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Dialectics of Inclusion in Physical Education: A Neutrosophic N- Alectic Approach to the Creation and Communication of Digital Content

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Abstract. This is how digital creations can foster inclusion in physical education, one of the more applicable and challenging aspects of today's diverse school realities. This study is significant, considering that we live in a digital world that requires the balance of such creations to promote equitable environments for increasingly functional, diverse school populations. While previous studies focused on inclusion in the physical education arena at school, none have studied the field based upon the uncertainties and discrepancies associated with communication and pedagogical endeavors, let alone from a digital perspective. Thus, the gap in the research is filled by the Neutrosophic N- Alectic approach, combining neutrosophic logic with dialectic studies to formulate an inclusion model versus access versus digital creation intent. The qualitative research effort through the content analysis of digital creations and educator interviews suggests that the most effective creation comes from an equilibrium between communicative sentiment and pedagogical effectiveness. This demonstrates that the N-Alectic approach can practically and theoretically articulate the realities of inclusion. Therefore, ethically, it champions the intent of accessibility by creators, teacher-reinforced training, and an educationally integrated policy. Ultimately, this study contributes to the existing body of knowledge surrounding inclusivity within physical education by championing equity and inclusivity through participation and access to digital educational communication as the ethically purposeful springboard.

Keywords: Inclusion, Physical Education, Digital Content, Educational Communication, N- Alectic Neutrosophic, Accessibility, Functional Diversity

1. Introduction

Inclusion in physical education, mediated by digital content, emerges as a fundamental pillar to guarantee equitable educational environments in an increasingly interconnected world. This study explores how digital educational communication can transform pedagogical practices in physical education, promoting the active participation of students with functional diversity. The relevance of this research lies in its capacity to respond to the demands of the 2030 Agenda and the Convention on the Rights of Persons with Disabilities, which underline inclusion as an ethical and educational imperative [1]. In a context where digital technologies redefine teaching-learning processes, it is crucial to investigate how digital resources can overcome physical, sensory and communicative barriers, promoting a fairer and more participatory physical education [2]. The integration of innovative communicative approaches not only enriches the motor experience but also strengthens students' sense of belonging, an essential aspect for educational equity [3]. Historically, physical education has been dominated by competitive and homogeneous paradigms, which often exclude students with specific needs [4]. However, the emergence of digital technologies has opened up new possibilities to redefine this discipline, allowing the creation of more flexible and accessible learning environments [5]. Since the end of the 20th century, inclusion has gained ground in global educational frameworks, driven by international regulations and technological advances that have diversified the ways of teaching and learning. Currently, interactive platforms, educational videos, and gamification tools are redefining physical education, offering opportunities to personalize learning and address functional diversity. However, the potential of these tools depends on their intentional design and alignment with sound pedagogical principles, such as Universal Design for Learning (UDL).

Despite these advances, significant challenges remain in the implementation of inclusive practices in physical education. The digital divide, both in access to infrastructure and in teacher training, limits the effectiveness of digital content in diverse contexts [2]. Furthermore, many digital resources lack technical accessibility and a clear pedagogical foundation, which restricts their impact on inclusion [5]. Previous studies have addressed inclusion from technical or curricular perspectives, but few have explored the communicative dynamics underlying the creation and dissemination of this content. This gap in the literature highlights the need for approaches that integrate the uncertainty and tensions inherent in digital inclusion processes.

The central problem this study addresses is: how can digital content, designed from a communicative perspective, promote inclusion in physical education by managing the contradictions and ambiguities of pedagogical practices? This question arises from the realization that digital resources, although promising, do not automatically guarantee inclusive environments. The lack of approaches that consider the complexity of the interactions between technology, communication, and functional diversity represents a significant barrier to achieving equitable physical education.

