



Neutrosophic psychology in playful spelling learning: Understanding cognitive and emotional dynamics in spelling competence

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Abstract. The problem explored in this article is spelling ability of 3rd year students of Basic General Education and how neutrosophic psychology can enhance spelling rules through playful teaching. Spelling is an essential component of presenting one's thoughts formally and non-verbally; unfortunately, without motivation and without dynamic approaches, spelling becomes complicated. The problem is observed in problems of the contemporary educated world as (positional) writing is formalized, and the requirements of language standards always should be met, which means logic and causation should be added for future endeavors of logical thinking and orientations by the public. Thus, similar research exists regarding playfulness, however, none exist which focus upon the problem via neutrosophic psychology--a psychology which embraces uncertainty and psychosocial transformation of learning. Thus, the purpose of the research is to investigate the problem via quasi-pedagogical experimental research, teacher semi-structured interviews and observations in class. Neutrosophic psychology serves as the model throughout to organize what became certain/uncertain and learned from engaging in spelling activities playfully; also, a quasi-experimental pretest/posttest with control and experimental groups was rendered. Empirical results suggest significant achievement in spelling ability which was not only captured in writing but motivated with increasing scholars' autonomy. Thus, the significance of this research reaches theoretical and practical realms for a new perspective of improving spelling ability promoted by neutrosophic psychological learning transformations gives dynamic, caring educators new avenues in sustainably constructively compiling spelling experiences dedicated to the individual.

Keywords: Neutrosophic Psychology, Playful Learning, Spelling Competence, Cognitive Dynamics, Emotional Dynamics, Basic Education, Uncertainty.

1. Introduction

Spelling competence constitutes an essential pillar in basic education, since it allows students to express ideas clearly and precisely, strengthening their communicative capacity and cognitive development. In a context where effective writing is crucial for academic and professional success, spelling difficulties in third-year students of Basic General Education represent a significant challenge [1], [2]. This study explores how neutrosophic psychology, by integrating the dimensions of truth,

indeterminacy and falsity, can enrich the playful learning of spelling rules, fostering not only technical mastery, but also motivation and emotional engagement [3]. The relevance of this topic lies in its impact on the comprehensive training of students, since solid spelling improves reading comprehension and the structuring of logical thinking [4], [5]. By addressing these dynamics, the research seeks to transform traditional, often monotonous, teaching into a dynamic and inclusive experience that responds to the current needs of students immersed in diverse educational environments.

Historically, spelling teaching has evolved from rote methods to more participatory approaches, influenced by advances in pedagogy and educational psychology [6]. In recent decades, the rise of playful approaches has revolutionized basic education, demonstrating that game-based activities increase motivation and facilitate knowledge retention [7]. However, in contexts such as that of the “San Daniel Comboni” Educational Unit, traditional methods still predominate, generating disinterest and difficulties in learning spelling rules [8]. The integration of digital technologies and playful strategies has shown promising results in various educational contexts, but its application in spelling remains limited [9]. This study is situated in this scenario, leveraging neutrosophic psychology to model the complex interactions between cognition, emotion, and uncertainty in spelling learning.

The central problem addressed by this research is the persistence of spelling errors in third-year students, exacerbated by the lack of pedagogical strategies that integrate emotional and cognitive dynamics within a framework that considers the uncertainty inherent in learning. How can neutrosophic psychology, applied to recreational activities, improve spelling competence by modeling the interactions between knowledge, motivation, and uncertainty? This question guides the study, highlighting the need for innovative approaches that overcome the limitations of conventional methods, which often ignore the affective dimensions and ambiguities of the educational process [10].

The magnitude of this problem is evident in the poor spelling performance observed in initial tests, where students show difficulties with basic rules such as the use of “h”, “m” before “p” and “b”, and the distinction between “k” and “q” [11]. These deficiencies affect not only the quality of writing, but also students' confidence and participation in academic activities [2]. Neutrosophic psychology offers a unique framework for addressing these issues, as it allows analyzing the dynamics of learning from a perspective that simultaneously considers correct knowledge, errors and areas of uncertainty [3]. By integrating this approach with playful activities, the study seeks to generate an educational environment that fosters autonomy and interest in spelling.

