reflect the local and contextual impact of social disciplines such as Education. This especially affects small universities or those with a more applied and contextualized educational focus.

In addition, the lack of data disaggregated by sub-areas in Education makes a more detailed analysis difficult. This impedes specific understanding of the impact that the indicators have in fields such as educational technologies, inclusive pedagogy or teacher training, areas which are fundamental within the educational discipline.

Lastly, the constant methodological changes in the Shanghai Ranking represent a challenge for longitudinal comparisons. The elimination of indicators, such as PUB, or the introduction of new metrics, such as World-Class Faculty, make it difficult to identify consistent tendencies and limit the extrapolation of solid long-term conclusions.

In response to these limitations, qualitative analyses focused on case studies of specific universities are proposed, as well as expert interviews. This would allow a deeper understanding of the institutional strategies that have contributed to the success or difficulties of these institutions in the global rankings. To improve the results of small universities, it would be interesting to analyze the strategies implemented to overcome the disadvantages in the rankings.

Another relevant line of research would be the design of alternative metrics which better reflect the particularities of disciplines such as Education. These metrics could include local relevance, community impact and pedagogical innovation, aspects which are not completely assessed in the current rankings.

Likewise, it is crucial to investigate how international collaborations can mitigate the structural barriers faced by small universities. The exploration of cooperation programs and global academic networks would make it possible to identify effective strategies to enhance the International Collaboration indicator.

Moreover, a critical review of bibliometric systems, such as Web of Science and Scopus, is necessary to promote the inclusion of relevant research published in languages other than English and in non-traditional formats. This would be especially valuable for social disciplines (Education) which produce a large quantity of research in formats such as books, pedagogical reports or local studies and reports.

Finally, it would be beneficial to carry out a longitudinal analysis of the Shanghai Ranking, examining how the methodological changes longitudinally affect Spanish universities and other countries over time. This could contribute to designing more effective positioning strategies adapted to changes in the indicators.

All of this is intended to promote the necessary adaptation of global classification systems to better recognize context-sensitive disciplines, such as education, which is considered essential for a more equitable academic landscape.

Based on the findings and limitations discussed, the following recommendations are proposed to enhance the visibility and positioning of universities in the Education category of global rankings such as ARWU:

- Promote strategic publication in first-quartile journals (Q1), balancing global impact with local relevance.
- Foster international research collaboration through programs like Erasmus+, Horizon Europe, and Latin American academic networks.
- Support academic leadership by encouraging participation in editorial boards and scientific associations.
- Invest in faculty development focused on research visibility and bibliometric literacy.
- Strengthen institutional communication strategies that highlight educational innovation and contextual impact.

Ultimately, beyond rankings and metrics, the true value of educational research lies in its capacity to transform lives, shape inclusive societies, and respond to the diverse realities of our time. Recognizing and supporting this diversity—through more flexible, contextual, and human-centered evaluation systems—should be a shared commitment. Only then can global excellence coexist with local relevance, ensuring that small institutions and applied disciplines like Education are not only counted, but truly valued.

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Authors' contributions
OEM designed the experiment, performed the theoretical and literature analysis and wrote the initial article. BMJ performed the review and contributed to the drafting of the manuscript. IAG managed the project, coordinated, supervised and reviewed the manuscript. All authors read and approved the final manuscript.

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Data availability
Data will be openly available in open repositories, once the manuscript has been accepted.

Declarations

Ethics approval and consent to participate
Authors accept the journal's ethics guidelines and consent to participate. Authors avoid misrepresenting research results which could damage the trust in the journal, accepting ethics requirements in accordance with the journal submission guidelines.

Consent for publication
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