EVALUATION OF THE CASE METHODOLOGY IN LEGAL EDUCATION: AN APPLICATION OF PLITHOGENIC LOGIC.

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ABSTRACT
The study focused on analyzing the perception and satisfaction of senior Law students at Universidad de los Andes regarding the use of the case method as a didactic tool. A mixed methodology that involved indeterminate Likert scales to assess various educational dimensions was implemented. Effectiveness, ease of learning, professional preparation, development of critical skills, and methodological preference were some of the considered dimensions. Data collected from 81 students were translated into TRINS matrices and processed using the $\gamma(V)$ function, leading to the acquisition of Refined Plithogenic Probabilities and Neutrosophic Plithogenic Probabilities. The results showed a positive trend towards the case method, highlighting its value in learning and professional preparation. However, the presence of indeterminate responses indicated the need for future research to better understand areas of ambiguity and improve teaching methodology. The study underscores the importance of the case method in legal education and suggests ongoing examination of pedagogical practices to enrich the educational experience of future legal professionals.
KEYWORDS: legal education; plithogenic logic; case methodology; student satisfaction

MSC: 97K80, 68T37, 91C20

RESUMEN
El estudio se centró en analizar la percepción y satisfacción de los estudiantes de Derecho de la Universidad de los Andes respecto al uso del método del caso como herramienta didáctica. Se implementó una metodología mixta que involucró escalas Likert indeterminadas para evaluar diversas dimensiones educativas, incluyendo efectividad, facilidad de aprendizaje, preparación profesional, desarrollo de habilidades críticas y preferencia metodológica. Los datos recopilados de 81 estudiantes se tradujeron en matrices TRINS y se procesaron utilizando la función $\gamma(V)$, culminando en la adquisición de Probabilidades Plitogénicas Refinadas y Probabilidades Plitogénicas Neutrosóficas. Los resultados mostraron una tendencia positiva hacia el método del caso, destacando su valor en el aprendizaje y la preparación profesional. Sin embargo, la presencia de respuestas indeterminadas indicó la necesidad de futuras investigaciones para comprender mejor las áreas de ambigüedad y mejorar la metodología de enseñanza. El estudio subraya la importancia del método del caso en la educación legal y sugiere un examen continuo de las prácticas pedagógicas para enriquecer la experiencia educativa de los futuros profesionales del derecho.
PALABRAS CLAVE: educación legal; lógica plitogénica; metodología del caso; satisfacción estudiantil.

1. INTRODUCTION

The legal education landscape, and particularly the application of the case method in training future legal professionals, has taken on unprecedented significance in today's academic discourse. This pedagogical approach not only fosters a more dynamic and practical learning environment but also challenges traditional paradigms by weaving real-world scenarios and critical debates into the classroom fabric [1]. Indeed, the escalating demand for analytical and problem-solving skills in the legal realm compels educators to transcend mere knowledge transmission, situating them at the confluence where theory and practice converge to deliver high-quality education [2]. Scholars emphasize that adopting such methodologies represents a transformative shift, one that can catalyze profound improvements in pedagogical outcomes and student preparedness.

Throughout the last few decades, the case method has evolved into a cornerstone of legal teaching, enabling students to engage with complex legal issues and hone essential critical thinking abilities. Its historical trajectory is anything but linear; it has been marked by pedagogical breakthroughs, curricular shifts, and continuous revisions of study materials to mirror societal and technological changes [3, 14]. Universities worldwide have witnessed significant transformations in their pedagogical strategies, integrating active learning techniques that strive to involve students more deeply than the traditional lecture format ever allowed [4].

One cannot overstate the importance of tracing the origins of the case method to fully appreciate its intrinsic value and why it has become an indispensable resource in modern legal education. Since its early adoption in law schools, this method has continuously adapted to meet the evolving needs of each generation, offering novel solutions to persistent educational challenges [5,15]. Early resistance and criticisms have gradually given way to

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widespread recognition of its ability to simulate professional environments, thus fostering active, collaborative learning experiences that mirror real-life legal dilemmas.

Academic discussions today often revolve around the efficacy of the case method within an increasingly interconnected and complex world. The advent of emerging technologies and new forms of social interaction has rendered legal scenarios more dynamic and challenging, demanding continuous adaptation of teaching strategies [6]. Far from being a hindrance, this dynamic climate provides a unique opportunity for innovation, encouraging educators to enrich legal training by embracing methods that respond adeptly to real-world complexities and uncertainties. Such educational agility is essential in preparing students for the multifaceted challenges they will face as practitioners.

