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Neutrosophic Spherical Sets for Aesthetic Experience and Instructional Excellence: An Empirical Study of Dance Education Classes Teaching Quality

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Abstract: Dance training must strike a balance between technical rigor and the development of artistic appreciation and emotional involvement in the ever-changing field of performing arts education. In the context of dance education, this study investigates the relationship between aesthetic experience and instructional excellence. This study assesses the quality of dance instruction across a range of educational modalities using an assessment system that considers elements including instructional clarity, expressive involvement, technical demonstration, feedback quality, inventiveness, and classroom atmosphere. Structured observations, learner feedback, and expert evaluations from six different dance teaching models from therapeutic movement sessions to classical ballet were used to gather data. This study uses Neutrosophic Spherical Sets to solve uncertainty information. We show score and accuracy functions to obtain crisp values.

The findings show that while traditional models performed better in terms of technical accuracy and structural clarity, teaching strategies that prioritize student-centered feedback and expressive flexibility typically produce deeper aesthetic engagement. This empirical study advances a more sophisticated comprehension of how educational approaches influence dance instruction's emotional resonance and learning results. For instructors, program designers, and organizations looking to improve the general caliber and influence of aesthetic education in dance, the research offers evidence-based suggestions.

Keywords: Neutrosophic Spherical Sets; Aesthetic Experience; Instructional Excellence; Dance Teaching Quality.

1. Introduction

One of the key elements influencing the decision-making process is uncertainty. One way to overcome this uncertainty is to use a fuzzy set (FS). FSs were created in 1965 by Lotfi

A. Zadeh as an advancement of conventional set theory[1]. The purpose of FSs is to more accurately and flexibly describe and handle uncertainty, particularly in circumstances when conventional binary logic might not be appropriate.

Classical sets, FSs, and IFSs that seek to handle ambiguous, partial, and contradictory facts are extended by the Neutrosophic Set (NS) theory. Smarandach [2], [3] provided this method, which allowed for a more sophisticated representation of uncertain particulars and addressed indeterminacy using a new kind of set.

1.1 Literature Review

Bannon et al. [4] outlined the range of new problems and worries that have surfaced from a continuous qualitative investigation of dance instruction. Reviewing the nature of aesthetic experiences in dance education was the study's primary goal to advance a cogent understanding of dance education as a unique and humanizing pedagogy. The growth of the person via heightened aesthetic awareness is at the heart of this method, which provides chances to improve reasoning abilities with a wider range of perceptions and concepts in an exploratory environment. This is supported by an analysis of the aesthetic notion and its applicability to dance as part of an arts or humanities education profile. The conversation then moves on to examine the teaching and learning processes associated with artistically relevant dance education, as well as future directions for dance education research via dance production, performance, and appreciation. To explore the problems identified by the continuing research study, the paper's conclusion calls for the adoption of a comprehensive approach to qualitative research technique.

Christensen et al. [5] draw attention to both the opportunities and difficulties presented by empirical aesthetics research on dance enjoyment. Up until now, behavioral and neuroimaging methods have mostly concentrated on seeing and identifying the movement and structure of the human body. However, only a few studies have specifically used the fundamental studies of the perceptual, emotional, and cognitive processes involved in movement observation, along with their neural correlations, as a basis for comprehending the aesthetic experience evoked by watching a dance. In the context of empirical aesthetics, they give a summary of these investigations and identify directions for further investigation into dance enjoyment. They also highlight certain conceptual and methodological concerns, such as dance theory scholarship and humanistic approaches to dance practice, that are to be considered when doing empirical research on the aesthetic enjoyment of dance.

With an emphasis on the moving body, Maivorsdotter et al. [6] examined aesthetic experience as a component of embodied learning in this essay. John Dewey's writings serve as the primary foundation for our theoretical framework. They outlined our comprehension of key ideas and discussed how they relate to physical education (PE). They applied the theoretical framework to an empirical investigation that draws inspiration from the pragmatic tradition. The purpose is to investigate the emotions of physical education students (PETE students) during a game of ball and the relationship between these emotions and the movement activity. 16 PETE students' tales

and observations from two ball game classes served as the primary source of empirical data. A categorical content analysis was performed on each story. Following an analysis of the empirical data, four groups based on two-word pairs—familiar or unknown, and happy or displeased—arose. Moving exercises in physical education are frequently thought of as technical or instrumental, as we argue in the article's discussion part. However, by approaching embodied learning from an aesthetic standpoint, we may highlight other aspects of ball game engagement and move beyond that initial impression. It might be a significant change to focus on learning related to emotions rather than just performance.

