

## INTERNAL STRUCTURE AND RELIABILITY OF SOFT SKILLS AND TEACHING PERFORMANCE SCALES AMONG UNIVERSITY PROFESSORS: EXPLORATORY PSYCHOMETRIC EVIDENCE

### ESTRUCTURA INTERNA Y CONFIABILIDAD DE ESCALAS DE HABILIDADES BLANDAS Y DESEMPEÑO DOCENTE EN PROFESORES UNIVERSITARIOS: EVIDENCIA PSICOMÉTRICA EXPLORATORIA

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#### Abstract

Measuring soft skills and teaching performance requires evidence on internal structure and score precision. The objective was to evaluate the internal structure and reliability of two scales administered to professors at a Colombian public university. An instrumental, quantitative, cross-sectional study was conducted with 200 professors who answered 46 items: 30 on soft skills and 16 on teaching performance. Descriptive statistics, floor and ceiling effects, corrected item-total correlations, Cronbach's alpha, McDonald's omega, the Kaiser-Meyer-Olkin index, Bartlett's test, parallel analysis with 1,000 random matrices, and exploratory factor analysis based on polychoric correlations, principal-axis factoring, and oblimin rotation were calculated. The matrices showed adequate factorability for soft skills (KMO = 0.93) and teaching performance (KMO = 0.92), with significant Bartlett tests ( $p < 0.001$ ). Overall internal consistency was high. Parallel analysis retained three factors for soft skills, explaining 56.97% of the variance, and two for teaching performance, explaining 61.38%. Cross-loadings, ceiling effects, and inadequate functioning of the reverse-worded item were observed. In conclusion, the scales show favorable precision, but their structure requires confirmation in independent samples before use in individual decisions.

**Keywords:** factor analysis, psychometrics, soft skills, teaching performance, teachers

#### Resumen

La medición de las habilidades blandas y del desempeño docente requiere evidencias sobre la estructura interna y la precisión de las puntuaciones. El objetivo fue evaluar la estructura interna y la confiabilidad de dos escalas aplicadas a profesores de una universidad pública colombiana. Se realizó un estudio instrumental, cuantitativo y transversal con 200 docentes que respondieron 46

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reactivos: 30 de habilidades blandas y 16 de desempeño docente. Se calcularon estadísticos descriptivos, efectos piso y techo, correlaciones ítem-total corregidas, alfa de Cronbach, omega de McDonald, índice Kaiser-Meyer-Olkin, prueba de Bartlett, análisis paralelo con 1.000 matrices aleatorias y análisis factorial exploratorio sobre correlaciones policóricas, mediante ejes principales y rotación oblimin. Las matrices mostraron adecuada factorizabilidad para habilidades blandas ( $KMO = 0,93$ ) y desempeño docente ( $KMO = 0,92$ ), con pruebas de Bartlett significativas ( $p < 0,001$ ). La consistencia interna global fue alta. El análisis paralelo retuvo tres factores en habilidades blandas, con 56,97 % de varianza explicada, y dos en desempeño docente, con 61,38 %. Se observaron cargas cruzadas, efectos techo y funcionamiento inadecuado del ítem inverso. En conclusión, las escalas presentan precisión favorable, pero su estructura requiere confirmación en muestras independientes antes de usarse en decisiones individuales.

**Palabras clave:** análisis factorial, desempeño docente, docentes, habilidades blandas, psicometría.

### Introduction

Recent changes in higher education have broadened the competencies required for university teaching. Chávez-Ventura et al. (2025) point out that the combination of face-to-face, virtual, and hybrid modalities demands the integration of disciplinary knowledge, pedagogical skills, and personal resources: academic performance depends not only on content but also on planning, clear communication, and group management. Therefore, socio-emotional competencies are part of professional teacher development and are related to the quality of educational processes (Criado-Del Rey et al., 2024).

Soft skills include personal and interpersonal dispositions, behaviors, and competencies that complement technical knowledge. Colledani et al. (2024) describe them as transversal capabilities associated with communication, initiative, decision-making, conflict management, and adaptation to different environments. Terms such as socio-emotional skills or employability skills do not always coincide, so they should be treated as dimensions that vary according to the population and the measurement conditions (Esquivel, 2025).

In university teaching, these skills fulfill a specific function due to the relational nature of education. Ceja Romay et al. (2022) identified competencies such as teamwork, assertive communication, and decision-making; empathy and leadership facilitate addressing students' needs. These abilities influence coexistence and the conditions for learning (Málaga Mamani et al., 2025).

Teaching performance encompasses the articulation of knowledge, skills, attitudes, and decisions aimed at fulfilling educational objectives. Rodríguez Siu et al. (2021) link it to disciplinary mastery, pedagogy, classroom management, motivation, and self-efficacy, going beyond simply presenting content: it includes designing learning experiences and adjusting instruction according to the needs of the group. Its assessment requires instruments that represent differentiated but related dimensions (Núñez Vives et al., 2022).

The close conceptual relationship between soft skills and teaching performance adds difficulties to their measurement. Cárdenas-Quirama et al. (2024) found that dimensions such as communication, empathy, and teamwork can present factor structures different from those expected, and even overlaps between interpersonal and pedagogical items when assessed through self-reporting. Therefore, before studying predictive relationships, it is necessary to verify whether each scale maintains an interpretable structure (Phuti et al., 2023).

Psychometric evidence shows that theoretical structures are not always reproduced equally across all populations. Al-Sa'di et al. (2023) developed a self-assessment instrument for educators and found variations in the organization of competencies, leading to revisions of several items. A scale, therefore, is not validated simply by prior use, but rather by the clarity of its items and the correspondence between the theoretical model and the observed structure (Tapullima-Mori et al., 2023).