However, despite the multitude of advantages reported in literature and observed in practice, questions and gaps remain regarding students' perceptions and satisfaction with this teaching approach. Observers wonder how effectively students are adapting to this style of learning and how they perceive its impact on their professional preparation and development of critical skills. While many studies extol its benefits quantitatively, the subjective experiences of students and the nuances of their sometimes ambiguous responses have not been thoroughly integrated into a comprehensive evaluation.

The crux of this research lies in addressing the absence of holistic approaches that adequately consider the subjective and indeterminate dimensions of evaluating the case method. Previous investigations have often highlighted measurable benefits but frequently neglected the personal and ambiguous facets of the student experience. How can we accurately assess and improve law students' perceptions of the case method when subjective factors and personal variability introduce layers of uncertainty and complexity that standard methodologies fail to capture?

To confront these challenges, this study proposes an innovative application of the neutrosophic Delphi method as a novel tool for capturing the inherent complexity within student opinions. By employing this approach, the research seeks to navigate uncertainty and ambiguity, offering a more nuanced and detailed evaluation of the case method's impact on legal education. The introduction of neutrosophic techniques allows for addressing the subjectivity and variability in student feedback, laying a robust foundation for future pedagogical enhancements that marry technological innovation with human-centered inquiry.

The primary objectives of this research are, first and foremost, to analyze law students' perceptions and satisfaction with the case method, employing neutrosophic tools to obtain a detailed and refined understanding of their opinions. Secondly, it aims to identify areas of ambiguity and develop concrete recommendations for optimizing teaching methodologies, thereby enhancing learning effectiveness and professional preparedness. These objectives align closely with the central research question and set a clear path for enriching educational practices within the legal domain.

2. PRELIMINARIES

2.1. Neutrosophic and refined neutrosophic set

Neutrosophic, developded by Smarandache (2005) [7,16], studies a perception or event or entity, "A" in relation to its opposite, "Anti- *A*" and not *A*, "Non- *A*", and as neither " *A*" nor "Anti*A*", denoted by "Neut- *A*".

Let us denote *X* as a metric space, where individual entities within *X* are symbolized by *x*. In this context, a single-valued neutrosophic set (SVNS) A within space *X* is defined by the following membership functions: the truth function $T_{A(x)}$, the indeterminacy function $I_{A(x)}$, and the falsity function $F_{A(x)}$. For an arbitrary point *x* in *X*, the values of $T_{A(x)}$, $I_{A(x)}$, and $F_{A(x)}$ are confined to the closed interval $[0, 1]$, fulfilling the condition

$$0 \leq T_{A(x)} + I_{A(x)} + F_{A(x)} \leq 3 .$$

The SVNS A is thus represented as

$$A = \{ x, T_{A(x)}, I_{A(x)}, F_{A(x)} \big| x \in X \}, \text{ see [8]}$$

According to the refined neutrosophic logic as formulated by Smarandache, we have the following:[9]

Definition 1: The concept of truth *T* is fractionated into distinct subclasses $T_1, T_2, \dots, T_p$; similarly, indeterminacy I is categorized into $I_1, I_2, \dots, I_r$, and falsity F into $F_1, F_2, \dots, F_s$. Here, *p*, *r*, *s* are all positive integers such that $p + r + s = n$.

Triple Refined Indeterminate Neutrosophic Sets (TRINS) further refine the notion of indeterminacy into three distinct memberships, enhancing both precision and applicability to contexts like the Likert scale. TRINS have been applied in areas such as personality classification. In contrast, a double-valued neutrosophic set (DVNS) bifurcates the concept of indeterminacy into two components.

Definition 2: A TRINS A in X, as previously outlined, is identified by five membership functions, namely positive $P_{A(x)}$, indeterminate $I_{A(x)}$, negative $N_{A(x)}$, positively indeterminate $IP_{A(x)}$, and negatively indeterminate $IN_{A(x)}$, each accompanied by a respective weight $w_m \in [0, 5]$. For every $x \in X$, we stipulate:

$$P_A(x), IP_A(x), I_A(x), IN_A(x), N_A(x) \in [0, 1]$$

and their weighted equivalents:

$$w_m P(P_A(x)), w_m IP(IP_A(x)), w_m I(I_A(x)), w_m IN(IN_A(x)), w_m N(N_A(x)) \in [0,5]$$

subject to the constraint:

$$0 \leq P_A(x) + IP_A(x) + I_A(x) + IN_A(x) + N_A(x) \leq 5$$

The TRINS A is thus notated as:

