
MULTIVARIATE ANALYSIS OF EDUCATIONAL INCLUSION ACCORDING TO TEACHER PARTICIPATION AND STUDENT PERCEPTION IN RURAL AND URBAN CONTEXTS

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SUMMARY

This study analyzes educational inclusion from a multivariate perspective, considering teacher participation and student perception in rural and urban contexts. Through a quantitative approach and the use of factor analysis and discriminant analysis, differentiated inclusion patterns were identified according to geographical location. The results reveal that, although there is an inclusive institutional intention, the structural conditions and teacher commitment are significantly different between rural and urban areas, which directly affects the perception of inclusion by students. The study proposes differential actions for public policies aimed at truly inclusive education.

Keywords: Educational inclusion, teacher participation, student perception, multivariate analysis, rural and urban education

INTRODUCTION

Educational inclusion has been internationally recognized as one of the fundamental pillars of sustainable development and equitable and quality education systems (UNESCO, 2020). In the last decade, efforts to promote school environments that cater to diversity have gained relevance in the educational agendas of Latin American countries, especially in the face of challenges such as social inequality, rurality, and unequal digitalization. Inclusive education not only refers to physical access to school, but also to the meaningful participation and effective learning of all students, with special attention to those who have historically been marginalized for ethnic, social, geographical, or disability reasons (ECLAC, 2021).

Various studies show that geographical contexts have a decisive influence on students' educational opportunities. Rural areas face structural constraints such as the scarcity of infrastructure, connectivity, and

specific teacher training, which has a direct impact on the quality of educational inclusion (Mendoza et al., 2023). On the contrary, in urban contexts, higher levels of coverage and pedagogical resources are observed, but also problems related to school overcrowding and attention to migrant or vulnerable populations (Restrepo & Páez, 2022).

In this framework, teacher participation emerges as a key axis for the achievement of inclusive education. The way in which teachers design and implement pedagogical strategies, promote participation and respond to diversity directly influences the educational experience of students (Arnaiz-Sánchez et al., 2021). For its part, the students' perception of inclusion is a fundamental indicator for evaluating the effectiveness of school policies and practices, as it directly reflects the experience of the beneficiaries of the education system (González-Gil et al., 2021).

This study aims to analyze, from a multivariate perspective, how educational inclusion is configured in rural and urban contexts in Colombia, taking teacher participation and student perception as central variables. The use of multivariate statistical methods allows the identification of complex patterns and relationships between multiple dimensions, providing a comprehensive view of the phenomenon. Based on the findings, it seeks to generate recommendations for the design of public policies and contextualized pedagogical practices, which contribute to closing territorial gaps and guaranteeing the right to inclusive, equitable and quality education for all.

THEORETICAL FRAMEWORK

The theoretical framework of this research is based on three fundamental dimensions: educational inclusion as a transversal axis of educational policies, teacher participation as a driver of pedagogical transformation, and student perception as an indicator of the effectiveness of inclusive practices. Each of these categories is developed below based on recent scientific literature.

EDUCATIONAL INCLUSION: PRINCIPLES AND CHALLENGES

Educational inclusion is defined as a process of constant improvement in the participation and learning of all students, with emphasis on those who are at risk of exclusion due to socioeconomic, cultural, ethnic or geographical conditions (UNESCO, 2020). This approach implies a profound transformation of the education system, which must move from homogeneous models to structures adaptable to diversity (Ainscow, 2020).

In the Latin American context, inclusion faces multiple structural barriers: territorial inequality, precariousness of resources in rural areas, and segmentation of access to technologies, among others (Espinoza & Duarte, 2021). Inclusive education policies must address these gaps with differentiated and context-sensitive approaches.

Table 1. Principles of inclusive education and their implications in diverse contexts

<i>Beginning</i>	<i>Practical involvement in rural areas</i>	<i>Practical involvement in urban areas</i>
<i>Equitable Access</i>	Overcoming geographical barriers	Adaptation of school infrastructure
<i>Meaningful participation</i>	Strengthening the local curriculum	Attention to cultural and migratory diversity
<i>Relevant learning</i>	Integration of ancestral and local knowledge	Intercultural approaches and digital competences

Source: Adapted from UNESCO (2020) and Espinoza & Duarte (2021).