2. Preliminaries

Definition 1[7]

The neutrosophic set can be defined by three membership function such as truth, indeterminacy, and falsity degrees such as:

$$S = \left\{\left(s, \left(T_s(x), I_s(x), F_s(x)\right)\right) : s \in S\right\}$$

$$0 \leq T_s(x) + I_s(x) + F_s(x) \leq 3$$

Definition 2

Spherical fuzzy set (SFS) can be defined as:

$$S = \left(\left(s, T_s(x), I_s(x), F_s(x)\right) | s \in S\right)$$

$$0 \leq T_s^2(x) + I_s^2\ (x) + F_s^2(x) \leq 1$$

Definition 3

Neutrosophic spherical set (NSS) can be defined as:

$$S = \left\{\left(T_s(x), I_s(x), F_s(x)\right) | s \in S\right\}$$

$$T_s(x): S \to [0,1], I_s(x): S \to [0,1], F_s(x): S \to [0,1]$$

$$0 \leq T_s^2(x) + I_s^2(x) + F_s^2(x) \leq \sqrt{3}$$

$T_s(x), I_s(x), F_s(x)$ refer to membership, non-membership, and hesitant membership.

Definition 4

This definition shows the operations of NSS such as:

$$s_1 \oplus s_2 = \left\{ \begin{array}{l} \left(T_{s_1}^2(x) + T_{s_2}^2(x) - T_{s_1}^2(x) T_{s_2}^2(x)\right)^{0.5}, \\ \left(I_{s_1}^2(x) + I_{s_2}^2(x) - I_{s_1}^2(x) I_{s_2}^2(x)\right)^{0.5}, \\ \left(F_{s_1}^2(x) + F_{s_2}^2(x) - F_{s_1}^2(x) F_{s_2}^2(x)\right)^{0.5} \end{array} \right\}$$

$$s_1 \otimes s_2 = \left\{ \begin{matrix} \left(T_{s_1}^2(x) T_{s_2}^2(x)\right), \\ \left(I_{s_1}^2(x) I_{s_2}^2(x)\right), \\ \left(F_{s_1}^2(x) F_{s_2}^2(x)\right) \end{matrix} \right\}$$

$$\varphi s_1 = \left\{ \begin{matrix} \left(1 - \left(1 - T_{s_1}^2(x)\right)^{\varphi}\right)^{0.5}, \\ \left(1 - \left(1 - I_{s_1}^2(x)\right)^{\varphi}\right)^{0.5}, \\ \left(1 - \left(1 - F_{s_1}^2(x)\right)^{\varphi}\right)^{0.5} \end{matrix} \right\}$$

$$s_1^{\varphi} = \left\{ T_{s_1}^{\varphi}(x), I_{s_1}^{\varphi}(x), F_{s_1}^{\varphi}(x) \right\}$$

Definition 5

For two NSS such as: $s_1 = \left(T_{s_1}(x), I_{s_1}(x), F_{s_1}(x)\right)$ *and* $s_2 = \left(T_{s_2}(x), I_{s_2}(x), F_{s_2}(x)\right)$

$$s_1 \oplus s_2 = s_2 \oplus s_1$$

$$s_1 \otimes s_2 = s_2 \otimes s_2$$

Definition 6

The combined of NSS can be obtained such as:

$$NSS = \left\{ \begin{matrix} \left[1 - \prod_{j=1}^{n} T_s^{k_j}(x)\right]^{0.5}, \\ \left[\prod_{j=1}^{n} I_s^{k_j}(x)\right]^{0.5}, \\ \left[\prod_{j=1}^{n} F_s^{k_j}(x)\right]^{0.5} \end{matrix} \right\}$$

Definition 7

The score and accuracy function of NSS can be obtained such as:

$$H(s) = \left\{ \begin{matrix} \left(T_{ij}(x) - F_{ij}(x)\right)^2 - \\ \left(I_{ij}(x) - F_{ij}(x)\right)^2 \end{matrix} \right\}$$

$$A(s) = \{T_s^2(x) + I_s^2(x) + F_s^2(x)\}$$

3. Results

This section shows the results for Aesthetic Experience and Instructional Excellence: An Empirical Study of Dance Teaching Quality. We use six criteria and six alternatives as shown in Figure 1.