$$A = \{x, P_A(x), IP_A(x), I_A(x), IN_A(x), N_A(x) | x \in X\}$$

Let's consider two Triple Refined Indeterminate Neutrosophic Sets (TRINS), designated *A* and *B*, defined in the metric space *X*. The intersection of *A* and *B* produces a third TRINS C, expressed as $C = A \cap B$. The formulation of the membership of *C* in terms of truth, indeterminacy towards truth, indeterminacy, indeterminacy towards falsehood, and falsehood is determined by the following functional relations based on the corresponding membership values of *A* and *B*:

$$T_{C(x)} = \min(T_{A(x)}, T_{B(x)})$$
$$IT_{C(x)} = \min(IT_{A(x)}, IT_{B(x)})$$
$$I_{C(x)} = \min(I_{A(x)}, I_{B(x)})$$
$$IF_{C(x)} = min(IF_{A(x)}, IF_{B(x)})$$
$$F_{C(x)} = \max(F_{A(x)}, F_{B(x)})$$

In the context of refined Neutrosophic, the fourth definition is introduced for the calculation of the generalized weight, which synthesizes the influence of all membership functions within the framework of the Triple Refined Indeterminate Neutrosophic Set (TRINS). This definition is crucial for assessing the relevance and contribution of each membership function to the overall value of a neutrosophic set. The generalized weighting for a TRINS A, symbolized by w_A, is mathematically defined as:

$$w_A = (\sum_{i=1}^{n} w^T T_{A(x_i)} + w^I IT_{A(x_i)} + w\, I_{A(x_i)} + w^F IF_{A(x_i)} + w^N F_{A(x_i)}) \quad (1)$$

Here, $w^T, w^I, w, w^F, y\, w^N$ represent the weights associated with the membership functions of truth, indeterminacy towards truth, indeterminacy, indeterminacy towards falsehood, and falsehood, respectively. These weights play a crucial role in evaluating the relevance of the various membership functions within the neutrosophic set and in determining their contribution to the broader theoretical construct of neutrosophic analysis.

2.2. Basic Notions on Plithogenic

According to F. Smarandache, Plithogenic refers to the birth, creation, formation, development, and evolution of new entities, emerging from the dynamic and organic fusion of old entities that may be contradictory, neutral, or non-contradictory [10,17]. This concept advocates for the integration and unification of theories and ideas across all disciplines. In this context, "entities" refer to knowledge encompassing various fields like the soft sciences, hard sciences, arts, and theoretical aspects of literature.

A Plithogenic Set is defined as a non-empty set *P*, where the elements within a specified domain $U(P \subseteq U)$ are distinguished by one or more attributes $A_1, A_2, \ldots, A_m, m \geq 1$. Each attribute can possess a range of potential values across a spectrum *S* of values (states), which may be finite, infinite, discrete, continuous, open, or closed. [11,18] Each element $x \in P$ is characterized by the entire range of potential values for the attributes contained within the set $V = \{v_1, v_2, \cdots, v_n\}$. An attribute's value has a degree of belonging $d(x, v)$ for an element *x* in set *P* based on a specific criterion. This degree of belonging can manifest as fuzzy, intuitionistic fuzzy, or neutrosophic, among other types.

This means that for every element x in the set *P*, there exists a function $d: PxV \rightarrow \wp([0,1]^z)$, as shown in equation (2), where $d(x, v) \subseteq [0,1]^z$ and $\wp([0,1]^z)$ represents the power set of $[0,1]^z$. Here, z indicates the degree of appurtenance, with $z = 1$ corresponding to the fuzzy degree, $z = 2$ to the intuitionistic fuzzy degree, and $z = 3$ to the neutrosophic degree of appurtenance.

$$\forall x \in P, d: PxV \rightarrow \wp([0,1]^z) \quad (2)$$

Furthermore, if the cardinality of *V* is greater than or equal to *1*, a function $c: V \times V \rightarrow [0,1]^2$ is termed as the attribute value contradiction degree function for any pair of attribute values v_a, v_b. This function adheres to the following axioms:

$c(v_a, v_a) = 0$, indicating no contradiction in the attribute value with itself.

$c(v_a, v_b) = c(v_b, v_a)$, denoting the symmetry in contradiction degree between any two attribute values.

The function *c*, as defined above, is represented by *c* to signify that it is a fuzzy attribute value contradiction degree function. It is also defined in other forms, such as $c_{IF}: V \times V \rightarrow [0,1]^2$ to denote a neutrosophic attributes value contradiction function, reflecting different levels of certainty or contradiction in the attribute values.