Despite advances in research on game-based learning, there is a significant gap in the literature regarding the incorporation of models that address uncertainty and emotions in spelling teaching [7]. While previous studies have highlighted the effectiveness of games in the classroom, few have explored how emotional and cognitive dynamics interact in complex learning contexts [9]. Neutrosophic psychology, by offering tools to model these interactions, fills this gap by providing a multidimensional approach that captures the ambiguities inherent in the educational process [3]. This study positions itself as a novel contribution by integrating these perspectives into a practical context.

In response to these shortcomings, this research proposes a mixed-method approach that combines pedagogical testing, teacher interviews, and classroom observations to evaluate the impact of playful activities designed within the framework of neutrosophic psychology. Playful strategies, such as word games and creative challenges, are implemented to address specific spelling rules, while the neutrosophic model analyzes the interactions between cognition, emotion, and uncertainty [8]. This approach allows not only to measure spelling progress, but also to understand how positive emotions, such as motivation, influence learning [10]. The research is developed at the “San Daniel Comboni” Educational Unit, a representative context of the educational challenges in basic education.

The research question posed seeks to answer whether the integration of neutrosophic psychology into playful strategies can transform spelling learning, making it more effective and meaningful for students. This study not only aims to contribute to theoretical knowledge about learning processes, but also to offer practical tools for teachers facing the challenge of teaching spelling in diverse classrooms

[11]. By modeling cognitive and emotional dynamics, it is hoped to generate insights that transcend the immediate context, applicable to other educational environments with similar challenges.

The objectives of this study are clear: first, to evaluate the effectiveness of neutrosophic psychology in the design of playful strategies to improve spelling proficiency in third-year students of Basic General Education; second, to analyze how cognitive and emotional dynamics influence spelling learning under this approach; and third, to propose a neutrosophic model that integrates uncertainty, motivation, and knowledge to optimize spelling instruction. These objectives, aligned with the research question, guide the development of this article, which seeks not only to advance theoretical understanding but also to offer practical solutions to transform spelling education into meaningful and motivating experiences.

2. Preliminaries

This section describes the psychological concepts used in this work. First, emotional intelligence is explained in subsection 2.1, while subsection 2.2 explains the main ideas of neutrosophic psychology theory.

2.1. Emotional intelligence

Goleman ([12]) classifies emotional intelligence (EI) into intrapersonal and interpersonal, see Figure 1. Interpersonal intelligence is related to the way a person can interact with others, in the case of students, the empathy they have among their classmates, the ease of working in a team, the consensus obtained from different debates, respect for ways of thinking, ways of living and acting.

Interpersonal intelligence allows us to understand and communicate with others, taking into account their different moods, temperaments, motivations, and abilities, including the ability to establish and maintain social relationships and assume different roles within groups. The important aspect of analyzing interpersonal intelligence is that, like all behavior, it is transmitted from parents to children, especially through the models created by the former. It includes skills such as empathy and the ability to manage interpersonal relationships, see [13].

Based on the aforementioned ideas, interpersonal intelligence is the ability to understand others and interact effectively with them. “It includes sensitivity to facial expressions, voice, gestures and postures, and the ability to respond,” see [14]. On the other hand, intrapersonal intelligence, according to Campbell et al., see [15], has to do with “understanding our thoughts and feelings. To the extent that we can raise our awareness, the relationship between our inner world and the external world of experiences will be stronger.” As stated in [12]: “The development of intrapersonal emotionality indicates the way in which a person manages and controls themselves, according to the tools acquired from their environment, expressing their feelings appropriately and effectively.”

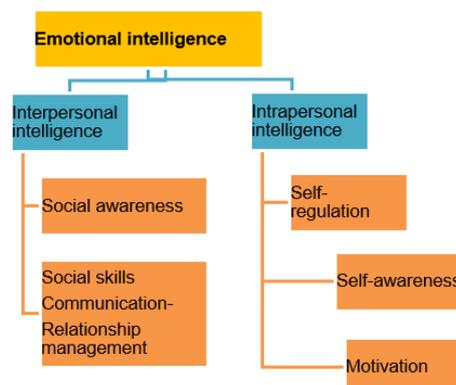


Figure 1: Components of Emotional Intelligence (Source [12])

Managing intrapersonal and interpersonal intelligence allows individuals to develop capabilities and skills that differentiate them from others, earning them recognition in society. Thus, good control of emotional intelligence allows them to establish relationships in friendship, work, and study, to know how to behave, and to manage their different moods and feelings.