Reliability should also not be assessed using a single coefficient. Sato et al. (2023) combined descriptive analyses, content validity, and internal consistency to examine a scale of interpersonal skills. Cronbach's alpha can be inflated by the number of items, while McDonald's omega considers the differentiated contribution of each item; both should be interpreted in conjunction with the dimensionality of the instrument, not as isolated tests (Estrada Alva et al., 2019).

Determining the number of factors is another critical decision. Choquehuanca Ramírez (2025) points out that the literature on soft skills and teacher performance presents heterogeneous definitions and diverse evaluation methods. Parallel analysis helps avoid extracting excessive factors, and exploratory factor analysis allows for the identification of weak loadings and inconsistent groupings, leading to a more parsimonious structure (Miranda Flores de Valgas & Rodríguez Rodríguez, 2025).

The available research focuses on interpersonal communication, personality, and teaching strategies, but it often uses overall scores without examining the internal workings of the scales. Psychometric studies with faculty from Latin American public universities are scarce, especially in Colombia (Mendoza-Zambrano et al., 2025).

Therefore, it is necessary to review these scales before using them to construct profiles or analyze their relationship with teaching performance. This study provides initial evidence on the behavior of the items, internal consistency, and dimensionality of both instruments. Its scope is exploratory, not a definitive validation: it seeks to guide subsequent confirmatory analyses. The objective was to evaluate the internal structure and reliability of the soft skills and teaching performance scales through item analysis, internal consistency, parallel analysis, and exploratory factor analysis in professors from a Colombian public university.

### **Materials and methods**

An instrumental, quantitative, non-experimental, cross-sectional study was conducted using data from a larger project with university professors. Ato et al. (2013) define instrumental studies as those that examine the metric properties of an instrument's scores; here, the behavior of the items, internal consistency, and factor structure of both scales were analyzed, without establishing their statistical relationship (Montero & León, 2007).

Furthermore, the scope was exploratory: the proposed structure for each instrument was compared with that observed in the data, without a prior confirmatory model. This allowed for estimating the number of factors, identifying items with low discriminative capacity or cross-loadings, and reviewing the correspondence between theoretical dimensions and the obtained groupings. Confirmatory and invariance analyses are reserved for later stages with independent samples (Boateng et al., 2018).

In terms of context, the study was conducted at a public university in Cartagena de Indias, Colombia, with undergraduate professors from the 2025-2 academic period. The target population consisted of approximately 380 faculty members from ten departments, including tenured, adjunct, and part-time professors. Participation was voluntary through an institutional call for applications; although the initial project envisioned stratified selection, the final sample was self-selected, which limits its representativeness and generalizability.

In the data collection process, carried out between August 20 and December 17, 2025, 216 forms were received, of which 16 were excluded due to incomplete information; the final sample consisted of 200 teachers (6.7 participants per item for soft skills and 12.5 for teaching performance). Sample adequacy was also examined through the factorization of the correlation matrices (Mundfrom et al., 2005; MacCallum et al., 1999).

Additionally, a form was applied with sociodemographic, educational and work variables (age, sex, marital status, stratum, level of education, teaching experience, affiliation and faculty), used only to describe the sample; none were incorporated into the factor analysis matrices.

Regarding the instruments, the soft skills scale had 30 items across four initial dimensions: teamwork (8 items), leadership (8), negotiation (7), and empathy (7), referring to collaboration, decision-making, peer support, consensus-building, problem-solving, and understanding emotional needs. DeVellis and Thorpe (2021) point out that the theoretical organization of a scale must be empirically tested, as closely related dimensions may overlap in specific populations.

Regarding scoring, the items were answered on a scale of one to five, with an overall theoretical range of 30 to 150 points. The item "In the team, we always do what you say," in reverse, was recoded using (6-x); no items were eliminated before the psychometric analysis (Hinkin, 1998).

Similarly, the teacher performance scale had 16 items in four domains of four items each (disciplinary mastery, pedagogy, classroom management, and motivation or self-efficacy), referring to professional development, lesson planning, clarity of presentation, and feedback. Each item was scored from one to five, with an overall range of 16 to 80 points (4 to 20 per domain); the scores were also expressed as averages per item, without assuming their generalizability to other teacher populations (American Educational Research Association et al., 2014).

Regarding the procedure, with institutional endorsements, the invitation was disseminated among eligible teachers via an electronic form containing the objectives, the voluntary nature of participation, the informed consent form, the characterization sheet, and the 46 items, in the same order for everyone (Bolarinwa, 2015). After the data collection period closed, the identification data were separated from the analysis database, and the presence of duplicates, missing responses, and out-of-range values was reviewed; no imputations were made, and the final database consisted of complete cases (Enders, 2010).

Before the analyses, it was verified that all responses were within the range of one to five, and the reverse-scored item was recoded. An implausible value (1979) was identified for the age variable and treated as missing data only for that variable; the participant was retained in the psychometric analyses because they completed both scales. No imputations were made, neither for the 16 incomplete forms nor for this age data (Little & Rubin, 2019).

Response patterns with extremely low variability were also examined, defined as the same category being selected in at least 45 of the 46 items. These cases were not excluded from the main analysis, as their responses were within the permitted range and there was no prior criterion for their exclusion; their influence was assessed later through a sensitivity analysis.

For the descriptive analysis, categorical variables were summarized using frequencies and percentages, and quantitative variables using mean, standard deviation, median, and interquartile range. For the scales and their dimensions, the mean per item, 95% confidence interval, skewness, kurtosis, and ceiling and floor effects were calculated. Discriminative capacity was examined using corrected item-total correlations and the change in alpha upon removal of each item; these criteria were used to decide whether to retain, revise, or remove each item.

In terms of reliability, this was estimated using Cronbach's alpha and McDonald's omega for the complete scales and their dimensions. Dunn et al. (2014) indicate that omega is more

appropriate when items have different factor loadings; both coefficients were interpreted in conjunction with item-total correlations, as high reliability can coexist with multidimensionality (Hayes & Coutts, 2020). The appropriateness of factor analysis was assessed using the KMO index and Bartlett's test of sphericity, the significance of which supports continuing with this analysis (Kaiser, 1974; Bartlett, 1954).