In the first, four experts evaluate the criteria and alternatives using NSS as shown in Table 1.

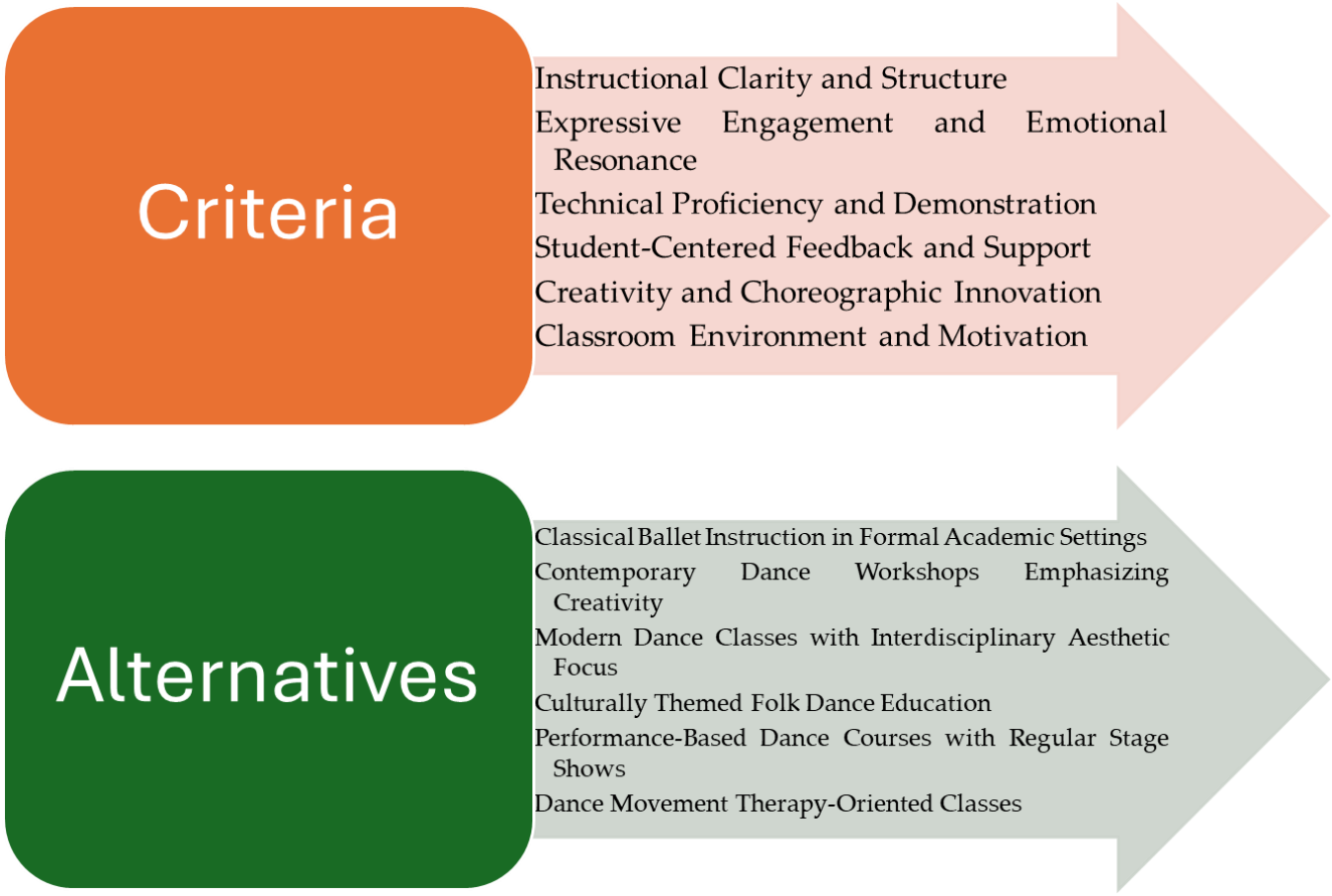

Figure 1. Criteria for Aesthetic Experience and Instructional Excellence: An Empirical Study of Dance Teaching Quality.