To answer this question, this study adopts an N- Alectic Neutrosophic approach, combining neutrosophic logic with dialectical analysis to model the tensions between inclusion, accessibility, and digital design. This approach captures the inherent indeterminacy and contradictions of communicative processes in digital educational environments. Through a qualitative analysis of digital resources and teacher interviews, the research seeks to identify patterns that enhance inclusion and overcome current limitations. This innovative methodological framework offers a unique perspective for addressing the complexity of inclusion in physical education. Digital educational communication, far from being a mere complement, is positioned as a strategic axis for transforming physical education. By designing digital content that prioritizes empathy, accessibility, and pedagogical coherence, it is possible to build learning environments that celebrate diversity and promote participation [3]. This study not only seeks to understand how digital content can be more inclusive, but also to propose practical strategies for its implementation in real-life educational contexts. The integration of Neutrosophic N- Alectics allows for the exploration of contradictions between pedagogical intentions and practical outcomes, offering a way to overcome them. In this sense, the research aligns with the need to rethink teaching practices in a digital context. Teachers, as communicative agents, play a crucial role in creating content that not only informs but also generates emotional and cognitive connections with students. By addressing the tensions between accessibility, technology, and pedagogy, this study contributes to a paradigm shift toward a more humane and equitable physical education. The research question guides this effort, seeking not only theoretical answers but also practical solutions to current challenges.

The objectives of this study are clear: first, to analyze how digital content can foster inclusion in physical education using an N- Alectic Neutrosophic approach; second, to identify the communicative and pedagogical characteristics that make these resources effective; and third, to propose strategies to overcome accessibility and teacher training barriers in digital contexts. These objectives are aligned with the research question and seek to advance theoretical and practical knowledge about inclusion in physical education, contributing to a more equitable and participatory education.

2. Preliminaries

2.1. Inclusion in Education

Inclusion in education is an essential pillar for building equitable educational systems that respond to student diversity. This principle, founded on respect for human rights, seeks to ensure that all students, regardless of their abilities, backgrounds, or characteristics, have access to a meaningful and participatory education. In the field of physical education, inclusion takes on particular relevance, as this discipline, traditionally focused on physical performance, has often marginalized students with functional diversity. Integrating inclusive approaches not only promotes equality but also enriches the learning process by valuing differences as an essential component of human development. This argumentative analysis explores inclusion in education, focusing on physical education, assessing its challenges, progress, and strategies, and highlighting its importance in building equitable educational environments.

Historically, education systems have operated under homogeneous paradigms that prioritize uniformity, often neglecting students with specific needs. Since the late 20th century, international frameworks such as the Salamanca Declaration (1994) have driven a shift toward inclusive models, advocating for educational environments that accommodate diversity. In physical education, this shift has entailed rethinking pedagogical practices to incorporate adaptations that allow for the active participation of all students, from those with physical disabilities to those with cognitive or sensory needs. However, the effective implementation of inclusion faces structural barriers, such as a lack of teacher training and adequate resources, that hinder its full realization.

A central aspect of inclusion in physical education lies in its ability to foster a sense of belonging. By designing activities that consider diverse abilities, teachers not only facilitate access to learning but also promote self-esteem and social interaction among students. For example, the use of adapted cooperative games can transform the educational experience, allowing all students to participate on equal terms. This approach contrasts with traditional practices, where competition and physical performance predominated, often excluding those who did not meet predefined standards. Inclusion, therefore, requires a cultural shift that values diversity as a resource, not an obstacle.

However, the challenges to achieving effective inclusion are significant. The digital divide, for example, limits access to technological tools that could facilitate personalized learning in physical education. Furthermore, the lack of teacher training in inclusive strategies and the use of adaptive technologies is a persistent obstacle. Many educators, although committed to inclusion, lack the skills necessary to design activities that meet the needs of all students. This shortcoming highlights the urgent need for ongoing training programs that integrate innovative pedagogical approaches, such as Universal Design for Learning (UDL), which promotes accessibility and flexibility in educational design.

The assessment of inclusion in physical education must also consider the impact of educational policies. International regulatory frameworks, such as the Convention on the Rights of Persons with Disabilities, have established clear guidelines for inclusion, but their implementation varies according to local contexts. In many countries, a lack of resources and insufficient institutional support make it difficult to translate these policies into concrete practices. For example, the absence of accessible infrastructure in schools can limit the participation of students with motor disabilities in physical activities. This gap between policies and their practical implementation highlights the need for stronger institutional commitment.

The integration of digital technologies offers a transformative opportunity for inclusion in physical education [6]. Interactive platforms, educational videos, and gamification tools allow for personalized learning experiences, adapting them to individual students' needs. For example, videos with subtitles and audio descriptions can facilitate the participation of students with visual or hearing impairments, while digital simulations can help anticipate movement sequences for those with motor difficulties [7].

