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Analyzing the Performance of Ideological and Political Education in Universities: A Neutrosophic Approach to Handling Truth, Indeterminacy, and Falsehood in Students' Responses

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Abstract

This paper presents a new way to evaluate ideological and political education (IPE) in universities using neutrosophic logic. Unlike traditional surveys that only show if students agree or disagree, this method looks deeper by also measuring how unsure students feel. Each answer is described using three values: truth (agreement), indeterminacy (uncertainty), and falsehood (disagreement). The model was tested in two different universities using a questionnaire that covered three areas: beliefs about national values, critical thinking, and civic behavior. The results showed that most students agreed with ideological ideas, but many were unsure when it came to critical thinking. A new tool called the Ideological Coherence Matrix (ICM), was also used to check if students were consistent in their views across different topics. Results showed that while many students were consistent, some had mixed or conflicting opinions. This highlights the need for better ways to connect ideas taught in class with how students actually think. The framework gives teachers and decision-makers a better understanding of student beliefs and helps improve how these topics are taught. We added another case study with ten criteria and six alternatives. This case study, we use the single valued neutrosophic set to overcome the uncertainty information. The single valued neutrosophic set is used with the EDAS method to rank the alternatives.

Keywords: Single valued Neutrosophic Sets; Ideological and political education, neutrosophic logic, educational assessment, internal consistency, uncertainty, student feedback, truth-indeterminacy-falsehood, higher education evaluation

1. Introduction

In the evolving landscape of higher education, IPE has emerged as a key pillar for shaping students' values, civic identity, and ethical awareness. In contexts such as China and other ideologically guided societies, IPE is not treated as an elective academic exercise but as a vehicle for reinforcing social cohesion and political alignment. Despite its strategic intent, a persistent challenge remains: how can universities meaningfully assess the effectiveness of such an education, particularly when its outcomes are inherently cognitive, affective, and often ambiguous?

Conventional assessment tools such as Likert scales or binary-choice surveys offer limited insight. These instruments are ill-suited for capturing the complexity of ideological learning, where students may partially agree with ideological content, express uncertainty, or even contradict themselves across different thematic areas. A student might, for example, express alignment with national values while remaining unsure about political participation or even reject specific ideological policies despite general agreement with the overarching framework. Traditional tools mask such internal inconsistencies and offer, at best, a partial view of student cognition.

To address this problem, the current study proposes the application of neutrosophic logic, a triadic reasoning framework introduced by Smarandache [4], which evaluates propositions through the simultaneous dimensions of truth, indeterminacy, and falsehood. Unlike binary or even fuzzy logic, neutrosophy accommodates contradictions and cognitive dissonance by design making it ideally suited for analyzing ideological perception. In this study, neutrosophic principles are used to create a new evaluative model for IPE, offering a more flexible, accurate, and nuanced representation of student responses.

Beyond measuring effectiveness, the research also introduces a novel construct: the ICM. This matrix assesses the internal consistency of students' ideological positions across multiple educational dimensions revealing whether their beliefs are integrated or fragmented. Together, these two contributions the neutrosophic scoring model and the ICM offer a fundamentally new approach to understanding how students engage with ideological education in universities.

2. Literature Review

Researchers' work on IPE has highlighted both its significance and its challenges. In their study on civic development, Chen and Wang [1] found that the impact of ideological education in Chinese universities is strongly influenced by students' prior beliefs and institutional culture. Zhao et al. [2], taking a more critical view, observed a misalignment between ideological curricula and students' real-life experiences, which often results in superficial acceptance or passive resistance.

The limitations of current assessment methodologies have also been well-documented. Brown [3] argued that traditional evaluation models fail to address the emotional complexity and cognitive ambiguity inherent in value-laden content. Particularly in politically charged topics, students' responses are often layered expressing partial agreement, conditional doubt, or outright rejection all within the same thematic field. Yet, common evaluation tools reduce this complexity into singular scalar values, thereby losing interpretive richness.

Among these challenges, neutrosophic logic offers a promising alternative. Developed by Smarandache [4], neutrosophy introduces a triadic evaluation mechanism that allows responses to be simultaneously true, indeterminate, and false. It has been applied in various technical domains such as artificial intelligence [5][7], healthcare, and decision-making [6], where uncertainty and contradiction are core features of the system being studied.