Consequently, the Plithogenic Set is delineated by (P, a, V, d, c), encompassed by the set *P*, the attribute set *A*, the value set *V*, the membership function *m*, and the function known as the value contradiction degree *k*. The contradiction function is pragmatically employed to evaluate the contradiction across all attributes relative to a predominant attribute, should such an attribute exist, which is deemed paramount in comparison to the others. [12]

In contrast, (U, a, V, d, c) is designated as Plithogenic Probability, wherein E represents the event space. Plithogenic Probability is defined as the likelihood of an event's occurrence across all random variables that influence it, each random variable may adhere to classical, *T, I, F*-neutrosophic, *I*-neutrosophic, *T, F*-intuitionistic fuzzy, *T, N, F*-picture fuzzy, *T, N, F*-spherical fuzzy, or other fuzzy extensions distribution functions. Thus, Plithogenic Probability extends the classical concept of multivariate probability. [13]

Moreover, Plithogenic Statistics encapsulates the analysis and insights derived via the methodologies of Plithogenic Probability. Plithogenic Statistics expands upon classical multivariate statistics. Refined Probabilities are fragmented into multiple elements of truth, indeterminacy, or falsehood, delineated as $T_1, \dots T_p, I_1, \dots I_p, F_1, \dots . F_r$, where at least one of the indices *p*, *q*, or *r* exceeds *1*.

3. METHOD

The present research falls within a quantitative, descriptive, and correlational study, which was conducted to evaluate the influence of the case method as a pedagogical tool and determine the level of satisfaction of Law students at the UNIANDES regarding this teaching methodology. To achieve this, a mixed methodology was applied that combined traditional statistical analysis with plithogenic logic, through the use of Plithogenic Neutrosophic Probabilities, allowing for a more detailed and nuanced approach to the perceptions and attitudes of the students.

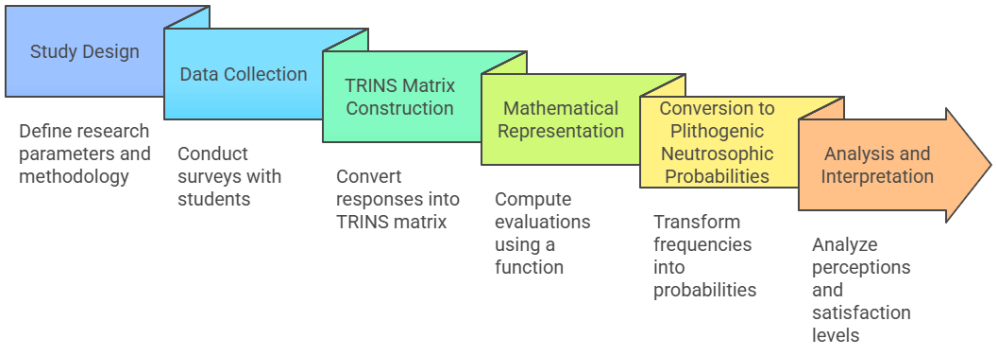

Figure 1. Research Methodology

Data collection was carried out through surveys applied to 81 senior Law students at UNIANDES. These surveys are designed to measure the students' perception of their satisfaction with the use of case studies as a teaching tool. Indeterminate Likert scales are used to evaluate specific elements of the surveys, seeking to identify indeterminacies in the students' responses.

After obtaining the results, the TRINS matrix is constructed for each respondent, categorizing each rating by statement on an indeterminate Likert scale ranging from (1) negative membership to (5) positive membership. This will allow determining the degree of acceptance of the statements by the students, expressing the responses in the form of TRINS, denoted as G_x.

For each student, their evaluation is represented by a vector in $[0, 1]^5$, where each component of the vector reflects an evaluation category from "Very High" to "Very Low". The function

$$\gamma(V) = 2v_1 + v_2 + 0.5v_3 - v_4 - 2v_5 \quad (3)$$

is used to analyze these data, calculating their relative frequency in percentages.

The frequency values are converted into Neutrosophic Plithogenic Probabilities to express the overall behavior of the studied dimensions. This is done through equation (3), representing the probabilities of each variable and its dimensions with values of the type (T, I, F), where T indicates the "strongly certain" probability that the dimension occurs adequately, I represents the "indeterminate" probability, and F the "totally certain" probability that the dimension does not occur adequately.

$$PNP = p_1 + p_2, pI, np_2 + np_1 \quad (4)$$

This methodological approach allows capturing the complexity and indeterminacy inherent to students' perceptions and satisfactions regarding the use of the case method as a pedagogical tool, using the framework of plithogenic logic and neutrosophic probabilities for a deeper and more nuanced analysis of the collected data.