However, the potential of these tools depends on their intentional design, which must prioritize accessibility and pedagogical coherence to prevent them from becoming a source of exclusion.

Despite progress, inclusion in physical education faces inherent tensions, such as balancing personalization and standardization. While adapted activities are essential to address diversity, there is a risk that they may be perceived as segregating if not fully integrated into the general curriculum. An effective inclusive approach requires that adaptations be designed to promote joint participation, avoiding stigmatization. For example, the use of strategies such as cooperative learning can foster collaboration between students with and without disabilities, creating a mutually supportive environment. This approach not only enhances the educational experience but also contributes to the development of values such as empathy and respect.

From a critical perspective, inclusion in physical education must go beyond technical adaptations and address the cultural and social dimensions of exclusion. Ableist imaginings, which value normative physical abilities, continue to permeate many educational practices, perpetuating invisible barriers [6]. Changing these perceptions requires a joint effort that involves teachers, students, and educational communities in building an inclusive culture. Educational communication, in this sense, plays a crucial role, since content designed with empathetic language and diverse representations can challenge stereotypes and promote acceptance of diversity.

In terms of appreciation, inclusion in physical education is not only desirable, but essential to fulfilling the principles of educational justice. The benefits of an inclusive approach transcend the classroom, fostering social, emotional, and physical skills that are essential for students' holistic development. Furthermore, inclusion enriches the educational environment by allowing differences to become opportunities for collective learning. However, its success depends on overcoming structural barriers, such as lack of resources and insufficient teacher training, as well as adopting pedagogical approaches that integrate diversity as a core value.

In conclusion, inclusion in physical education represents an ethical and pedagogical commitment that requires transforming teaching practices, educational policies, and cultural perceptions. The integration of digital technologies, when designed with an inclusive approach, offers a promising path to overcome traditional barriers and build equitable learning environments. However, this process requires sustained investment in training, infrastructure, and policies that prioritize diversity. Inclusive physical education not only guarantees the right to education but also celebrates the richness of human differences, promoting a more just and cohesive society.

2.2. N - Alectic Neutrosophic as a theoretical framework.

N - alectics, a sophisticated extension of neutrosophy proposed by Smarandache (2002), emerges as an analytical framework that overcomes the limitations of traditional dialectics, based on the binary dynamics of opposites (True, T, and False, F). Neutrosophy introduces a trialectics that incorporates a third essential component: indeterminacy or neutrality (I), defined as an intermediate state reflecting ambiguity, uncertainty, or coexistence between extremes. Smarandache (2002) describes this perspective as a "dynamic of opposites (T and F) and the neutrality/indeterminacy (I) between them," which extends the analysis to complex systems where rigid dichotomies do not capture the totality of interactions. This approach further evolves into n-alectics, a general model that refines the basic components T (Truth), I (Indeterminacy), and F (Falsehood) into n interdependent subcomponents: $(T_1, T_2, \ldots, T_\mathrm{p};\ I_1, I_2, \ldots, I_\mathrm{r};\ F_1, F_2, \ldots, F_\mathrm{s})$, where p, r, and s are positive integers and

$p + r + s = n$physical logic allows multidimensional phenomena to be decomposed into specific elements, modeling their dynamic relationships more accurately.

The foundation of n-alectics is inspired by pre-Columbian indigenous worldviews, such as those in the Mesoamerican, Andean, and Amazonian worldviews, which have historically adopted non-binary thought structures. For example, in the Toltec-Aztec worldview, Quetzalcoatl embodies a trialectic of heaven (T: divine wisdom), earth (I: transformation and balance), and the underworld (F: death and renewal), illustrating a system where opposites are not mere contrasts, but interconnected forces in constant transformation [8]. Similarly, in Andean dialectics, concepts such as Yanantin (complementary duality) and Pachakuti (cyclical change) reflect an interplay of complementary opposites, while Amazonian Shuar cosmology extends this idea to an n-alectic network of multiple spiritual forces, such as Tsunki (T_1 – Spirit of Water), Nunkui (T_3 – Fertility) and Nekás (F_3 – Chaos), mediated by the shaman (I_3) and other entities. These ancestral philosophies, which integrate indeterminacy as an essential component, find an echo in n-alectic, which formalizes this complexity through advanced mathematical and philosophical logic.