Subsequently, the number of factors was established through an independent parallel analysis for each instrument: 1,000 random matrices were generated with the same number of participants and items, and factors whose eigenvalue exceeded the 95th percentile of those randomly generated were retained (Horn, 1965). The final selection also considered the parsimony of the solution, the number of items with substantive loadings, and the interpretability of the factors, comparing the resulting structure with the four dimensions initially proposed without requiring an exact replication (Lloret-Segura et al., 2014).

Once the number of factors was defined, an exploratory factor analysis was performed separately for each scale, using polychoric correlation matrices due to the ordinal nature of the responses and their skewness, which were more appropriate than Pearson's correlation in this case (Holgado-Tello et al., 2010). Extraction was done along principal axes with oblimin oblique rotation, as it was expected that the factors of both scales would be related; outward loadings were considered to be  $\geq 0.40$  and cross loadings  $\geq 0.30$  in more than one factor.

For the naming of the factors, each was defined according to the content shared by its items with the highest loadings, without automatically transferring the original theoretical labels, and the presence of factors with few items, loadings of opposite sign, or reduced communalities was reviewed. Watkins (2018) recommends integrating statistical and conceptual criteria in the factor interpretation, to avoid mathematically acceptable but theoretically untenable solutions.

In the sensitivity analysis, 13 participants (6.5% of the sample) were identified with the same response category in at least 45 of the 46 items. Therefore, the KMO, alpha, omega, and parallel analysis were recalculated after excluding them (sensitivity sample: 187 teachers). The structure was considered stable as there were no relevant changes compared to the full sample, which was retained as the main analysis because these profiles did not have invalid responses and their exclusion had not been defined beforehand.

Regarding the software, the database cleaning, participant characterization, and descriptive analyses were performed using IBM SPSS Statistics v. 26; estimations using polychoric correlations, McDonald's omega, parallel analysis, and oblimin rotation were performed using R, with a significance level of 0.05 for Bartlett's test. The factor analysis was based on the magnitude of the indicators and the conceptual coherence of the groupings.

From an ethical standpoint, the research collected information from adult university professors using self-administered questionnaires and was classified as minimal risk, as there were no interventions or deliberate modification of biological, physiological, or psychological variables. Each participant received information about the purpose of the study, its voluntary nature, and the right to withdraw without consequence, and provided electronic informed consent before accessing the instruments (World Medical Association, 2013).

In this same vein, the analytical basis was anonymized and the confidential use of the information was guaranteed. The study adhered to the principles of autonomy, beneficence, non-maleficence, and justice, the international guidelines for research with human subjects, and Resolution 8430 of 1993 of the Colombian Ministry of Health, given that the data came directly from participating professors (Council for International Organizations of Medical Sciences, 2016; Colombian Ministry of Health, 1993).

## Results

The initial database consisted of 216 forms. After verifying the completeness of the 46 items corresponding to the soft skills and teaching performance scales, 200 complete records were retained, representing 92.6% of the questionnaires received. The remaining 16 records were excluded from the psychometric analyses due to incomplete information on one or both scales. No values outside the expected response range of one to five were identified.

Before calculating the scores, the reversed item "In the team, we always do what you say" was recoded using the (6-x) transformation to maintain a consistent interpretive direction. An implausible value of 1979 was detected for the age variable, so its description was based on 194 valid observations. The data cleaning and the composition of the analytical sample are presented in Table 1.

**Table 1. Database purification and analytical sample characteristics**

| Indicator                                   | Result                                       |
|---------------------------------------------|----------------------------------------------|
| Forms received                              | 216                                          |
| Records excluded from psychometric analysis | 16                                           |
| Reason for exclusion                        | Incomplete information on one or both scales |
| Final analytical sample                     | 200                                          |
| Proportion of complete records              | 92.6%                                        |
| Soft skills items                           | 30                                           |
| Teaching performance items                  | 16                                           |
| Total number of items analyzed              | 46                                           |
| Recoded reversed items                      | 1                                            |
| Valid cases for age                         | 194                                          |
| Age, mean $\pm$ SD                          | 52.57 $\pm$ 10.78 years                      |
| Median age (IQR)                            | 52.50 (45.00–61.00) years                    |
| Male                                        | 101 (50.5%)                                  |
| Female                                      | 99 (49.5%)                                   |
| Master's degree training                    | 105 (52.5%)                                  |
| Doctoral training                           | 44 (22.0%)                                   |
| Linking of professorships                   | 118 (59.0%)                                  |
| Plant linkage                               | 81 (40.5%)                                   |
| Occasional relationship                     | 1 (0.5%)                                     |

**Note.** SD = standard deviation; IQR = interquartile range. The implausible age value was excluded only from analyses related to this variable. Incomplete records were not imputed.

**Fountain:** original work.

The gender distribution was practically balanced. Academic qualifications were primarily at the master's and doctoral levels, while tenured professorships accounted for more than half of the sample. These characteristics describe the composition of the participants and do not imply statistical representativeness of the entire institutional faculty.

Overall and dimensional scores were concentrated at the top of the scale. Averages ranged from 4.21 to 4.59 out of five. Classroom management had the highest average, followed by negotiation and motivation or self-efficacy. Subject matter expertise registered the comparatively lowest score, although its average remained above four. Descriptive statistics and the distribution of scores are presented in Table 2.