4. RESULTS

The data collected were taken from final-year law students, as it was considered that they have a higher level of understanding of the analyzed pedagogical tool so that the results obtained would be significant for the study. Specific variables and their dimensions related to student satisfaction and the effectiveness of the case method as a pedagogical tool were analyzed. The selected study variables include the level of student satisfaction and the

level of appreciation/use of case studies as a teaching method. The dimensions to be evaluated for the second variable focused on:

- D11 Satisfaction with the Teaching Methodology,
- D12 Satisfaction with Classroom Interaction,
- D13 Satisfaction with the Learning Obtained for the first variable.

For the second variable, the dimensions of analysis proposed are:

- D21 Effectiveness of case studies,
- D22 Ease of learning,
- D23 Perception of preparation for professional practice,
- D24 Development of critical thinking and problem-solving,
- D25 Level of preference for the case study method.

Table 1 shows, as an example, the results corresponding to each dimension evaluated in the questionnaire through variable 1. The obtained values show the degree of agreement, the degree of indeterminacy with a tendency towards positive agreement, the degree of indeterminacy, the degree of indeterminacy with a tendency towards negative disagreement, and the degree of disagreement of each evaluated student, with respect to each dimension of the analyzed variables.

No	Satisfaction with the Teaching Methodology	Satisfaction with Class Interaction	Satisfaction with the Learning Obtained
1	(1; 1; .4; .6; .6)	(.6; .2; 0; 0; 1)	(1; 0; 0; .4; .4)
2	(1; .6; .2; .2; .2)	(.8; .6; .4; .4; .4)	(1; .4; 0; 0; .2)
3	(1; .4; 0; 0; .2)	(.6; .8; .2; .8; .6)	(1; .6; 0; 0; 0)
4	(.8; .2; 0; 0; 0)	(.6; 0; .6; 0; 1)	(1; .6; .4; 0; 0)
5	(.4; .2; 0; 0; 0)	(.6; .8; 0; 1; .8)	(.4;.4;.2; .2; 0)
6	(.6; .4; 0; 0; 0)	(.6; 0; 0; .6; .6)	(.6; .6; 0; 0; 0)
7	(1; 0; .4; .4; 0)	(.4; 0; .4; 1; .4)	(1; .2; .4;.4; 0)
8	(.6; .6;.6; .6; 0)	(0; 0; .2; .6; 1)	(.8;.6; .2; 0;.2)
9	(.8; .4; .2; 0; .2)	(.4; .4; 0; .4; 0)	(.6; 0;.6;.6; .4)
10	(1; .2; 0; 0; .2)	(.8; .6; 0; 0; .4)	(.4; .6; 0; 0;0)
11	(.8; .2; 0; 0; 0)	(.6; 1; .4; .4; .6)	(1; .4; 0; 0;.2)
12	(.6; .6; .6; .6; 0)	(.6; 0; .6; .8; 1)	(.8; .2; 0;0;0)
13	(.8; .4; .2; 0; .2)	(.6; .4; .2; .2; .6)	(.6; .6;.6;0;.6)
14	(1; .2; 0; 0; .2)	(.6; .6; 0; 0; .8)	(.4;1; 1;.4; .6)
15	(.8; .2; 0; 0; 0)	(0; .2; .4; .4; .4)	(.2;0; 0; .2; 1)
16	(.6; 0; 0; .4; 0)	(0; .6; .2; .2; 0)	(1; 0; 0; .4; .4)
17	(.4; .2; 0; 0; 0)	(.4; 0; .6; .6; 0)	(1; .4; 0; 0; .2)
18	(0; .6; 0; 0; 0)	(.8; .6; .8; .8; 1)	(1; .6; 0; 0; 0)