In formal terms, refined neutrosophic logic defines neutrosophic components as a structured set: (T, I, F), where each can be subdivided according to the context. For example, in fourfold neutrosophic logic, an intermediate case between trialectic and n- alectic, a refinement of (T, F) into (T, I_1, I_2, F) is proposed, as in the case of man (T), woman (F), complementarity (I_1), and contradiction (I_2).

In its most general form, n-alectics is expressed as:
$(T1, T2, \dots, Tp; I1, I2, \dots, Ir; F1, F2, \dots, Fs)$ where the total number of subcomponents $(n = p + r + s)$depends on the granularity required for the analysis. This flexibility makes it possible to capture the richness of dynamic systems, where interactions are not reduced to simple polarities. Furthermore, n-alectics is applied in practice through quantitative metrics, as in the ethical decision-making described in the base article. In this case, weights (w_i) are assigned to each subcomponent; for example, w_T= 0.33 for T, w_I= 0.165 for pure I, w_F= 0.175 for F, and the neutrosophic distance to an ideal solution is calculated using the formula:

$$d_i^{\,+} = \sum_{i=1}^{n}\Big(w_T\big|T_{A(x_i)} - T_{B(x_i)}\big|^{\lambda} + w_{IT}\big|IT_{A(x_i)} - IT_{B(x_i)}\big|^{\lambda} + w_I\big|I_{A(x_i)} - I_{B(x_i)}\big|^{\lambda} + w_{IF}\big|IF_{A(x_i)} - IF_{B(x_i)}\big|^{\lambda} + w_F\big|F_{A(x_i)} - F_{B(x_i)}\big|^{\lambda}\Big) \quad \textbf{(1)}$$

where λ determines the type of distance (λ = 1 for Hamming, λ = 2 for Euclidean), x_i are the observed values and y_i the ideal ones [9]. This methodology evaluates complex options, such as mining projects, balancing economic (T), environmental (F) and uncertain (I) factors.

For the analysis of the relationship between metacognitive strategies and scientific attitude in students of the Faculty of Education of the National University of San Marcos, n-alectics offers an adequate theoretical framework. Metacognitive strategies, understood as processes of planning, monitoring and evaluating one's own learning, can be mapped as subcomponents of T (e.g., T1: effective planning; T2: self-reflection), while scientific attitude, as a disposition towards inquiry and critical thinking, could include both positive (T) and negative (F) elements, e.g., F1: rejection of science). Indeterminacy (I) encompasses aspects such as uncertainty in the application of these strategies (I1) or ambiguity in the perception of science (I2), reflecting the cognitive and attitudinal complexities of students. This approach overcomes the limitations of previous studies that tend to treat these phenomena in an isolated or binary way, offering a perspective that integrates multiple dimensions into a relational system [10]. For example, the ideal solution for a student with high metacognition and a positive scientific attitude could be defined as:

$$I = \big(max(T_x), max(IT_x), min(I_x), min(IF_x), min(F_x)\big) \quad (2)$$

Where:

- T_x: Truth associated with option x.
- IT_x: Indeterminacy that tends towards the truth associated with option x.
- I_x: Pure indeterminacy associated with option x.
- IF_x: Indeterminacy that tends to falsehood associated with option x.
- F_x: Minimum falsehood associated with option x.

The relevance of n-alectics in this context lies in its ability to model the dynamic interaction between these elements, aligning with principles of complementarity and balance present in Andean philosophies such as Yanantin , which resonate with teacher training in a culturally diverse environment [11]. Furthermore, its practical application, inspired by the ethical decision-making model of the base article, allows to quantify these relationships through weights assigned to each subcomponent and neutrosophic distance calculations, providing a robust methodological tool.

3. Result.

This research aimed to analyze the tensions and complementarities inherent in the creation of inclusive digital content for physical education. The goal was to evaluate different digital strategies, not only in terms of their pedagogical effectiveness but also in their ability to navigate the complexities of functional diversity, accessibility, and empathic communication. To this end, three archetypes of digital content were examined, considering the uncertainties, ambiguities, and contradictions that define the interaction between technology and inclusion in dynamic educational contexts.