**Table 2. Descriptive statistics and distribution of scales and dimensions**

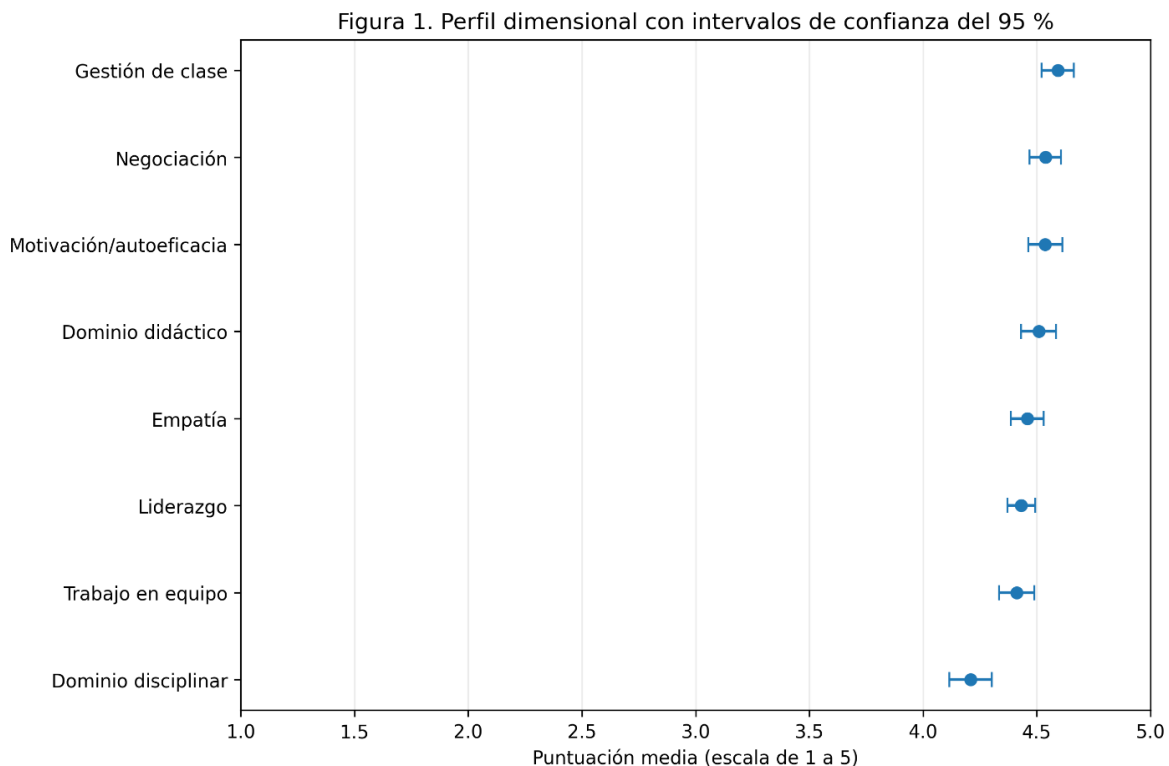
| Scale or dimension         | Items | Average | OF   | 95% CI    | Median | RIC       | Asymmetry | Kurtosis | Ceiling, % |
|----------------------------|-------|---------|------|-----------|--------|-----------|-----------|----------|------------|
| Soft skills, total         | 30    | 4.46    | 0.43 | 4.40–4.52 | 4.57   | 4.30–4.74 | -2.02     | 5.64     | 1.5        |
| Teamwork                   | 8     | 4.41    | 0.56 | 4.33–4.49 | 4.50   | 4.25–4.88 | -1.48     | 2.15     | 15.0       |
| Leadership                 | 8     | 4.43    | 0.44 | 4.37–4.49 | 4.50   | 4.25–4.75 | -2.18     | 8.08     | 7.0        |
| Negotiation                | 7     | 4.54    | 0.50 | 4.47–4.61 | 4.71   | 4.29–4.86 | -2.40     | 10.66    | 22.5       |
| Empathy                    | 7     | 4.46    | 0.52 | 4.39–4.53 | 4.57   | 4.14–4.86 | -1.51     | 3.27     | 21.0       |
| Total teaching performance | 16    | 4.46    | 0.48 | 4.39–4.53 | 4.56   | 4.23–4.81 | -1.36     | 2.77     | 12.5       |
| Disciplinary domain        | 4     | 4.21    | 0.67 | 4.11–4.30 | 4.25   | 3.94–4.75 | -0.82     | 0.37     | 21.5       |
| Didactic domain            | 4     | 4.51    | 0.56 | 4.43–4.59 | 4.75   | 4.00–5.00 | -1.16     | 1.14     | 40.5       |
| Class management           | 4     | 4.59    | 0.51 | 4.52–4.66 | 4.75   | 4.25–5.00 | -1.36     | 1.76     | 46.0       |
| Motivation/self-efficacy   | 4     | 4.54    | 0.54 | 4.46–4.61 | 4.75   | 4.25–5.00 | -1.45     | 2.47     | 38.5       |

**Note.**(n=200). SD = standard deviation; 95% CI = 95% confidence interval; IQR = interquartile range. Scores were expressed as averages per item on a scale of one to five. Ceiling = percentage of participants who achieved a dimensional score equal to 5.00.

**Fountain:** original work.

All dimensions showed negative skewness, indicative of a concentration of responses in the higher categories. This pattern was especially pronounced in negotiation and leadership. The highest ceiling effect was observed in classroom management, where 46.0% of participants achieved the maximum score, followed by teaching proficiency and motivation or self-efficacy. No absolute minimum scores were observed in any of the dimensions.

To simultaneously represent the magnitude and precision of the dimensional scores, Figure 1 presents the means and their 95% confidence intervals. The graphical arrangement confirms the highest score for classroom management and the lowest relative score for the subject area.



**Figure 1. Dimensional profile of soft skills and teaching performance. The dots represent the means and the horizontal lines their 95% confidence intervals. The dimensions were ordered from highest to lowest score. The response scale ranged from one to five. Fountain: original work.**

The matrices were well-suited for factor analysis. The soft skills scale achieved a Kaiser-Meyer-Olkin index of 0.93, and the teaching performance scale a value of 0.92. In both instruments, Bartlett's test of sphericity was statistically significant, allowing us to reject the hypothesis of an identity matrix and supporting the presence of systematic correlations between the items.