19	(.4; .4; .2; .2;.2)	(0; .4; 0; 0; .8)	(1; .6; .4; 0; 0)
20	(1; .6; .2; .2; .2)	(1; .6; .8; .8; .4)	(.4;.4; .2; .2;0)
21	(1; .4; 0; 0; .2)	(.8; .2; 0; 0; .6)	(.6; .6; 0; 0; 0)
22	(.8; .2; 0; 0; 0)	(.6; .4; 0; 0; 0)	(1;.2; .4; .4; 0)
23	(.4; .2; 0; 0; 0)	(.6; 0; .4; .4; .8)	(.8; .6;.2;0; .2)
24	(.6; .4; 0; 0; 0)	(1; .6; .6; .6; 0)	(.6;0;.6; .6; .4)
25	(1; 0; .4; .4; 0)	(.8; .4; 1; 1; .4)	(.4;.6; 0; 0; 0)
26	(.6; .6; .6; .6; 0)	(.6; .2; 0; 0; .2)	(1; .4; 0; 0; .2)
27	(.8; .4; .2; 0; .2)	(.6; 0; .2; .2; 0)	(.8; .2; 0; 0;0)
28	(1; .2; 0; 0; .2)	(.2; .2; .4;.4; .6)	(.4;.6;.6; .6;.4)
29	(.8; .2; 0; 0; 0)	(.6; .6; .2; .2; .2)	(1;.6; .8; .8; 0)
30	(.6; .6; .6; .6; 0)	(.4; 0; .6; .6; .4)	(.8; .4; 0; 0;.2)
31	(.8; .4; .2; 0; .2)	(0; .6; .8; .8; 0)	(1; 0; 0; .4; .4)
32	(1; .2; 0; 0; .2)	(.4; .4; 0; 0; .2)	(1; .4; 0; 0; .2)
33	(.8; .2; 0; 0; 0)	(.4; .6; .8; .8; .4)	(1; .6; 0; 0; 0)
34	(.6; 0; 0; .4; 0)	(.8; .2; 0; 0; .6)	(1; .6; .4; 0; 0)
35	(.4; .2; 0; 0; 0)	(0; .4; .2; .2; 0)	(.4;.4; .2;.2; 0)
36	(0; .6; 0; 0; 0)	(.6; .6; 0; 0; .8)	(0.6;.6; 0; 0;0)
37	(.4; .4; .2; .2; .2)	(.4; .2; .4; .4; .6)	(1; .2; .4; .4;0)
38	(.8; .6; 0; 0; 0)	(.6; .6; .2; .2; .2)	(.8;.6; .2; 0;.2)
39	(1; .6; .2; .2; .2)	(1; 0; .6; .6; .4)	(.6;0; .6;.6;.4)
40	(1; .4; 0; 0; .2)	(.6; .6; .8; .8; 0)	(.4; .6; 0; 0;0)
41	(.8; .2; 0; 0; 0)	(.4; .4; 0; 0; .2)	(1; .4; 0; 0; .2)
42	(.4; .2; 0; 0; 0)	(0; .6; .8; .8; .4)	(.8; .2; 0; 0;0)
43	(.6; .4; 0; 0; 0)	(.2; .2; 0; 0; .6)	(.6;.6;.8; .8;0)
44	(1; 0; .4; .4; 0)	(.4; .4; .2; .2; 0)	(.6; .2;0; 0;.2)
45	(.6; .6; .6; .6; 0)	(0; .6; 0; 0; .8)	(1; .4; 0; 0; 0)
46	(.8; .4; .2; 0; .2)	(.4; .2; .4; .4; 0)	(.6; 0; .4;.4;0)
47	(1; .2; 0; 0; .2)	(.8; .6; .2;.2; .4)	(1; 0; 0; .4; .4)
48	(.8; .2; 0; 0; 0)	(0; 0; .6; .6; .2)	(1; .4; 0; 0; .2)
49	(.6; .6; .6; .6; 0)	(.6; .4; .4; .4; 0)	(1; .6; 0; 0; 0)
50	(.8; .4; .2; 0; .2)	(.4; .2; .6; .6; 0)	(1; .6; .4; 0; 0)
51	(1; .2; 0; 0; .2)	(0; .6; 0; 0; 0)	(.4; .4; .2;.2;0)
52	(.8; .2; 0; 0; 0)	(.4; .4; .2; .2;.2)	(.6; .6; 0; 0; 0)
53	(.6; 0; 0; .4; 0)	(.8; .6; 0; 0; .6)	(1; .2; .4; .4;0)
54	(.4; .2; 0; 0; 0)	(0; .2; .4; .4; .6)	(.8; .6; .2;0;.2)
55	(0; .6; 0; 0; 0)	(1; .6; .2; .2; .2)	(.6; 0; .6;.6;.4)
56	(.4; .4; .2; .2;.2)	(.8; 0; .6; .6; .4)	(.4; .6; 0; 0; 0)
57	(.8; .6; 0; 0; 0)	(.6; .6; .8; .8; 0)	(1; .4; 0; 0; .2)
58	(0; .2; .4; .4; .6)	(.4; .4; 0; 0; .2)	(.8; .2; 0; 0; 0)
59	(1; .6; .2; .2; .2)	(.8; 0; .4; .4; 0)	(0; 0; .6; .6; 0)
60	(1; .4; 0; 0; .2)	(0; .6; .6; .6; 0)	(1; .6; .8; .8;0)
61	(.8; .2; 0; 0; 0)	(.6; .4; 1; 1; .4)	(.8; .4; 0;0; 0)
62	(.4; .2; 0; 0; 0)	(.4; .2; 0; 0; .6)	(.6;.6;.8; .8;0)
63	(.6; .4; 0; 0; 0)	(.8; 0; .2; .2; 1)	(.6;.2; 0; 0; 0)