The underdevelopment of emotional intelligence in students results in poor performance in both emotional and academic areas. Therefore, it is important to understand the emotions experienced during the academic day in order to modulate and manage these emotions, develop tolerance to control daily frustrations, adopt a positive attitude with colleagues, prevent interpersonal conflicts, improve the quality of life at university, and organize feelings and moods.

Neutrosophic psychology: basic concepts

This section is dedicated to summarizing the main concepts and methods of the Theory of Neutrosophic Psychology.

In [9] Smarandache refers to Sigmund Freud who divides memory into: conscious, preconscious and unconscious. In the framework of neutrosophic psychology it is defined as a third state called "aconscious", which means: being ignorant, impassive, indifferent, insensitive and unfeeling.

Similar to neutrosophic theory, neutrosophic psychology deals with concepts represented by $\langle A \rangle$, $\langle \text{neut}A \rangle$, $\langle \text{anti}A \rangle$, one of which is described below:

- 1) Conscious, i.e. things we are currently aware of, corresponds to $\langle A \rangle$.
- 2) Unconscious, which includes things we are not aware of and which are difficult to access because they are located deep within our mind. It is the opposite of the conscious and corresponds to $\langle \text{anti}A \rangle$.
- 3) Unconscious, which etymologically means distant from the conscious and the unconscious, or neither conscious nor unconscious, but intermediate, or a mixture of the conscious and the unconscious, a vague intermediate zone between the two. It corresponds to $\langle \text{neut}A \rangle$ or Indeterminacy, as in Neutrosophy.

Thus, consciousness, unconsciousness, and unconsciousness are the sources of positive, neutral (or combined), and negative emotions, thoughts, and behaviors throughout our lives.

In human behavior, there is a constant interaction and discussion between the conscious, the unconscious, and the unconscious. Sometimes people are predominantly rational, sometimes they are predominantly irrational, and sometimes they are indifferent.

The triple $(\langle A \rangle, \langle \text{neut}A \rangle, \langle \text{anti}A \rangle)$ extends to *discrete refined neutrosophic memory*, where $(\langle A \rangle_1, \langle A \rangle_2, \dots, \langle A \rangle_n; \langle \text{neut}A \rangle_1, \langle \text{neut}A \rangle_2, \dots, \langle \text{neut}A \rangle_m; \langle \text{anti}A \rangle_1, \langle \text{anti}A \rangle_2, \dots, \langle \text{anti}A \rangle_n)$ they are defined in terms of refined neutrosophy, see [9, 16-17].

Also Smarandache in [9] quotes Carl Jung who divided the unconscious into ([18]):

- The personal unconscious, which is specific to each individual and includes forgotten or suppressed consciousness;
- The collective unconscious, characteristic of the entire human species, is made up of ancestral memories called "archetypes" (images of universal meaning) and mental patterns as inherited psychic structures.

Smarandache adds the group unconscious, which is:

- Group unconsciousness, which lies between the personal and collective unconscious. It is characteristic of a specific group to which an individual belongs and has significantly influenced them.

Equivalently, it extends Jung's personal and collective consciousness to group consciousness.

Aconsciousness has a degree of conscious (c), and a degree of unconsciousness (u), where $c \in [0,1]$, and $0 \leq c + u \leq 2$.

In neutrosophic psychology there is the following notation:

$$NL(\text{entity}) = (c, a, u)(1)$$

Where c = degree of consciousness (truth), a = degree of non-consciousness (indeterminacy): I am not sure if it is conscious or unconscious, or a mixture of both, and u = degree of unconsciousness (falsehood), while NL is the notation for the semantics of neutrosophic logic ([19, 20]).

$NL(\text{conscious}) = (1, 0, 0)$; $NL(\text{acounsconscious}) = (0, 1, 0)$; and $NL(\text{unconscious}) = (0, a, 1)$, where $a \in (0, 1]$, leaving room for indeterminacy (unknown, unclear).