Overall internal consistency was high for both scales. Soft skills showed a Cronbach's alpha of 0.94 and a McDonald's omega of 0.95, while teaching performance reached values of 0.91 and 0.94, respectively. The indicators of factorial adequacy, reliability, and item discrimination are presented in Table 3.

**Table 3. Factorial adequacy, internal consistency, and item discrimination**

| Scale or dimension            | KMO  | Bartlett ( $\chi^2$ )<br>(gl) | p          | $\alpha$ | $\omega$ | Corrected item-total<br>correlation |
|-------------------------------|------|-------------------------------|------------|----------|----------|-------------------------------------|
| Soft skills, total            | 0.93 | 3864.78 (435)                 | <<br>0.001 | 0.94     | 0.95     | −0.20–0.76                          |
| Teamwork                      | —    | —                             | —          | 0.86     | 0.86     | 0.44–0.69                           |
| Leadership                    | —    | —                             | —          | 0.74     | 0.84     | −0.18–0.75                          |
| Negotiation                   | —    | —                             | —          | 0.89     | 0.89     | 0.58–0.75                           |
| Empathy                       | —    | —                             | —          | 0.86     | 0.87     | 0.49–0.76                           |
| Total teaching<br>performance | 0.92 | 2059.93 (120)                 | <<br>0.001 | 0.91     | 0.94     | 0.30–0.76                           |
| Disciplinary domain           | —    | —                             | —          | 0.69     | 0.70     | 0.34–0.63                           |
| Didactic domain               | —    | —                             | —          | 0.86     | 0.87     | 0.62–0.76                           |
| Class management              | —    | —                             | —          | 0.87     | 0.87     | 0.66–0.77                           |
| Motivation/self-<br>efficacy  | —    | —                             | —          | 0.83     | 0.84     | 0.62–0.74                           |

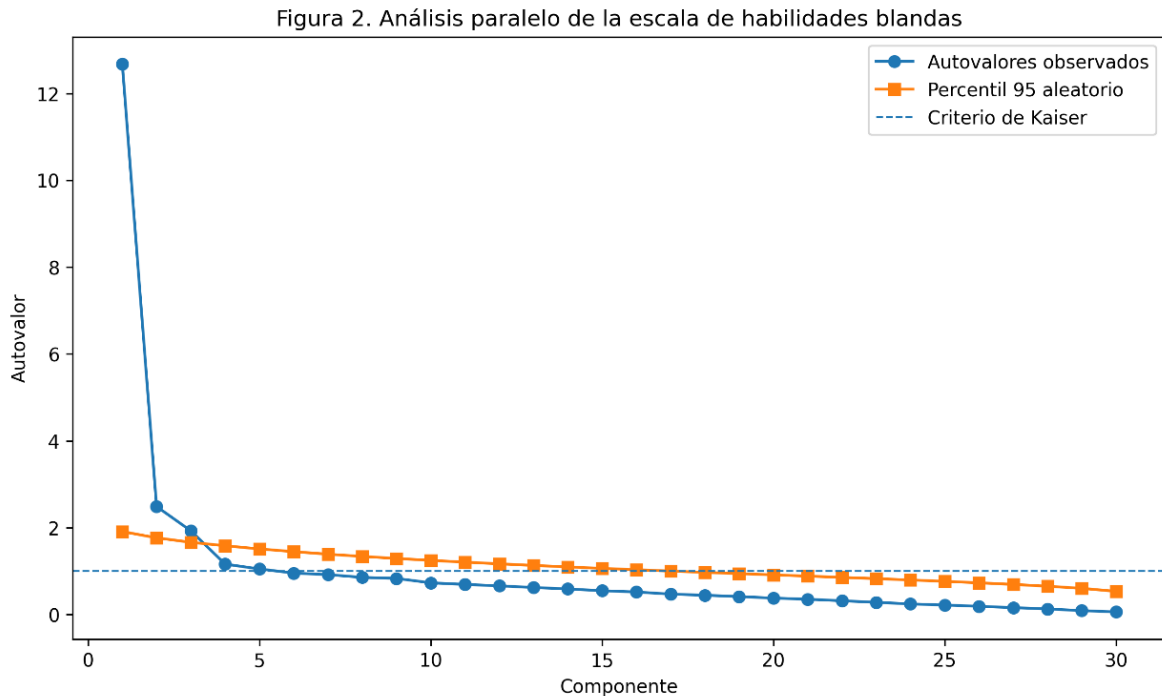
**Note.**(n=200). KMO = Kaiser–Meyer–Olkin index; df = degrees of freedom;  $\alpha$  = Cronbach's alpha;  $\omega$  = McDonald's total omega. Dashes indicate parameters not estimated separately for the dimension.

**Fountain:** original work.

The greatest difference between alpha and omega was observed in leadership, with values of 0.74 and 0.84, respectively. The reversed item "In the team, we always do what you say" showed a negative corrected item-total correlation of −0.18, even after recoding. When this item was diagnostically excluded, the alpha for the leadership dimension increased from 0.74 to 0.87. No other soft skills item showed item-total correlations below 0.30.

Within teaching performance, the disciplinary domain showed the lowest internal consistency, with  $\alpha = 0.69$  and  $\omega = 0.70$ . Its item-total correlations ranged between 0.34 and 0.63. The remaining performance dimensions presented coefficients greater than 0.83 and corrected item-total correlations equal to or greater than 0.62.