64	(1; 0; .4; .4; 0)	(.4; .4; .4; .4; 0)	(1; .4; 0; 0; 0)
65	(.6; .6; .6; .6; 0)	(.8; .2;.6; .6; .2)	(.6;0; .4;.4; 0)
66	(.8; .4; .2; 0; .2)	(0; .6; 0; 0; .4)	(.4;.6;.6;.6; .2)
67	(1; .2; 0; 0; .2)	(.6; .4; .2;.2; .6)	(1; 0; 0; .4; .4)
68	(.8; .2; 0; 0; 0)	(.4; .6; 0; 0; 0)	(1; .4; 0; 0; .2)
69	(.6; .6; .6; .6; 0)	(0; .2; .4; .4; .2)	(1; .6; 0; 0; 0)
70	(.8; .4; .2; 0; .2)	(.6; .6; .2; .2; 0)	(1; .6; .4; 0; 0)
71	(1; .2; 0; 0; .2)	(.4; 0; .6; .6; .4)	(.4; .4; .2;.2;0)
72	(.8; .2; 0; 0; 0)	(.8; .6; .8; .8; .2)	(.6; .6; 0; 0; 0)
73	(.6; 0; 0; .4; 0)	(0; .4; 0; 0; .6)	(1; .2; .4; .4;0)
74	(.4; 0.2; 0; 0; 0)	(.6; .6; .8; .8; 0)	(.8;.6;.2; 0;.2)
75	(0; 0.6; 0; 0; 0)	(.4; 0.2; 0; 0; 0)	(.6; 0; .6;.6;.4)
76	(.4; .4; .2; .2;.2)	(.4; .4; 0; 0;.4)	(.4; .6; 0; 0;0)
77	(.8; 0.6; 0; 0; 0)	(.8; .4; 0; 0; .2)	(1; .4; 0; 0; .2)
78	(0; .2; .4; .4; .6)	(0;0; .4; .4; 0)	(.8; .2; 0;0; 0)
79	(1; .6; .2; .2; .2)	(.6; .6; .6; .6; 0)	(0; .2; .4; .4;0)
80	(.8; 0; .6;.6; .4)	(.4; .4; 1; 1; .4)	(.6; .6;.2;.2;.2)
81	(.6;.6;.8;.8;0)	(1; 0.2; 0; 0; 1)	(.2; 0.4;0;0;0)

Table 1: Evaluation of the dimensions corresponding to the variable Student Satisfaction Level
Source: own elaboration.

The acquirement of these evaluations allows for their adjustment using the function

$$\gamma(V) = 2v_1 + v_2 + 0.5v_3 - v_4 - 2v_5$$

to analyze this data, calculating their relative frequency in percentages. Those elements whose evaluation of $\gamma(V)$ is equal to or higher than 2 are categorized within the range "Strongly Agree (Str.Ag.)", while scores equal to or higher than 1 are considered "Agreement (Ag.)". Those that fall within the interval of -1 to 1 are classified as "Indeterminate (Ind.) 5", those between -2 and -1 as "Disagree (Disag.)", and those that score lower than -2 are assigned to the group of "Strongly Disagree (Str.Disag.)". Table 2 shows the absolute frequencies obtained from this analysis, as well as their percentages.

Variables	Dimensions		Str.Disag	Disag.	Ind.	Ag.	Str.Ag.
Influence of using the case of study method	Effectiveness of case studies in career learning	Af	0	1	29	38	13
		%	0.0%	1.2%	35.8%	46.9%	16.0%
	Ease of learning with this method	Af	0	3	16	41	21
		%	0.0%	3.7%	19.8%	50.6%	25.9%
	Perception of preparation for professional practice with this method	Af	0	2	11	52	16
		%	0.0%	2.5%	13.6%	64.2%	19.8%
	Development of critical thinking and problem-solving	Af	0	0	10	50	21
		%	0.0%	0.0%	12.3%	61.7%	25.9%
	Level of preference for the case study method over other methods	Af	0	0	17	3. 4	30
		%	0.0%	0.0%	21.0%	42.0%	37.0%
Student satisfaction level	Satisfaction with the Teaching Methodology	Af	0	2	13	54	12
		%	0.0%	2.5%	16.0%	66.7%	14.8%
	Satisfaction with Class Interaction	Af	1	3	51	24	2
		%	1.2%	3.7%	63.0%	29.6%	2.5%
	Satisfaction with the Learning Obtained	Af	0	1	17	33	30
		%	0.0%	1.2%	21.0%	40.7%	37.0%

Table 2: Absolute frequencies (Af) and percentages of the results obtained
Source: own elaboration.