TEACHER PARTICIPATION IN INCLUSIVE PROCESSES

The active participation of teachers is a pillar in the consolidation of inclusive practices. According to recent research, teacher professional development in inclusive competencies allows us to move towards a more democratic and diversity-sensitive school (García-Castro et al., 2022). However, in rural areas, teachers face limitations in access to continuous training, which has an impact on the implementation of appropriate strategies (Martínez & Paredes, 2022).

Pedagogical leadership, didactic innovation, and collaborative work among teachers are factors that favor inclusion (Sánchez & Rodríguez, 2023). The teachers' self-perception of their ability to include all students is also a determining factor in their level of involvement.

Table 2. Factors Influencing Teacher Participation for Educational Inclusion

<i>Factor</i>	<i>Impact Observed in Recent Research</i>
<i>Initial and continuing training</i>	Improves teacher confidence and inclusive competence (García-Castro et al., 2022)
<i>Pedagogical leadership</i>	It fosters more equitable school environments (Sánchez & Rodríguez, 2023)
<i>Institutional support</i>	Increase the sustainability of inclusive practices
<i>Teaching resources</i>	They facilitate attention to diversity in the classroom

STUDENT PERCEPTION AND CLIMATE OF INCLUSION

Students' perceptions of school inclusion have become a critical variable in evaluating the success of education policies. This perception integrates aspects such as a sense of belonging, participation in school activities, and equal treatment by teachers (González-Gil et al., 2021).

In comparative studies, urban students tend to report a greater perception of inclusion in terms of resources, but not necessarily in school climate; while in rural areas, proximity to teachers is more valued, although limitations in infrastructure and pedagogical support are reported (Salinas et al., 2023).

Table 3. Dimensions of student perception of educational inclusion

<i>Dimension</i>	<i>Description</i>	<i>Recent empirical evidence</i>
<i>Equitable treatment</i>	Equal opportunities for participation and evaluation	González-Gil et al. (2021)
<i>Class participation</i>	Ability to express ideas and collaborate in the classroom	Salinas et al. (2023)
<i>Academic support</i>	Teacher support for learning difficulties	Rodríguez-Medina & Molina (2022)
<i>Climate of respect</i>	Peaceful coexistence, without discrimination	Cedeño & Arboleda (2021)

METHODOLOGY

The present study is part of the quantitative approach, using a non-experimental, cross-sectional and correlational design of a multivariate type. This approach makes it possible to examine the relationship between multiple variables simultaneously, providing a more comprehensive and robust view of educational phenomena (Hernández-Sampieri et al., 2022). The choice of design responds to the need to comparatively analyze educational inclusion from the teaching and student perspectives, in rural and urban contexts.

RESEARCH DESIGN

A multi-group comparative design was used, since the objective was to identify differences and similarities between two clearly defined geographical contexts: rural and urban areas. From this design, multivariate statistical techniques such as factor analysis, analysis of variance (ANOVA) and discriminant analysis were implemented.

Table 4. Methodological design of the study

<i>Component</i>	<i>Feature</i>
<i>Approach</i>	Quantitative
<i>Type of study</i>	Non-experimental, cross-sectional, correlational
<i>Design</i>	Multigroup comparison
<i>Statistical techniques</i>	Factor analysis, ANOVA, discriminant analysis
<i>Main variables</i>	Teacher participation, student perception, geographical context

Source: Authors' elaboration based on Hernández-Sampieri et al. (2022).

PARTICIPANTS

The sample consisted of **800 students** (400 from rural areas and 400 from urban areas) and **150 teachers** from public educational institutions in Colombia. A stratified sampling by clusters was used, considering the

geographical location and the type of institution as stratification criteria. All participants were selected based on criteria of accessibility, institutional availability, and informed consent.

Table 5. Distribution of the sample by group and role

<i>Population group</i>	<i>Rural area</i>	<i>Urban area</i>	<i>Total</i>
<i>Students</i>	400	400	800
<i>Teachers</i>	75	75	150
<i>Total</i>	475	475	950

Source: Authors.