The results presented below derive from the application of **neutrosophic n -alectics** , an analytical framework that allowed this complex interaction to be modeled by decomposing pedagogical constructs into subcomponents of truth, indeterminacy, and falsity, and quantitatively assessing their relationships. This approach, grounded in a refined neutrosophic logic, facilitated the capture of the multiple dimensions involved, revealing patterns that transcend traditional assessments of digital tools. Thus, this section presents the key findings obtained, highlighting how pedagogical strategies and technological platforms are intertwined, and offering an empirical basis for understanding their impact on inclusion within physical education.

Step 1: Definition of neutrosophic subcomponents

alectic neutrosophy , we classify the factors that influence the ability of digital content to promote inclusion in physical education as follows:

Truth (T) -- Elements that actively promote inclusion:

- **T_1** : **Pedagogical Coherence:** Content aligns with inclusive learning objectives and sound pedagogical principles.
- **T_2** : **Communicative Empathy:** Content resonates with students' diverse experiences, promoting understanding and participation.

Indeterminacy (I) -- Uncertainties and ambiguities:

- **I_T** (Indeterminacy Tending Toward Truth): **Flexibility and Adaptability:** The content can be easily modified by teachers and students to fit specific needs, tending to positive results.
- **I** (Pure Indeterminacy): **Ambiguity in Usability:** The interface can be interpreted in different ways, generating uncertain results for students with different abilities.
- **I_F** (Indeterminacy tends towards falsehood): **Subtle Stigma Risk:** The design, although well-intentioned, could reinforce stereotypes or generate performance anxiety.

Falsehood (F) -- Elements that hinder or harm inclusion:

- **F_1** : **Technical Accessibility Barriers:** The content has technical flaws (e.g., incompatibility with screen readers, lack of subtitles) that exclude users.
- **F2** : **Deficit Focus:** Content focuses on the student's limitations rather than their abilities and potential.

Thus, the scenario of an inclusive digital content can be structured as an n- alectic set :

$$\{\boldsymbol{T}_1, \boldsymbol{T}_2;\ \boldsymbol{I\_T}, \boldsymbol{I}, \boldsymbol{I\_F};\ \boldsymbol{F}_1, \boldsymbol{F}_2\}$$

Step 2: Assign weights to the components

To reflect the relative importance of each dimension in inclusive physical education, and in line with an approach that values both pedagogical soundness and human impact, the following weights are assigned:

Positive elements of inclusion:

- $wT_1 = 0.25$ (Pedagogical Coherence)
- $wT_2 = 0.20$ (Communicative Empathy)

Undetermined factors:

- $w_{IT} = 0.15$ (Flexibility and Adaptability)
- $w_I = 0.10$ (Ambiguity in Usability)
- $w_{IF} = 0.10$ (Risk of Subtle Stigmatization)

Negative or limiting elements:

- $wF_1 = 0.10$ (Technical Accessibility Barriers)
- $wF_2 = 0.10$ (Focus on the Deficit)

Addition= $\mathbf{0.25 + 0.20 + 0.15 + 0.10 + 0.10 + 0.10 + 0.10 = 1.00}$

These values prioritize pedagogical coherence (T_1) and empathy (T_2), recognizing that digital content must be both educationally sound and humanly connective to be truly inclusive.