Table 1. NSS numbers.

	$NSSC_1$	$NSSC_2$	$NSSC_3$	$NSSC_4$	$NSSC_5$	$NSSC_6$
$NSSA_1$	(0.9, 0.6, 0.2)	(0.8, 0.7, 0.2)	(0.7,0.6, 0.5)	(0.6, 0.7, 0.4)	(0.5, 0.8, 0.4)	(0.4, 0.6, 0.7)
$NSSA_2$	(0.9, 0.6, 0.2)	(0.5, 0.7, 0.6)	(0.4, 0.6, 0.7)	(0.5, 0.8, 0.4)	(0.6, 0.7, 0.4)	(0.7,0.6, 0.5)
$NSSA_3$	(0.8, 0.7, 0.2)	(0.7,0.6, 0.5)	(0.6, 0.7, 0.4)	(0.5, 0.8, 0.4)	(0.4, 0.6, 0.7)	(0.8, 0.7, 0.2)
$NSSA_4$	(0.6, 0.7, 0.4)	(0.7,0.6, 0.5)	(0.8, 0.7, 0.2)	(0.9, 0.6, 0.2)	(0.5, 0.7, 0.6)	(0.9, 0.6, 0.2)
$NSSA_5$	(0.5, 0.8, 0.4)	(0.6, 0.7, 0.4)	(0.7,0.6, 0.5)	(0.8, 0.7, 0.2)	(0.9, 0.6, 0.2)	(0.5, 0.7, 0.6)
$NSSA_6$	(0.5, 0.8, 0.4)	(0.5, 0.8, 0.4)	(0.6, 0.7, 0.4)	(0.5, 0.8, 0.4)	(0.5, 0.7, 0.6)	(0.4, 0.6, 0.7)
	$NSSC_1$	$NSSC_2$	$NSSC_3$	$NSSC_4$	$NSSC_5$	$NSSC_6$
$NSSA_1$	(0.6, 0.7, 0.4)	(0.8, 0.7, 0.2)	(0.7,0.6, 0.5)	(0.6, 0.7, 0.4)	(0.5, 0.8, 0.4)	(0.4, 0.6, 0.7)
$NSSA_2$	(0.7,0.6, 0.5)	(0.5, 0.7, 0.6)	(0.4, 0.6, 0.7)	(0.6, 0.7, 0.4)	(0.6, 0.7, 0.4)	(0.7,0.6, 0.5)
$NSSA_3$	(0.8, 0.7, 0.2)	(0.7,0.6, 0.5)	(0.6, 0.7, 0.4)	(0.7,0.6, 0.5)	(0.6, 0.7, 0.4)	(0.8, 0.7, 0.2)
$NSSA_4$	(0.9, 0.6, 0.2)	(0.7,0.6, 0.5)	(0.8, 0.7, 0.2)	(0.8, 0.7, 0.2)	(0.7,0.6, 0.5)	(0.9, 0.6, 0.2)
$NSSA_5$	(0.5, 0.7, 0.6)	(0.6, 0.7, 0.4)	(0.7,0.6, 0.5)	(0.9, 0.6, 0.2)	(0.8, 0.7, 0.2)	(0.5, 0.7, 0.6)
$NSSA_6$	(0.6, 0.7, 0.4)	(0.6, 0.7, 0.4)	(0.6, 0.7, 0.4)	(0.5, 0.7, 0.6)	(0.9, 0.6, 0.2)	(0.6, 0.7, 0.4)
	$NSSC_1$	$NSSC_2$	$NSSC_3$	$NSSC_4$	$NSSC_5$	$NSSC_6$