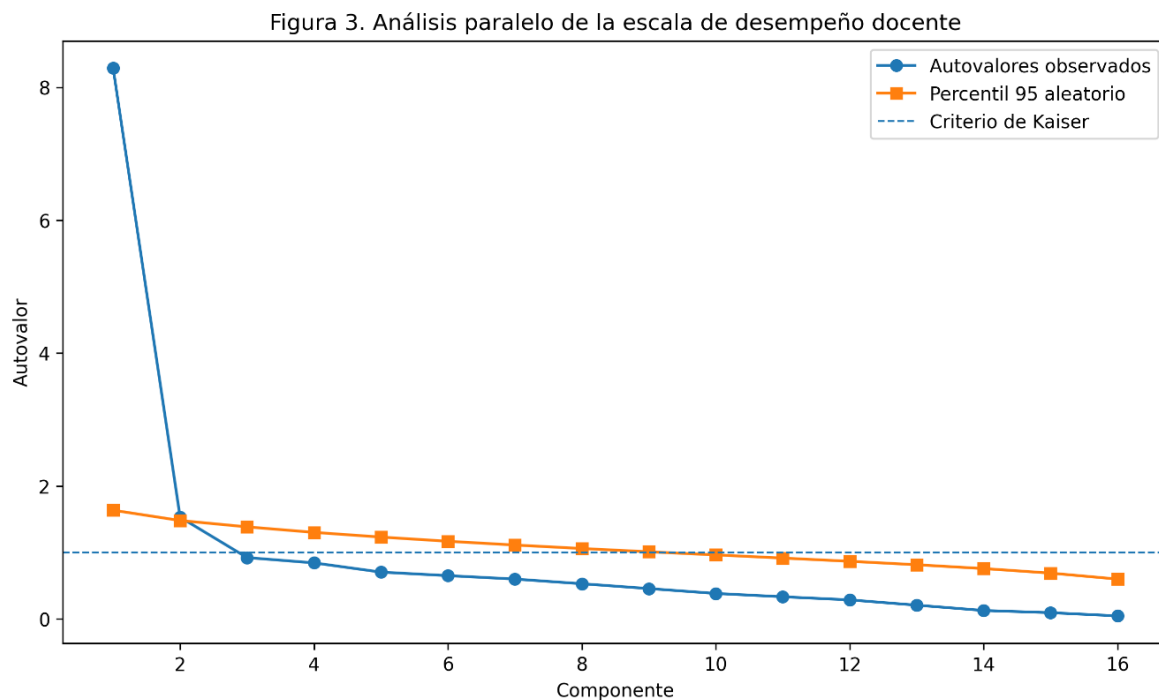
The dimensionality of the soft skills scale was examined using parallel analysis with 1000 random matrices. The first three observed eigenvalues—12.68, 2.49, and 1.93—exceeded the respective 95th percentile values of the random matrices—1.91, 1.77, and 1.66. The fourth observed eigenvalue was 1.16, which was below its random reference of 1.58.



**Figure 2. Parallel analysis of the soft skills scale. The observed eigenvalues were compared with the 95th percentile of the eigenvalues generated in 1000 random matrices with the same number of variables and participants. Components whose observed eigenvalue exceeded the corresponding random value were retained.**  
**Fountain:** original work.

According to this criterion, three components for soft skills were retained. The first explained 42.25% of the total variance; the second, 8.29%; and the third, 6.43%. The solution accounted for 56.97% of the variance. The difference between the first eigenvalue and the remaining ones revealed a dominant overall component, accompanied by two additional sources of variation.

In teaching performance, the first two observed eigenvalues were 8.29 and 1.53, both higher than their random references of 1.64 and 1.48. The third observed eigenvalue was 0.92 and was below the corresponding random value of 1.39.



**Figure 3. Parallel analysis of the teacher performance scale. The observed eigenvalues were compared with the 95th percentile of 1000 random matrices. Retention was established when the observed eigenvalue exceeded the corresponding random reference.**

**Fountain:** original work.

Parallel analysis supported a two-component solution for teacher performance. The first component explained 51.81% of the variance and the second 9.57%, for a cumulative variance of 61.38%. From the third component onward, the observed eigenvalues were lower than those expected by chance. Comparative results for both scales are summarized in Table 4.

**Table 4. Results of parallel analysis and explained variance**

| Scale                | Component | Observed eigenvalue | Random 95th percentile | Decision      | Variance explained, % |
|----------------------|-----------|---------------------|------------------------|---------------|-----------------------|
| Soft skills          | 1         | 12.68               | 1.91                   | Retain        | 42.25                 |
|                      | 2         | 2.49                | 1.77                   | Retain        | 8.29                  |
|                      | 3         | 1.93                | 1.66                   | Retain        | 6.43                  |
|                      | 4         | 1.16                | 1.58                   | Do not retain | 3.87                  |
| Teaching performance | 1         | 8.29                | 1.64                   | Retain        | 51.81                 |
|                      | 2         | 1.53                | 1.48                   | Retain        | 9.57                  |
|                      | 3         | 0.92                | 1.39                   | Do not retain | 5.77                  |

| Scale | Component | Observed eigenvalue | Random 95th percentile | Decision      | Variance explained, % |
|-------|-----------|---------------------|------------------------|---------------|-----------------------|
|       | 4         | 0.84                | 1.30                   | Do not retain | 5.27                  |

**Note.** Parallel analysis was performed with 1000 random matrices. A component was retained when its observed eigenvalue exceeded the 95th percentile of the corresponding random eigenvalue.

**Fountain:**original work.

Based on the number of retained components, an exploratory factor analysis was performed using principal axis extraction and oblimin oblique rotation. The estimation was carried out separately for each instrument on polychoric correlation matrices, corresponding to the ordinal nature of the items.

In soft skills, the three-factor solution presented an interpretable organization, although it did not exactly reproduce the four theoretical dimensions. The first factor mainly grouped items related to negotiation, problem-solving, and interpersonal management; the second focused on collaborative participation, teamwork, and shared leadership; and the third included items related to empathy and socio-emotional support. Salient factor loadings ranged from 0.41 to 0.93.