The acquisition of this data facilitates the generation of Refined Plithogenic Probabilities (RPP) and Neutrosophic Plithogenic Probabilities (NPP) for all evaluated dimensions, as detailed in Table 3. This statistical derivation process allows for a deeper and more nuanced interpretation of the data sets, using advanced theoretical frameworks to reflect the complexity and multidimensionality of the evaluated perceptions. The application of RPP and NPP offers an innovative approach to analyzing and understanding variations and trends within the responses, thus allowing for a more holistic and detailed view of the underlying dynamics in the studied dimensions.

Variables	RPP	NPP

Effectiveness of case studies in career learning	(0.0; 1.23; 35.8; 46.91; 16.05)	(62.96; 35.80; 1.23)
Ease of learning with this method	(0.0; 3.7; 19.75; 50.62; 25.93)	(76.55; 19.75; 3.70)
Perception of preparation for professional practice with this method	(0.0; 2.47; 13.58; 64.2; 19.75)	(83.95; 13.58; 2.47)
Development of critical thinking and problem-solving	(0.0; 0.0; 12.35; 61.73; 25.93)	(87.66; 12.35; 0.00)
Level of preference for the case study method over other methods	(0.0; 0.0; 20.99; 41.98; 37.04)	(79.02; 20.99; 0.00)
Satisfaction with the Teaching Methodology	(0.0; 2.47; 16.05; 66.67; 14.81)	(81.48; 16.05; 2.47)
Satisfaction with Class Interaction	(1.23; 3.7; 62.96; 29.63; 2.47)	(32.10; 62.96; 4.93)
Satisfaction with the Learning Obtained	(0.0; 1.23; 20.99; 40.74; 37.04)	(77.78; 20.99; 1.23)

Table 3: Refined Plithogenic Probabilities (RPP) and Neutrosophic Plithogenic Probabilities (NPP)
Source: own elaboration.

Following the analysis and interpretation of the obtained data, it was inferred that there was a positive inclination toward the case of study method as a pedagogical tool among the surveyed students. The values of the Refined Plithogenic Probabilities indicated a generally favorable perception across various key dimensions. On one hand, the effectiveness of case studies in learning the profession received high scores in the 'Agree' and 'Strongly Agree' categories, suggesting that students found this particular teaching method especially beneficial for their academic formation. At the same time, the dimension of Ease of Learning with this method showed a significant percentage of students responding favorably, reflecting that the case method was perceived as accessible and understandable. Regarding the third variable, the high percentages in positive categories highlight that students felt well-prepared for their future profession. This finding is particularly significant as it suggests that the case method aligns effectively with the practical demands of a legal career. Moreover, satisfaction with the teaching methodology was overwhelmingly positive, with the majority of students expressing a high degree of satisfaction. This stands as an endorsement of the implementation of the case method by the Law faculty, supporting its continuity and possible expansion in the curriculum.

However, the data showed a distribution with a tendency towards neutral and indeterminate responses in terms of satisfaction with class interaction. This suggests that, although the methodology was generally well-received, there might be aspects in class that require review and improvement.

The Neutrosophic Plithogenic Probabilities (NPP) provided an additional layer of analysis, allowing for the incorporation of indeterminacies and degrees of uncertainty in the evaluation of student perceptions. The PNP values emphasized that despite the positive acceptance of the case method, areas of ambiguity remain that could benefit from a more detailed qualitative analysis to identify and address specific concerns or doubts of the students.

5. CONCLUSION

During the study, a quantitative and descriptive assessment of the influence of the case method on the legal education of senior students at Universidad de los Andes was undertaken. Surveys were designed using indeterminate Likert scales to capture the perceptions and satisfaction levels of students concerning this pedagogical tool. The data collection instruments focused on measuring specific aspects such as the effectiveness of learning, the ease of the method, the perception of professional preparation, the development of critical thinking skills, and the preference for this method over others.

Data from 81 participants were processed through the construction of TRINS matrices, allowing the responses to be translated into a format that reflected varying degrees of acceptance. The main conclusions derived from the study indicate a generally positive reception of the case method, with high percentages of students reporting elevated satisfaction levels and a positive valuation of the method's effectiveness in their academic and professional formation. However, a significant proportion of neutral responses was noted, suggesting areas of uncertainty and potential for methodological improvements. The plithogenic analysis offered a deeper perspective on student perceptions, highlighting the complexity of responses and the presence of indeterminacies that could be explored in future research to optimize educational practice in Law.

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