Given U a universe of discourse, subsets A, B and C , then the Crisp Neutrosophic Set of Type 2 satisfies the axioms : $A \cap B = \emptyset, B \cap C = \emptyset, C \cap A = \emptyset$ and $A \cup B \cup C = U$. Therefore, A, B, C form a disjoint partition of the universe of discourse U .

The crisp refined neutrosophic set of type 2 (and similarly for types 1 and 3) is defined as : $A = A_1 \cup A_2 \cup \dots \cup A_p, B = B_1 \cup B_2 \cup \dots \cup B_r, C = C_1 \cup C_2 \cup \dots \cup C_s$, with $A \cap B = B \cap C = C \cap A = \emptyset$, where p, r, s are integers $\geq 1, p + r + s \geq 4$, and $A_i \cap A_j = \emptyset$ for $i, j \in \{1, 2, \dots, p\}, i \neq j; B_k \cap B_l = \emptyset$ for $k, l \in \{1, 2, \dots, r\}, k \neq l$; and $C_m \cap C_n = \emptyset$ for $m, n \in \{1, 2, \dots, s\}, m \neq n$.

Neutropsyctic Personality Crisp considers the human person as a universe of discourse U , and three disjoint sets which are the following ([9, 21]) :

E = set of emotions of this person;

H = set of thoughts of this person;

B = set of behaviors of this person.

Therefore, $U = E \cup H \cup B$, with $E \cap H = \emptyset, H \cap B = \emptyset$, and $B \cap E = \emptyset$. Therefore, $U = \langle E, H, B \rangle$.

Furthermore, the trait is measured by degrees of $\langle \text{trait} \rangle$ and degrees of $\langle \text{antitrait} \rangle$, so that each person is classified on a range between these two opposites and is dynamic. They also include an intermediate position where there is uncertainty.

The most common trait-antitrait pairs are the following:

- Extraversion – Introversion
- Consciousness – Unconsciousness
- Perfectionism – Imperfectionism
- Sensitivism – Insensibilism
- Novator – Conservative
- Self-esteem – Self-esteem not
- Kindness – Dislike
- Openness to intellect and experience – Closeness to intellect and experience
- Inhibition – Disinhibition
- Flexibility – Rigidity
- Emotivism [Neuroticism (Hans Eysenck)] – Non- emotivism
- Obsession – Not obsession
- Caution – Impulsiveness
- Shyness – Boldness
- Honesty – Dishonesty
- Hostility [Psychoticism (Hans Eysenck)] – Non-hostility.

The *neutrosophic trait operator* is the cumulative degree of individual x with respect to both the Trait and the antiTrait, and is defined as:

$$d_{\text{Trait\&antiTrait}}: S \rightarrow [-1, 1](2)$$

Where, $d_{\text{Trait\&antiTrait}}(x) = d_{\text{Trait}}(x) + d_{\text{antiTrait}}(x)$.

To classify an individual as belonging to the trait or the anti-trait, a threshold is defined and denoted by Thr for the trait and antiThr for the anti-trait, such that:

- If $d_{\text{Trait\&antiTrait}}(x) \geq +\text{Thr}$, then the individual is classified as definitely belonging to the Trait,

- If $d_{Trait\&antiTrait}(x) \leq -antiThr$, then the individual is categorized as definitely belonging to the anti-Trait.
- If $d_{Trait\&antiTrait}(x) \in (-\varepsilon, +\varepsilon)$, then the individual is classified as being in a totally indeterminate state between the Trait and the anti-Trait.
- Yes $d_{Trait\&antiTrait} \in (\varepsilon, Thr)$, then the individual is classified as belonging mostly to the Trait.
- Yes $d_{Trait\&antiTrait}(x) \in (-antiThr, -\varepsilon)$, then the individual is classified as belonging mostly to the anti-Trait.

The way to deal with $d_{Trait\&antiTrait}$ It is illustrated as follows:

“Suppose a psychiatrist, after many sessions, neutrosophic questionnaires, and observations measured with neutrosophic statistics, has come to the conclusion that the two dimensions of George P.'s temperament are estimated with some precision as:

- The degree of stability (trait) is $d_{GP}(stable) = 0.2 \in [0, 1]$,
- The degree of instability (antitrait) is $d_{GP}(unstable) = -0.5 \in [-1, 0]$; and
- The degree of extroversion (trait) is $d_{GP}(extroverted) = 0.9 \in [0, 1]$,
- The degree of introversion (antitrait) is $d_{GP}(introverted) = -0.3 \in [-1, 0]$.