Seven items were identified with loadings equal to or greater than 0.30 on more than one factor. The reverse-scored item showed a negative loading close to  $-0.40$  on the collaborative participation factor. Correlations among the three factors ranged from 0.36 to 0.60, demonstrating an association between the empirical dimensions without reaching extreme levels of collinearity.

In teaching performance, the two-factor analysis revealed a more defined structure. The first factor comprised 14 items related to professional mastery, lesson planning, classroom management, and pedagogical motivation, with loadings between 0.70 and 0.98. The second factor consisted of items related to intellectual production and participation as a presenter or workshop facilitator, with loadings of 0.94 and 0.73, respectively. The correlation between the two factors was 0.35. The summarized factor structure is presented in Table 5.

**Table 5. Synthesis of the exploratory factor structure obtained**

| Scale       | Empirical factor | Predominant content                                            | Reagents with charge $\geq 0.40$ | Load range | Correlations between factors |
|-------------|------------------|----------------------------------------------------------------|----------------------------------|------------|------------------------------|
| Soft skills | Factor 1         | Negotiation, problem-solving, and interpersonal skills         | 15                               | 0.41–0.93  | 0.47 with F2; 0.60 with F3   |
|             | Factor 2         | Collaborative participation, teamwork, and shared leadership   | 8                                | 0.46–0.84  | 0.36 with F3                 |
|             | Factor 3         | Empathy, emotional understanding, and support among colleagues | 6                                | 0.44–0.81  | —                            |

| Scale                | Empirical factor | Predominant content                                                                        | Reagents with charge $\geq 0.40$ | Load range | Correlations between factors |
|----------------------|------------------|--------------------------------------------------------------------------------------------|----------------------------------|------------|------------------------------|
| Teaching performance | Factor 1         | Professional expertise, teaching methods, classroom management, and pedagogical motivation | 14                               | 0.70–0.98  | 0.35 with F2                 |
|                      | Factor 2         | Intellectual production and academic projection                                            | 2                                | 0.73–0.94  | —                            |

**Note.** Principal axis extraction and oblimin oblique rotation on polychoric correlation matrices. Factor loadings equal to or greater than 0.40 were considered salient. Factor names were assigned based on the content of the items with the highest loadings.

**Fountain:** original work.

As part of the sensitivity analysis, 13 response profiles—6.5% of the sample—were identified in which the same category was selected in at least 45 of the 46 items. These cases were retained in the main analysis because there was no pre-established exclusion criterion and all their responses fell within the acceptable range. Subsequently, the analyses were repeated excluding these profiles, with a sample of 187 participants.

Excluding profiles with low variability did not alter the overall structure of the results. Soft skills retained three components and teaching performance two. Likewise, the KMO indices and internal consistency coefficients remained close to those obtained in the complete sample, as shown in Table 6.

**Table 6. Sensitivity analysis according to inclusion of low variability response profiles**

| Scale                | Sample        | n   | KMO  | $\alpha$ | $\omega$ | retained components |
|----------------------|---------------|-----|------|----------|----------|---------------------|
| Soft skills          | Main analysis | 200 | 0.93 | 0.94     | 0.95     | 3                   |
|                      | Sensitivity   | 187 | 0.92 | 0.93     | 0.94     | 3                   |
| Teaching performance | Main analysis | 200 | 0.92 | 0.91     | 0.94     | 2                   |
|                      | Sensitivity   | 187 | 0.91 | 0.90     | 0.93     | 2                   |

**Note.** The sensitivity analysis excluded 13 participants whose modal category was present in at least 45 of the 46 items. KMO = Kaiser–Meyer–Olkin index;  $\alpha$  = Cronbach's alpha;  $\omega$  = McDonald's total omega.

**Fountain:** original work.

## Discussion

This study evaluated the psychometric properties of two instruments designed to measure soft skills and teaching performance in university professors. The results showed adequate factorization of the matrices, high internal consistency, and a simpler empirical structure than initially proposed. The soft skills scale was designed with four dimensions, but parallel analysis supported a three-component solution. In the teaching performance scale, the four theoretical domains were reorganized into two components. Overall, the global scores showed favorable

precision, although the differentiation between some subscales still requires further evidence before they can be considered fully independent constructs.

Scores were concentrated at the top of the scales, with dimensional means ranging from 4.21 to 4.59 out of five. Ceiling effects were highest in classroom management, teaching proficiency, and motivation or self-efficacy. Chen and Chen (2025) found a similar pattern on a socio-emotional competence scale administered to students at Chinese universities, with scores close to four. Although the population and purpose of that study were different, their results show that socio-emotional self-reports can be concentrated in favorable categories. Cansancio (2026) also reported scores above 4.50 in the performance evaluation of professors at Philippine state universities. These means may correspond to consolidated competencies, but they should be interpreted in conjunction with potential social desirability bias, the limitations of self-reporting, and the reduced ability of some items to differentiate high scorers.

Overall internal consistency was high on the soft skills and teaching performance scales. However, these coefficients alone do not constitute sufficient evidence of internal structure validity. Vizioli and Pagano (2022) point out that Cronbach's alpha assumes tau-equivalence, unidimensionality, and the absence of correlated errors, conditions that are not always met in this type of scale. Therefore, they recommend first examining dimensionality, estimating omega in congeneric models, and using polychoric correlations when the items are ordinal. This approach supports the combined use of alpha and omega in this study and allows us to understand the differences observed between the two coefficients in leadership and subject-matter mastery. In these dimensions, the unequal contribution of the items makes omega a more appropriate estimate than alpha interpreted in isolation.