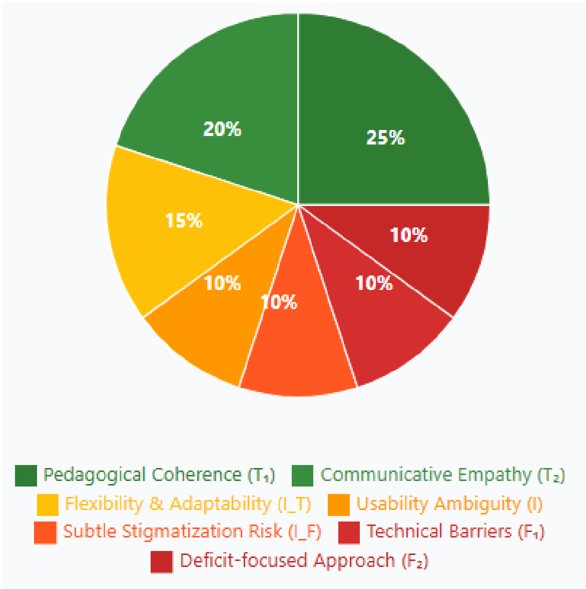

Figure 1: Neutrosophic Component Weight Distribution

Step 3: Identify the ideal profile and evaluate the options

The ideal profile of inclusive digital content combines perfect pedagogical coherence and maximum empathy, with minimal ambiguity and barriers. Using the structure of the ideal neutrosophic solution, we assign the following values:

$$S_{ideal} = (max(Tx), max(ITx), min(Ix), min(IFx), min(Fx))$$

$$\mathrm{I}_{\text{ideal}} = \{T_1 = 1.0, T_2 = 1.0, I_T = 0.2, I = 0.1, I_F = 0.1, F_1 = 0.0, F_1 = 0.0\}$$

Three digital content strategies were evaluated:

Option A: Gamified Application

An app with challenges, points, and leaderboards to motivate physical activity.

- $T_1 = 0.6$ (Pedagogy is subordinated to the game)
- $T_2 = 0.5$ (Competition can reduce empathy)
- $I_T = 0.4$ (Some flexibility in the levels)

- I = 0.6 (The rules of the game may be ambiguous)
- IF = 0.7 (High risk of stigma due to classifications)
- F_1 = 0.4 (Complex interfaces not always accessible)
- F_2 = 0.5 (Focuses on performance and scoring)

Option B: Adaptive Learning Platform

A web-based system that uses AI to personalize activities based on student performance.

- T_1 = 0.9 (High pedagogical coherence)
- T_2 = 0.6 (Personalization is technical, not always empathetic)
- I_T = 0.8 (Very flexible thanks to AI)
- I = 0.5 (The algorithm may be a "black box")
- IF = 0.4 (Can segregate students into learning paths)
- F_1 = 0.3 (Requires high digital competence)
- F_2 = 0.2 (Focuses on individual progress, not deficits)

Option C: Co-created Video Library

A collection of instructional videos created by teachers and students of all abilities, showing multiple ways to complete an activity.

- T_1 = 0.7 (Pedagogically sound but less structured)
- T_2 = 0.9 (Maximum empathy when showing real pairs)
- I_T = 0.6 (Flexible due to the variety of examples)
- I = 0.2 (Communication is direct and clear)
- IF = 0.2 (Low risk of stigma when celebrating diversity)
- F_1 = 0.1 (Simple and accessible video format)
- F_2 = 0.1 (Focuses on capabilities and creativity)

Step 4: Calculating the Neutrosophic Distance

Hamming distance formula (λ = 1) for each option:

$$d_i^+ = \Sigma\Big(w_{Ti}\left|T_{ideal(xi)} - T_{observado(xi)}\right|^\lambda + w_{ITi}\left|IT_{ideal(xi)} - IT_{observado(xi)}\right|^\lambda + w_{Ii}\left|I_{ideal(xi)} - I_{observado(xi)}\right|^\lambda + w_{IFi}\left|IF_{ideal(xi)} - IF_{observado(xi)}\right|^\lambda + w_{Fi}\left|F_{ideal(xi)} - F_{observado(xi)}\right|^\lambda\Big)$$

Option A (Gamified Application):

$$d_A = 0.25|0.6 - 1.0| + 0.20|0.5 - 1.0| + 0.15|0.4 - 0.2| + 0.10|0.6 - 0.1| + 0.10|0.7 - 0.1| + 0.10|0.4 - 0.0| + 0.10|0.5 - 0.0|$$

$$d_A = 0.25(0.4) + 0.20(0.5) + 0.15(0.2) + 0.10(0.5) + 0.10(0.6) + 0.10(0.4) + 0.10(0.5)$$

$$d_A = 0.100000 + 0.100000 + 0.030000 + 0.050000 + 0.060000 + 0.040000 + 0.050000$$

$$\boldsymbol{d_A = 0.430}$$

Option B (Adaptive Platform):