$NSSA_1$	(0.9, 0.6, 0.2)	(0.8, 0.7, 0.2)	(0.7,0.6, 0.5)	(0.6, 0.7, 0.4)	(0.5, 0.8, 0.4)	(0.4, 0.6, 0.7)
$NSSA_2$	(0.5, 0.7, 0.6)	(0.5, 0.7, 0.6)	(0.4, 0.6, 0.7)	(0.5, 0.8, 0.4)	(0.6, 0.7, 0.4)	(0.7,0.6, 0.5)
$NSSA_3$	(0.4, 0.6, 0.7)	(0.9, 0.6, 0.2)	(0.6, 0.7, 0.4)	(0.5, 0.8, 0.4)	(0.4, 0.6, 0.7)	(0.8, 0.7, 0.2)
$NSSA_4$	(0.5, 0.8, 0.4)	(0.5, 0.7, 0.6)	(0.9, 0.6, 0.2)	(0.9, 0.6, 0.2)	(0.9, 0.6, 0.2)	(0.9, 0.6, 0.2)
$NSSA_5$	(0.6, 0.7, 0.4)	(0.4, 0.6, 0.7)	(0.5, 0.7, 0.6)	(0.9, 0.6, 0.2)	(0.5, 0.7, 0.6)	(0.9, 0.6, 0.2)
$NSSA_6$	(0.7,0.6, 0.5)	(0.5, 0.8, 0.4)	(0.4, 0.6, 0.7)	(0.5, 0.7, 0.6)	(0.4, 0.6, 0.7)	(0.5, 0.7, 0.6)
	$NSSC_1$	$NSSC_2$	$NSSC_3$	$NSSC_4$	$NSSC_5$	$NSSC_6$
$NSSA_1$	(0.4, 0.6, 0.7)	(0.5, 0.7, 0.6)	(0.8, 0.7, 0.2)	(0.5, 0.7, 0.6)	(0.5, 0.8, 0.4)	(0.6, 0.7, 0.4)
$NSSA_2$	(0.5, 0.7, 0.6)	(0.9, 0.6, 0.2)	(0.9, 0.6, 0.2)	(0.9, 0.6, 0.2)	(0.6, 0.7, 0.4)	(0.7,0.6, 0.5)
$NSSA_3$	(0.5, 0.7, 0.6)	(0.8, 0.7, 0.2)	(0.5, 0.7, 0.6)	(0.8, 0.7, 0.2)	(0.7,0.6, 0.5)	(0.8, 0.7, 0.2)
$NSSA_4$	(0.8, 0.7, 0.2)	(0.8, 0.7, 0.2)	(0.8, 0.7, 0.2)	(0.5, 0.8, 0.4)	(0.7,0.6, 0.5)	(0.8, 0.7, 0.2)
$NSSA_5$	(0.9, 0.6, 0.2)	(0.9, 0.6, 0.2)	(0.9, 0.6, 0.2)	(0.9, 0.6, 0.2)	(0.8, 0.7, 0.2)	(0.9, 0.6, 0.2)
$NSSA_6$	(0.5, 0.7, 0.6)	(0.5, 0.7, 0.6)	(0.5, 0.7, 0.6)	(0.8, 0.7, 0.2)	(0.9, 0.6, 0.2)	(0.5, 0.7, 0.6)

We use the NSS combined operator to combine different matrices as shown in Figures 2-7.

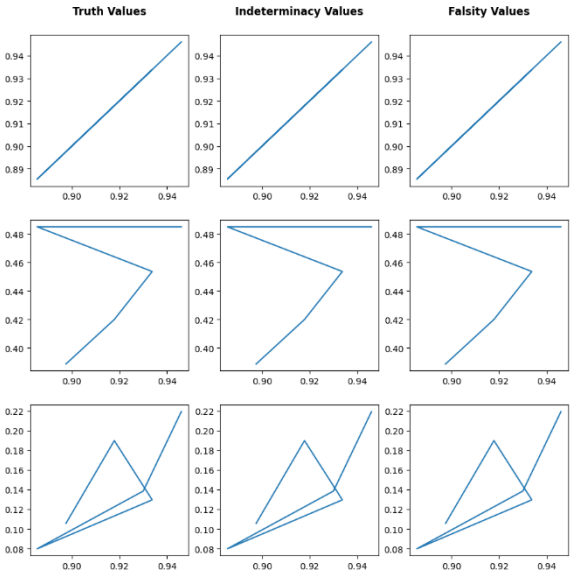

Figure 2. Combined matrix for NSSC1.