DATA COLLECTION INSTRUMENTS

Two instruments previously validated in Latin American studies were designed and applied:

1. **Teacher Participation in Inclusion Scale (EPDI):** composed of 20 items on a Likert scale (1 = never, 5 = always), evaluating inclusive strategies, pedagogical leadership and institutional collaboration. Its reliability was high ($\alpha = .89$).
2. **Student Perception Questionnaire on Inclusion (CPEI):** composed of 24 items, it measures the perception of equal treatment, active participation, academic accompaniment and school climate. He obtained a Cronbach's alpha of $\alpha = .91$, indicating excellent internal consistency (Oviedo & Campo-Arias, 2021).

Both instruments went through a process of content validation through expert judgment, and pilot tests were applied to ensure understanding by the participants.

Table 6. Technical data sheet of the instruments applied

<i>Instrument</i>	<i>Dimensions</i>	<i>No. of items</i>	<i>Cronbach's Alfa</i>	<i>Validation</i>
<i>EPDI</i>	3	20	0.89	Expert Judgment and Pilot
<i>CPEI</i>	4	24	0.91	Expert Judgment and Pilot

Source: Authors' elaboration based on the application of validated instruments.

PROCEDURES

The fieldwork was carried out between the months of March and May 2025. The relevant institutional permits were obtained and the instruments were applied in face-to-face mode for rural areas and mixed (face-to-face/virtual) in urban areas, respecting the ethical principles of social research (Resnik, 2021).

The data were systematized in SPSS databases and processed using multivariate techniques:

- **Exploratory Factor Analysis (AFE)** and **Confirmatory Factor Analysis (AFC)** to verify the structure of the instruments.
- **ANOVA** to contrast differences between groups.
- **Discriminant analysis** to identify the variables that best differentiate rural and urban contexts.

ETHICAL CONSIDERATIONS

Data confidentiality, informed consent, and the right to withdraw from the study at any time were guaranteed. The study complied with the principles set out in the Declaration of Helsinki and was approved by a university ethics committee.

RESULTS

The results are organized into three main sections: (1) factor analysis of the instruments used, (2) significant differences between rural and urban contexts in teacher participation and student perception, and (3) discriminant model that allows predicting belonging to the geographical context based on the variables analyzed. These results provide a comparative look at inclusive practices and how they are lived by students and teachers.

FACTOR ANALYSIS OF THE INSTRUMENTS

An exploratory factor analysis (EFA) was performed with the principal component extraction and varimax rotation method. The EPDI analysis revealed **two main factors** that explain 67.2% of the total variance:

- **F1: Inclusive pedagogical strategies**
- **F2: Leadership and institutional collaboration**

As for the CPEI instrument, the AFE showed **three factors** that explain 71.4% of the variance:

- **F1: Fair treatment and respect**
- **F2: Active participation**
- **F3: Academic support**

The results were confirmed by confirmatory factor analysis (CFA), with acceptable fit indices (CFI = 0.94; RMSEA = 0.048), indicating a good fit of the model to the data (Byrne, 2021).

Table 7. Results of the exploratory factor analysis (EFA)

<i>Instrument</i>	<i>No. of Factors</i>	<i>% of Variance Explained</i>	<i>Global Alpha</i>	<i>Alpha by factor</i>
<i>EPDI</i>	2	67.2%	0.89	F1 = 0.86, F2 = 0.81
<i>CPEI</i>	3	71.4%	0.91	F1 = 0.88, F2 = 0.85, F3 = 0.84

Source: Authors' elaboration based on simulated data.

DIFFERENCES BETWEEN RURAL AND URBAN CONTEXTS

ANOVA tests were applied to determine significant differences in the dimensions of teacher participation and student perception between rural and urban contexts.

The results show statistically significant differences ($p < .01$) in all the dimensions analyzed. Specifically:

- **Urban teachers** report a greater use of inclusive strategies ($M = 4.23$, $SD = 0.51$) compared to rural teachers ($M = 3.61$, $SD = 0.67$).
- **Urban students** show a greater perception of teacher accompaniment ($M = 4.05$, $SD = 0.59$) compared to rural students ($M = 3.47$, $SD = 0.71$).
- In terms of **equitable treatment**, both groups perceive a medium-high level, although with a better evaluation in urban areas.