In the field of education, the use of neutrosophic models remains limited but growing. Ni et al [5] applied neutrosophic sets to assess teaching quality in universities, reporting more granular diagnostic insights compared to traditional metrics. Alqaralleh and Alsmadi [9] proposed a neutrosophic risk model for higher education project evaluation, demonstrating its usefulness in strategic planning. However, none of these studies have focused specifically on ideological and political education.

This lack underscores the unique contribution of the present research. By applying neutrosophic logic to IPE and introducing the new ICM construct this paper advances both educational theory and the practical methodologies available for measuring ideological learning outcomes.

3. A Neutrosophic Framework for Evaluating IPE

This section presents a new framework that applies neutrosophic logic to the evaluation of IPE. Unlike traditional methods that rely on binary or scalar responses such as "agree" or "disagree," this model captures each student's perspective using a three-part expression: N = (T, I, F)

Where:

T: degree of agreement (truth)
I: degree of uncertainty (indeterminacy)
F: degree of disagreement (falsehood)

This structure allows for a more accurate understanding of student thinking by showing not only what they believe, but also how confident or uncertain they are about that belief. It is important to note that the three values T, I, and F do not necessarily sum up to 1. This flexibility allows students to naturally express their opinions without forced constraints, capturing the complexity and potential contradictions inherent in human thought processes.

The overall effectiveness of given dimensions, such as ideological alignment, critical thinking, or civic behavior, is calculated using Equation (1):

$$E = \sum_{i=1}^{n}(wi * (Ti - Fi - \alpha Ii)) \quad (1)$$

Where:

wi: Importance weight for item i
α: penalty coefficient for indeterminacy (typically set to 0.5)

n: number of questions in the dimension

In this equation, agreement increases the effectiveness score, disagreement lowers it, and uncertainty reduces it partially depending on the weight of α. This reflects the idea that ambiguity is not always negative, it may reflect open-mindedness or reflection but still needs to be accounted for. The penalty factor α was set to 0.5 based on previous studies and practical considerations. This value provides a balanced approach, neither overemphasizing nor minimizing the impact of uncertainty (indeterminacy). Researchers may adjust this factor depending on their specific educational context or research needs to reflect different tolerance levels for uncertainty.

The instrument used in this framework consists of 10 items, grouped into three thematic areas:

1. Ideological Alignment covers beliefs about national values and political systems
2. Critical Thinking includes reflection, questioning, and analysis of ideas
3. Civic Behavior, focuses on participation in public life and a sense of responsibility

Students respond to each item by assigning values between 0 and 1 for T, I, and F. This structure respects the complexity of human thought and avoids the limitations of forced-choice responses.

The neutrosophic questionnaire used in this study was carefully constructed to assess three core dimensions: ideological alignment (4 items), critical thinking (3 items), and civic behavior (3 items). Each item was phrased as a clear, specific statement that reflects a real-world educational or civic scenario. For example:

1) *"I believe the values promoted in ideological education align with my personal beliefs."*
2) *"I feel confident analyzing political arguments presented in class."*
3) *"I actively participate in civic or community-related initiatives encouraged by the university."*

Participants were asked to rate each item using three separate values between 0 and 1, corresponding to T: How much do they agree with the statement. I, How unsure or conflicted they feel about it, F, How much do they disagree with it.

To help students understand this format, especially if neutrosophic thinking was unfamiliar brief examples were provided during the introduction to the survey. For instance, a model scenario illustrated how someone could partially agree with T = 0.6, feel some uncertainty I = 0.3, and slightly disagree with F = 0.1 with a complex statement. Students were told that T, I, and F do not need to add up to 1, allowing for natural contradictions or ambiguity in their thinking.

This design ensures that the tool captures the depth of cognitive response, rather than forcing artificial clarity. Additionally, the items were reviewed by two education specialists to ensure they align with the intended constructs and avoid leading language.

3.1 Introducing the Ideological Coherence Matrix

Building on individual comparisons, the framework expands to assess overall ideological coherence across all related themes. For each student, ICM values are computed between every pair of the three core dimensions: ideological alignment, critical thinking, and civic behavior. These include:

1. Ideological Alignment ↔ Critical Thinking
2. Critical Thinking ↔ Civic Behavior
3. Ideological Alignment ↔ Civic Behavior

Each pair is assessed for coherence using Equation (2):

$$ICM_{xy} = |T_x - T_y| + |I_x - I_y| + |F_x - F_y| \quad (2)$$

Where:

$Tx, Ix, and Fx$ are the truth, indeterminacy, and falsehood values for dimensions x,
$Ty, Iy, and Fy$ are the corresponding values for dimension y,
$ICM_{x,y}$ is a scalar that reflects the internal divergence between the two ideological dimensions.