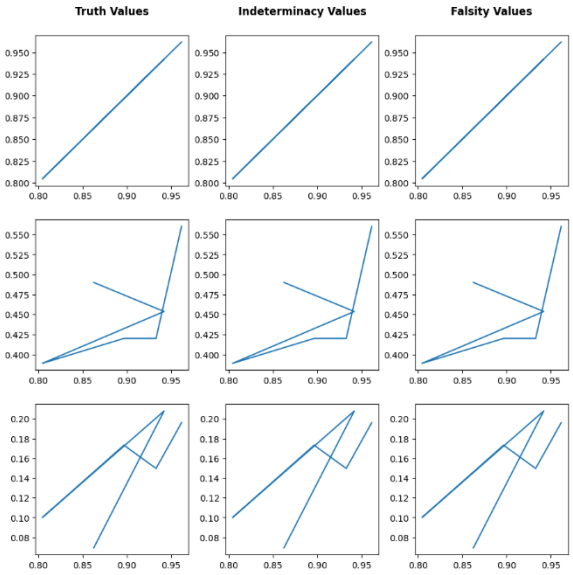

Figure 3. Combined matrix for NSSC2.

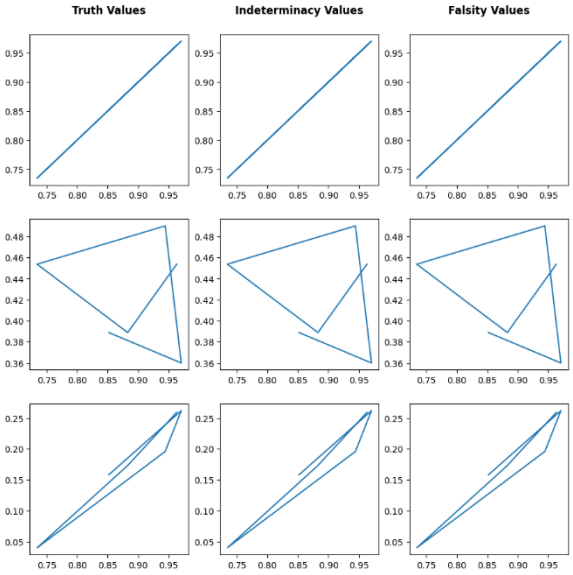

Figure 4. Combined matrix for NSSC3.

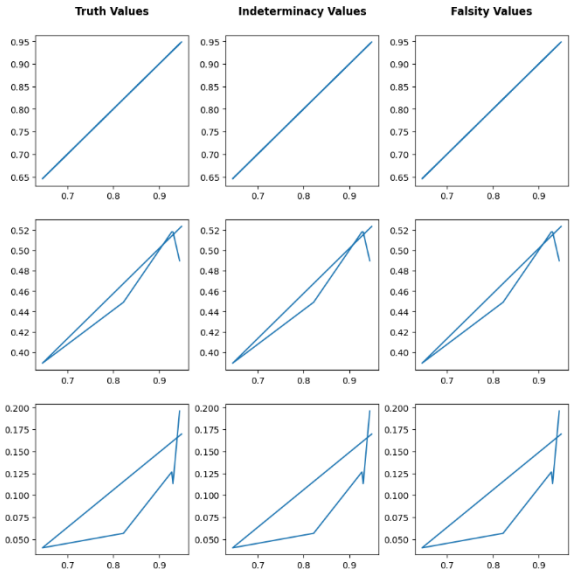

Figure 5. Combined matrix for NSSC4.