So $d_{GD\langle stable \rangle \& \langle unstable \rangle}(x) = d_{GP}(stable) + d_{GP}(unstable) = 0.2 + (-0.5) = -0.3$, and $d_{GD\langle extroverted \rangle \& \langle introverted \rangle}(x) = d_{GP}(extroverted) + d_{GP}(introverted) = 0.9 + (-0.3) = +0.6$.”

3. Results.

This section details the results obtained from the implementation of a playful learning program and the subsequent data collection through pedagogical instruments and surveys. Data processing is carried out using the tools of neutrosophic psychology to model the interaction between the components of spelling competence.

Statistical Sampling

The study population included **350 third-year students** of Basic General Education from various educational institutions in Educational District 18D01. To ensure the representativeness of the findings, a statistically significant sample was calculated using the specified formula.

- **Step 1: Defining parameters for sample calculation.**
 - N (Population size): 350 students.
 - z (Confidence level): 1.96 (corresponding to 95% confidence).
 - p (Probability of success): 0.5 (maximum variability is assumed since there is no direct precedent).
 - q (Probability of failure): $1 - p = 0.5$.
 - d (Permissible sampling error): 5% o 0.05.

- **Step 2: Applying Formula 3.**

$$n = (N - 1) \cdot d^2 + z^2 \cdot p \cdot qN \cdot z^2 \cdot p \cdot q$$

- **Step 3: Substituting values and calculating numerically .**

- **Numerator:**

$$350 \cdot (1.96)^2 \cdot 0.5 \cdot 0.5 = 350 \cdot 3.8416 \cdot 0.25 = 336.14$$

- **Denominator:**

$$\begin{aligned} & (350 - 1) \cdot (0.05)^2 + (1.96)^2 \cdot 0.5 \cdot 0.5 \\ & (349 \cdot 0.0025) + (3.8416 \cdot 0.25) = 0.8725 + 0.9604 = 1.8329 \end{aligned}$$

- **Final calculation of n:**

$$n = 1.8329336.14 \approx 183.39352937967156$$

- **Step 4: Rounding the sample size.** Since the result is a fractional number, it is rounded up to the nearest whole number to ensure the sample size is not lower than required. Therefore, the final sample size was **184 students**.

Variables and Neutrosophic Classification

An assessment instrument (combining observation, testing, and surveys) was administered to the 184 students to measure seven key variables. The responses and observations were classified according to three neutrosophic categories:

- **<CO> (Spelling Competence Indicator):** Represents positive results, rule mastery, high motivation and functional emotions (the trait).
- **<Anti CO> (Spelling Difficulty Indicator):** Represents frequent errors, lack of motivation, and dysfunctional emotions such as anxiety (the anti-trait).
- **< Neut CO> (Indeterminacy Indicator):** Represents ambiguous, inconsistent responses or a mixture of understanding and error, reflecting a state of learning in transition.

The variables measured were:

- **V₁:** Perception of the difficulty of spelling (Easy, More or less, Difficult).
- **V₂:** Motivation towards recreational spelling activities (High, Medium, Low).
- **V₃:** Anxiety level during spelling tests (Low, Sometimes, High).
- **V₄:** Degree of collaboration in group spelling games (Always, Sometimes, Never).
- **V₅:** Autonomy in identifying and correcting one's own errors (High, Regular, Low).
- **V₆:** Long-term retention of rules learned playfully (Good, Average, Bad).
- **V₇:** Transfer of playful learning to formal and spontaneous writing (Successful, Partial, Non-existent).

The percentage results of the evaluation are consolidated in Table 1.