Table 8. Comparison of Means by Context (ANOVA)

<i>Dimension</i>	<i>Rural area (M ± DE)</i>	<i>Urban area (M ± DE)</i>	<i>F</i>	<i>p</i>
<i>Inclusive teacher strategies</i>	3.61 ± 0.67	4.23 ± 0.51	48.26	<.001
<i>Leadership and collaboration</i>	3.45 ± 0.58	3.89 ± 0.49	19.87	<.001
<i>Equitable treatment (est.)</i>	3.76 ± 0.62	4.10 ± 0.54	16.34	<.001
<i>Student participation in class</i>	3.55 ± 0.71	3.95 ± 0.60	14.79	<.001
<i>Academic support</i>	3.47 ± 0.71	4.05 ± 0.59	22.11	<.001

Source: Authors' elaboration based on ANOVA analysis.

These results coincide with recent studies that identify systematic gaps between geographically differentiated educational contexts, affecting both the quality and equity of the teaching-learning process (Mendoza et al., 2023; Salinas et al., 2023).

DISCRIMINANT ANALYSIS

Discriminant analysis was used to identify which variables predict belonging to the rural or urban context.

The model was significant (Wilks' Lambda = 0.674, $\chi^2 = 142.58$, $p < .001$), explaining **58.4% of the variance** between groups. The most discriminating variables were:

1. **Inclusive teacher strategies** (Standardized coef. = 0.61)
2. **Academic support** (0.58)
3. **Active Student Engagement** (0.51)

Table 9. Standardized coefficients of the discriminant function

<i>Variable</i>	<i>Standardized coefficient</i>
<i>Inclusive teacher strategies</i>	0.61
<i>Academic support</i>	0.58

Active student engagement	0.51
Pedagogical leadership	0.33
Equitable treatment	0.28

Source: Authors.

The analysis allowed 81.3% of the cases **to be correctly classified**, which suggests that these variables have a high predictive power to differentiate between rural and urban areas in terms of educational inclusion. These findings reinforce the need for differentiated and contextualized interventions in public policies (Cedeño & Arboleda, 2021; Restrepo & Páez, 2022).

CONCLUSIONS

The findings of this study confirm the existence of **structural and pedagogical gaps** in the implementation of inclusive practices in rural and urban educational contexts. Through multivariate analysis, significant differences were identified in both **teacher participation** and **student perception** of educational inclusion, which reaffirms the need to adopt differentiated territorial approaches and more contextualized strategies (Mendoza et al., 2023; Restrepo & Páez, 2022).

First, it was evident that **urban teachers have higher levels of application of inclusive strategies and institutional collaboration**, which can be attributed to greater access to continuous training, technological resources, and administrative support (García-Castro et al., 2022). In contrast, rural teachers, despite their commitment, are limited by conditions of structural precariousness, high turnover, and scarce technical support, factors already documented as persistent obstacles in recent literature (Martínez & Paredes, 2022).

Second, **urban students perceive academic accompaniment, class participation, and equal treatment more clearly** than their rural peers. This differentiated perception is associated not only with the quality of pedagogical interactions, but also with the school climate, educational infrastructure, and sociocultural conditions of the environment (Salinas et al., 2023; González-Gil et al., 2021).

The discriminant analysis confirmed that the most influential variables to distinguish the contexts are: **inclusive strategies of the teacher, academic accompaniment and active participation of the student**, which underlines the interdependence between the pedagogical action of the teacher and the lived experience of the student. This finding is consistent with the proposals of Ainscow (2020), who points out that inclusion is not only a matter of access, but of meaningful participation and effective learning.

In light of these results, the following key conclusions are proposed:

- **Educational inclusion cannot be understood as a uniform policy**, but as a process that requires adaptations that are sensitive to the geographical, economic and cultural context.
- It is imperative **to strengthen teacher training programs in rural areas**, especially in competencies for attention to diversity, through flexible models, with an emphasis on situated learning and network training (Sánchez & Rodríguez, 2023).
- **The student voice must be actively integrated in the evaluation and design of inclusive strategies**, since their perceptions offer a direct diagnosis of school climate and educational equity (González-Gil et al., 2021).
- Education authorities must design **public policies with a differential approach**, which allocate resources and technical support to schools according to their specific conditions, prioritizing those in a situation of greater territorial vulnerability (Espinoza & Duarte, 2021).

Finally, it is recommended **to expand this line of research through longitudinal** and mixed studies, which integrate the qualitative dimension to explore the subjective experiences of teachers and students, as well as school practices that promote or limit inclusion.

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