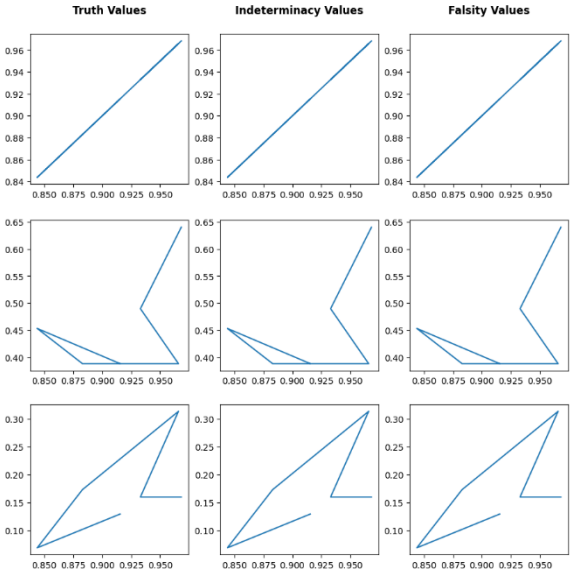

Figure 6. Combined matrix for NSSC5.

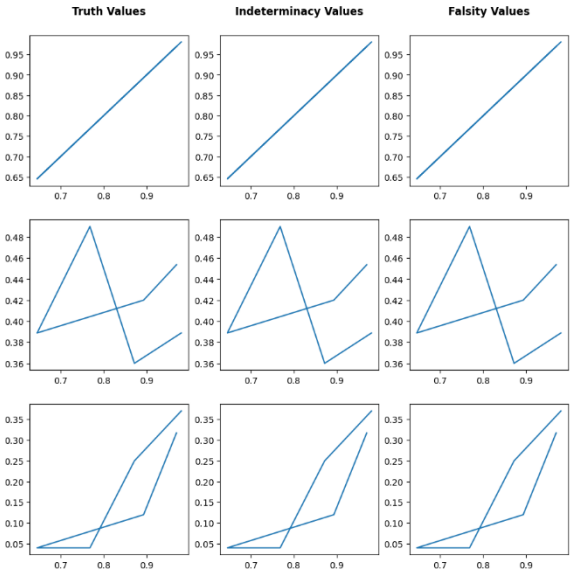

Figure 7. Combined matrix for NSSC6.

Then we use the Hamming distance to obtain each value of alternative. The alternatives are ranked as shown in Figure 8.

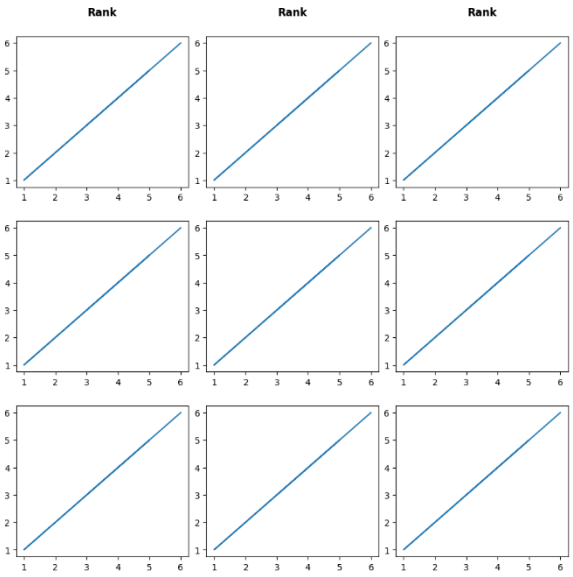

Figure 8. Ranks of alternatives.

4. Conclusions

This study emphasizes how important aesthetic experience is in determining how successful dance instruction is. The results emphasize that the capacity to support emotional expression, creative flexibility, and comprehensive student participation are just as important components of

instructional effectiveness as technical proficiency or methodical delivery. The most successful teaching strategies in promoting both creative development and student pleasure were those that struck a balance between technique and expressive movement, such as contemporary and transdisciplinary programs. This study used the Neutrosophic Spherical Sets (NSSs). Four experts evaluate the criteria and alternatives using the NSSs. Hamming distance is used in this study.

Additionally, encouraging classroom settings and tailored comments were shown to be essential elements of successful dance education. Future educational frameworks should incorporate emotional intelligence, cultural relevance, and creativity into the assessment of instructional quality because aesthetic appreciation is subjective and multifaceted by nature. This study establishes the groundwork for further research on experiential learning in performing arts fields and provides useful implications for reconsidering dance teaching.

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