The retention of three components in the soft skills scale, instead of the four initially proposed, aligns with the conceptual complexity described in the social-emotional literature. Berg et al. (2017), after reviewing 136 competency frameworks, found that different terms are often used to describe similar content and that a single term can encompass distinct abilities. They also observed that several competencies are simultaneously located in more than one domain. This lack of direct correspondence between labels and their content may explain the reorganization found. Leadership, negotiation, cooperation, and empathy do not necessarily function as independent areas, but rather as related abilities within a broader interpersonal domain.

The exploratory solution obtained supports this interpretation. The first component primarily included items related to negotiation, problem-solving, and interpersonal management. The second grouped items related to collaborative participation, teamwork, and shared leadership, while the third focused on empathy, emotional understanding, and peer support. This organization shows that distinct interpersonal processes can be identified, although cross-loadings indicate that some behaviors fulfill several functions simultaneously. Participating in decisions, recognizing the achievements of others, requesting support, or considering alternative opinions can simultaneously express cooperation, relational leadership, and negotiation skills.

The behavior of the reversed item is another indicator that warrants review. Even after recoding, the statement "In the team, we always do what you say" showed a negative item-total correlation and a loading in the opposite direction to the collaborative component. DeVellis and Thorpe (2021) point out that problems of comprehension, specificity, or conceptual correspondence can affect the unidimensionality and psychometric properties of a scale, even when statistical recoding is correct. In this case, the item's behavior should not be attributed solely to its reverse formulation nor resolved by its automatic elimination. It is necessary to examine whether participants interpreted it as authoritarianism, influence, directive leadership, or a description of a common team dynamic.

The structure of the teacher performance scale was also simpler than initially proposed. Fourteen items converged into a broad pedagogical-professional component, while the items related to intellectual production and participation as a presenter or workshop facilitator formed a second component related to academic outreach. This separation has a conceptual basis. Rahman and Indahyanti (2021) describe teacher performance as a multidimensional construct in which an overall score can mask components related to planning, content presentation, student relationships, classroom management, professional development, and institutional participation. The results do not support a strictly unidimensional structure, but neither do they reproduce the four subscales initially proposed.

The differentiation of the research component partially coincides with faculty evaluation frameworks that distinguish between teaching, research, academic production, and service. Cansancio (2026) defined university performance based on these areas, which supports the separation of intellectual production and academic projection from disciplinary mastery. However, the second component consisted of only two items, which limits its stability and the breadth of the content represented.

The results should also be interpreted considering the working conditions of university faculty. Reddy et al. (2024) noted that teaching, research, administration, mentoring, and pressure to publish are among the conditions that influence their performance. These variables were not included in the instruments analyzed. For this reason, some of the differences observed in performance and academic output could be related to organizational conditions that the items do not capture.

From a measurement perspective, the results support the use of overall scores in research and group analyses, but they do not yet justify their application in individual hiring, promotion, or disciplinary decisions. Berg et al. (2017) caution that several socio-emotional instruments were developed separately from the theoretical frameworks they are intended to evaluate, and that doubts remain about their use in accountability processes. In this context, teacher performance evaluation should integrate different sources of information, such as self-assessment, observation, student feedback, peer review, portfolios, and evidence of academic output.

Strengths of the study include the availability of 200 complete records, independent analysis of the instruments, the use of parallel analysis to determine the number of factors, and consideration of the ordinal nature of the items. Furthermore, Cronbach's alpha and McDonald's omega were jointly estimated, and the overall structure was found to remain intact after excluding profiles with low response variability. These decisions allowed for separate examination of internal consistency, factorization, and dimensionality, rather than limiting the psychometric evaluation to a single coefficient.

However, the results should be interpreted with several limitations in mind. The data came from a single university and were collected through self-reports administered at a single point in time, which may increase social desirability bias and common variance. Ceiling effects reduced the ability of some items to differentiate between participants with high scores. Although the sample size allowed for an initial exploratory assessment, it may be limited for testing complex models that include all 46 items. External criteria, classroom observations, student evaluations, and institutional indicators that would have allowed for examining the relationship between scores and other variables were not incorporated. Furthermore, invariance by sex, type of affiliation, or faculty was not assessed, so it cannot be concluded that the scales function the same way across all groups.

Given these limitations, future studies should compare the three-factor solution for soft skills with the two-factor structure of teaching performance in independent samples. This can be done using confirmatory factor analysis or exploratory structural equation models, with polychoric

correlation matrices and appropriate estimators for ordinal variables, such as WLSMV or DWLS. It will also be necessary to examine composite reliability, mean variance extracted, the HTMT index, and measurement invariance. The revision of the reversed item should be supported by cognitive interviews to understand how participants interpret it. Furthermore, the academic production and outreach component requires more indicators related to research, innovation, extension, and dissemination.

### Conclusions

This study provides exploratory psychometric evidence on two scales designed to assess soft skills and teaching performance in university professors. Both scales exhibit adequate factorization and high internal consistency; however, the identified empirical structure was simpler than the proposed one. The soft skills scale reveals three components related to interpersonal problem-solving, collaboration and leadership, and empathy. The teaching performance scale, on the other hand, reveals two components: one linked to pedagogical and professional functions, and the other associated with intellectual output and academic impact.

The results also show that the theoretical dimensions do not function as completely independent areas, as some competencies share relational and functional elements. Similarly, ceiling effects, cross-loadings, and difficulties in the behavior of the reverse-formulated item were identified, which limits the ability of certain items to differentiate between participants with high scores. It is important to note that the high reliability obtained should not be interpreted as definitive validation of the internal structure, but rather as favorable evidence regarding the accuracy of the scores. Therefore, confirmatory factor analyses, invariance studies, and applications in independent samples are required.

Finally, in practical terms, overall scores can be used in research and group assessments, but they do not yet support individual decisions regarding teacher evaluation, promotion, or ranking. Consequently, psychometric quality must be assessed by integrating internal consistency, dimensionality, item behavior, theoretical coherence, and the characteristics of the university context.

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