$$d_B = 0.25|0.9 - 1.0| + 0.20|0.6 - 1.0| + 0.15|0.8 - 0.2| + 0.10|0.5 - 0.1| + 0.10|0.4 - 0.1| + 0.10|0.3 - 0.0| + 0.10|0.2 - 0.0|$$

$$d_B = 0.25(0.1) + 0.20(0.4) + 0.15(0.6) + 0.10(0.4) + 0.10(0.3) + 0.10(0.3) + 0.10(0.2)$$

$$d_B = 0.025000 + 0.080000 + 0.090000 + 0.040000 + 0.030000 + 0.030000 + 0.020000$$

$$\boldsymbol{d_B = 0.315}$$

Option C (Co-created Video Library):

$$d_C = 0.25|0.7 - 1.0| + 0.20|0.9 - 1.0| + 0.15|0.6 - 0.2| + 0.10|0.2 - 0.1| + 0.10|0.2 - 0.1| + 0.10|0.1 - 0.0| + 0.10|0.1 - 0.0|$$

$$d_C = 0.25(0.3) + 0.20(0.1) + 0.15(0.4) + 0.10(0.1) + 0.10(0.1) + 0.10(0.1) + 0.10(0.1)$$
$$d_C = 0.075000 + 0.020000 + 0.060000 + 0.010000 + 0.010000 + 0.010000 + 0.010000$$
$$\boldsymbol{d_C = 0.195}$$

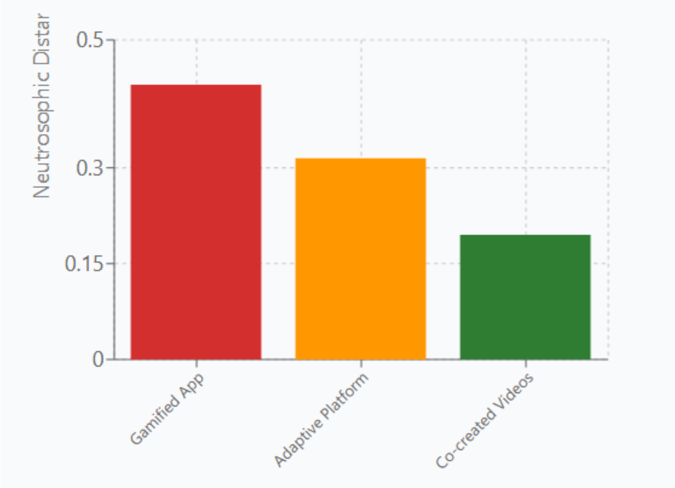

Figure 2 : Neutrosophic Distance from Ideal Inclusion Profile

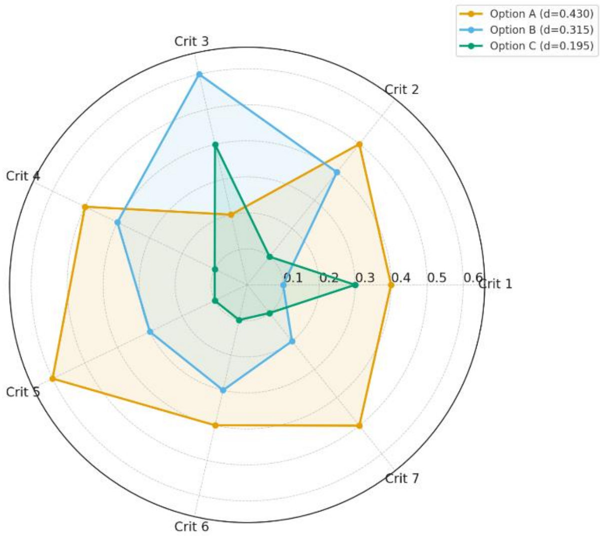

Figure 3. Radar chart comparing Options A (Gamified Application), B (Adaptive Platform), and C (Co-created Video Library)

Option **C (Co-created Video Library)** has the lowest neutrosophic distance (0.195), followed by Option B (0.315) and Option A (0.430). This makes it the digital strategy closest to the ideal of inclusion.

4. Discussion

The results obtained through the neutrosophic n- alectic analysis offer a deep insight into the dynamics of inclusion in digital physical education. The main finding is that the least technologically complex strategy, the **Co-created Video Library (Option C)** , turns out to be the most effective, outperforming the AI platform and the gamified application . This demonstrates that inclusive effectiveness lies not in technical sophistication, but in human-centered design.