Table 1: Evaluation results classified into percentages of <CO>, < Neut CO> and <Anti CO> responses

Variable	<CO>	< Neut CO>	<Anti CO>
V ₁	35.0%	25.0%	40.0%
V ₂	85.0%	10.0%	5.0%
V ₃	30.0%	20.0%	50.0%
V ₄	75.0%	15.0%	10.0%
V ₅	60.2%	22.5%	17.3%
V ₆	55.0%	30.0%	15.0%
V ₇	28.8%	35.7%	35.5%

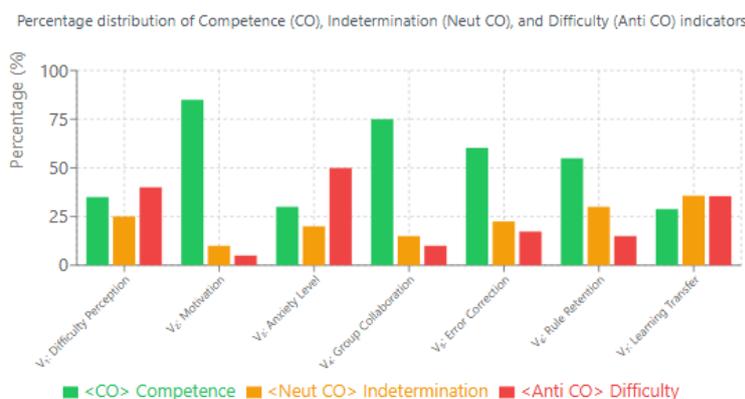


Figure 2: Neutrosophic Distribution Across Variables

Neutrosophic Processing

To quantify the dynamics between spelling competence and difficulty, the neutrosophic trait operator was applied to the data in Table 1, following the methodological steps.

- **Step 1: Data normalization.** Percentage values were divided by 100 to express them in the range [0, 1].
- **Step 2: Bipolar Representation.** Normalized <Anti CO> values were multiplied by -1 to represent the anti-trait. <CO> values remained positive.
- **Step 3: Calculation of the Neutrosophic Trait Operator.** Equation 2 was applied to each variable.
- **Step 4: Aggregation of Results.** The arithmetic mean of the values in each of the three columns (<CO>, <Neut CO>, <Anti CO>) was calculated to obtain an overall group status. Equation 2 was then applied to these aggregated averages.

Detailed calculations are presented in Table 2.

Table 2: Processing of <CO>, <Neut CO> and <Anti CO>, using d_i for each variable and the final result

Variable	<CO>	<Neut CO>	<Anti CO>	d_i
V ₁	+0.350	0.250	-0.400	-0.050
V ₂	+0.850	0.100	-0.050	0.800
V ₃	+0.300	0.200	-0.500	-0.200
V ₄	+0.750	0.150	-0.100	0.650
V ₅	+0.602	0.225	-0.173	0.429
V ₆	+0.550	0.300	-0.150	0.400
V ₇	+0.288	0.357	-0.355	-0.067
Aggregate Results	+0.527143	0.226000	-0.246857	0.280286

Bipolar neutrosophic index showing net competence effect (positive values indicate competence dominance)

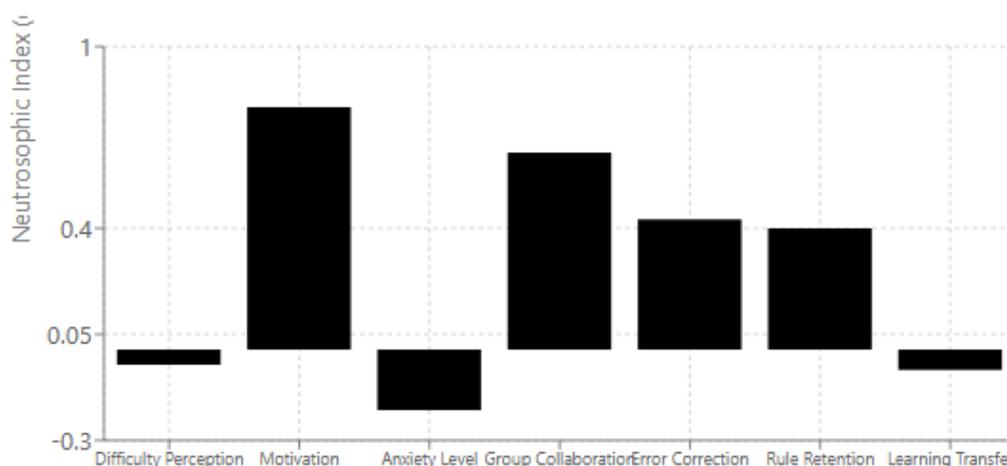


Figure 3: Neutrosophic Competence Index (d_i) by Variable

Calculation of Aggregate Results:

- **Average of <CO>:**
 $0.350 + 0.850 + 0.300 + 0.750 + 0.602 + 0.550 + 0.288 = 4.69 \approx 0.52714285... \approx 0.527143$
- **Average of <Neut CO>:**

$$70.250 + 0.100 + 0.200 + 0.150 + 0.225 + 0.300 + 0.357 = 71.582 \approx 0.226 \approx 0.226000$$

- **Average <Anti CO> (absolute value for the average):**
 $70.400 + 0.050 + 0.500 + 0.100 + 0.173 + 0.150 + 0.355 = 71.728 \approx 0.24685714\dots \approx 0.246857$
- **Final Aggregate Index :**
 $0.527143 - 0.246857 = 0.280286$

The overall aggregate index of spelling proficiency in the group is **0.280286**. Although positive, this value is not high, suggesting a favorable trend, but with a considerable influence of indeterminacy and difficulties.

4. Discussion

The use of neutrosophic psychology offers a granular perspective for analyzing the effectiveness of playful learning strategies, overcoming the limitations of traditional hit/miss metrics. The aggregate index of **0.280286** indicates that, overall, playful intervention has a more positive than negative effect on spelling proficiency. However, this value, not being close to 1, reveals that the system is in a state of marked indeterminacy, where success is not fully established.

The analysis of the individual variables is revealing:

- **Strengths:** Motivation for playful activities (V_2) with an index of **0.800** and collaboration in group games (V_4) with **0.650** are the pillars of the strategy's success. This confirms that the playful approach is highly effective in generating engagement and a positive learning environment, aligning with the principles of interpersonal intelligence.
- **Zones of Conflict and Opportunity:** Variables with negative indices indicate the main challenges. **Test anxiety (V_3) at -0.200** is the most detrimental factor, suggesting that although students enjoy the game, evaluative pressure triggers negative emotions that sabotage performance. Similarly, **transfer of learning to formal writing (V_7) at -0.067** and **initial perception of difficulty (V_1) at -0.050** show that knowledge acquired in the game context does not automatically generalize to other areas, and preexisting beliefs about the difficulty of the subject persist.
- **The Role of Indeterminacy (< Neut CO>):** The average indeterminacy of **0.226000** is significant. Variables such as retention (V_6) and transfer (V_7) present high percentages of < Neut CO> (30% and 35.7% respectively). This accurately captures the "aware" state of learning: students do not fully master the rule, but they do not ignore it either. They are in an intermediate zone, crucial for pedagogical intervention, where a small push can consolidate knowledge or allow it to be lost.

This neutrosophic approach, therefore, not only measures the final outcome, but also diagnoses the process. It shows that the problem is not the playful method itself, but the connection between the play environment (emotionally safe and motivating) and the evaluative environment (anxiety-generating), as well as the lack of explicit strategies for skill transfer.

5. Conclusions

This study applied a neutrosophic psychology framework to evaluate the dynamics of playful spelling learning in third-year students, reaching the following conclusions:

1. The overall balance of the playful strategy is **moderately positive** (index of 0.280286), which validates its use but warns against uncritical implementation. Its success is not absolute and coexists with significant areas of difficulty and uncertainty.
2. **Specific deficiencies** limiting the program's effectiveness were precisely identified. The most critical are:
 - High **evaluation anxiety (V_3)**, which counteracts the emotional benefits of the game.

- A **weak transfer of skills (V₇)** from the playful context to formal writing.
 - The **persistence of a negative perception (V₁)** about the difficulty of spelling.
3. The **playful component is exceptionally effective in fostering motivation (V₂) and collaboration (V₄)**, demonstrating its power to positively impact the emotional and interpersonal dimension of learning.
 4. Neutrosophic analysis proved to be a superior diagnostic tool in allowing for the quantification of the **state of indeterminacy (neutral CO)**. This "intermediate" state offers the greatest pedagogical opportunity, as it represents students who are on the threshold of consolidating their learning.

In short, neutrosophic psychology not only validates the potential of playful learning but also illuminates its complexities, enabling educators to design more precise and effective interventions that address both the cognitive and emotional dimensions of the learning process.

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