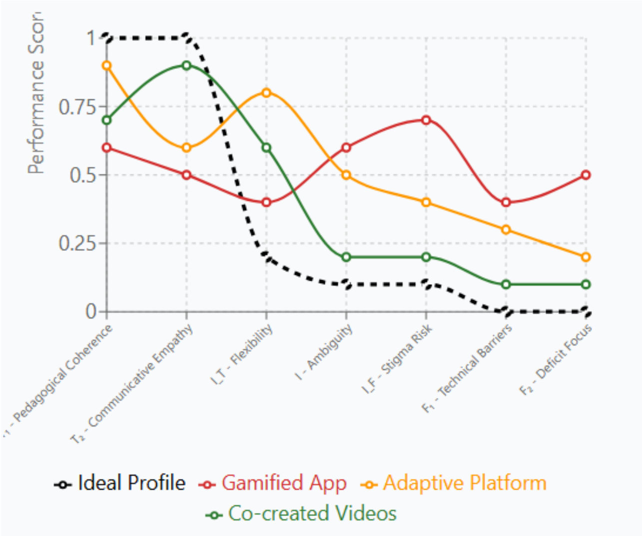

Figure 4: Performance Profile Comparison Across Neutrosophic Components

Alectic approach lies in its ability to deconstruct simplistic dichotomies. Instead of a binary logic (accessible/inaccessible), the model captures a spectrum of **indeterminacy** . The **Gamified Application (Option A)** , for example, fails not only because of its technical barriers, but primarily because of its high indeterminacy tending towards falsity (I_F = 0.7): the risk of the competition generating stigma outweighs its motivational benefits. This is a nuance that conventional analyses often ignore.

The **Adaptive Platform (Option B)** , although pedagogically very sound ($T_1 = 0.9$), shows a greater distance due to weaker communicative empathy ($T_2 = 0.6$) and considerable pure indeterminacy (I = 0.5). The algorithm, although personalizing the content, operates as a "black box," creating a distance between the student and the learning process, and lacks the representation and validation component that co -creation offers.

The success of the **Co-created Video Library (Option C)** is based on its exceptional balance. It achieves high communicative empathy ($T_2 = 0.9$) and almost completely minimizes negative factors ($F_1 = 0.1$, $F_2 = 0.1$) and harmful indeterminacies (I_F = 0.2). Its main theoretical contribution is the validation of the **principle of authentic representation** : seeing peers with diverse abilities perform tasks fosters inclusion more powerfully than any personalization algorithm. This finding aligns with worldviews such as the Andean *Yanantin* (complementary duality), where learning is built in community and through mutual recognition.

This analysis demonstrates that to achieve true digital inclusion, strategies must prioritize **pedagogical coherence** and **communicative empathy** over mere technological innovation. The neutrosophic model provides a quantifiable metric to assess this balance, offering a robust tool for educators and designers to make informed decisions that foster more equitable and participatory learning environments.

5. Conclusion

Ultimately, this study demonstrates that the application of **neutrosophic n- alectics** reveals a fundamental truth about digital inclusion in physical education: the most effective solutions are those that strike a balance between pedagogical structure and human connection. The quantitative analysis determined that the **Co-created Video Library** (d_C = 0.195) was the superior strategy, not because of its technological complexity, but because of its ability to minimize barriers and negative uncertainties while maximizing empathy and representation.

counterintuitive finding that a " low-tech " solution outperforms AI and gamification platforms underscores that technology should be a means to connection, not an end in itself. The neutrosophic methodology was crucial in quantifying qualitative elements such as "stigma risk" or "ambiguity," demonstrating that these factors of uncertainty are crucial to the success of an inclusive initiative.

This work not only validates a digital content model based on co -creation and participation, but also establishes the n- alectic approach as a powerful tool for pedagogical analysis. By overcoming the reductionism of binary assessments, it enables educators and designers to navigate the complexity inherent in human diversity. The implication is clear: to build truly inclusive physical education in the digital age, we must prioritize the design of experiences that are **pedagogically coherent, technically accessible, and, above all, deeply empathetic**.

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