Once all pairwise scores are calculated, an average ICM value is derived per student. This average reflects the student's overall ideological stability across the different domains. A lower average score indicates greater internal harmony, while a higher value suggests that the student may hold contradictory or fragmented beliefs across topics.

This process enables a deeper level of interpretation. Rather than only measuring what students think, we begin to understand how consistently they think. A student who scores high on ideological support but low on civic behavior, for example, may be internally conflicted or struggling to connect belief with action. These discrepancies often go unnoticed in conventional assessments.

By identifying coherent, ambivalent, and contradictory thinkers, educators can take a more personalized approach. Students showing high internal alignment may be ready for more advanced content, while those with contradictions might benefit from open discussion, reflective tasks, or support bridging theory and practice.

This framework not only adds depth to the evaluation process but also opens a new pathway for cognitive diagnostics in ideological education—an area previously overlooked in research and practice.

3.2 Single Valued Neutrosophic EDAS method (SVN-EDAS)

This section shows the operations of the single valued neutrosophic numbers (SVNNs) [10-12] with steps of the EDAS method to rank the alternatives.

We can define the SVNS such as:

$$R = \{(T_R(D_i), I_R(D_i), F_R(D_i))|d_i \in D\} \quad (3)$$

We can define the operations of the SVNNs such as:

$R_1 = t_{R_1}(D), i_{R_1}(D), f_{R_1}(D)$ and $R_2 = t_{R_2}(D), i_{R_3}(D), f_{R_4}(D)$

$$R_1^c = \left(f_{R_1}(D), 1 - i_{R_1}(D), t_{R_1}(D)\right) \quad (4)$$

$$R_1 \cup R_2 = \left(\max\{t_{R_1}(D), t_{R_2}(D)\}, \min\{i_{R_1}(D), i_{R_2}(D)\}, \min\{f_{R_1}(D), f_{R_2}(D)\}\right) \quad (5)$$

$$R_1 \cap R_2 = \left(\min\{t_{R_1}(D), t_{R_2}(D)\}, \max\{i_{R_1}(D), i_{R_2}(D)\}, \max\{f_{R_1}(D), f_{R_2}(D)\}\right) \quad (6)$$

$$R_1 + R_2 = \begin{pmatrix} t_{R_1}(D) + t_{R_2}(D) - t_{R_1}(D)t_{R_2}(D), \\ i_{R_1}(D)i_{R_2}(D), \\ f_{R_1}(D)f_{R_2}(D) \end{pmatrix} \quad (7)$$

$$R_1 R_2 = \begin{pmatrix} t_{R_1}(D)t_{R_2}(D), \\ i_{R_1}(D) + i_{R_2}(D) - i_{R_1}(D)i_{R_2}(D), \\ f_{R_1}(D) + f_{R_2}(D) - f_{R_1}(D)f_{R_2}(D) \end{pmatrix} \quad (8)$$

$$QR_1 = \left(1 - \left(1 - t_{R_1}(D)\right)^Q, \left(i_{R_1}(D)\right)^Q, \left(f_{R_1}(D)\right)^Q\right) \quad (9)$$

$$R_1^Q = \left(\left(t_{R_1}(D)\right)^Q, 1 - \left(1 - i_{R_1}(D)\right)^Q, 1 - \left(1 - f_{R_1}(D)\right)^Q\right) \quad (10)$$

3.3 EDAS Method

We show the steps of the EDAS method to rank the alternatives [13-14]. Experts create the decision matrix using the SVNNs. These numbers are converted to crisp values and combined to a single matrix. We compute the criteria weights using the average approach.

The mean solution is determined

$$H_j = \frac{\sum_{i=1}^{m} y_{ij}}{m} \quad (11)$$

The distances are computed for beneficial and non-beneficial criteria such as:

$$a_{ij} = \frac{\max\left(0, \left(y_{ij} - H_j\right)\right)}{H_j} \quad (12)$$

$$b_{ij} = \frac{\max\left(0, \left(H_j - y_{ij}\right)\right)}{H_j} \quad (13)$$

$$a_{ij} = \frac{\max\left(0, \left(H_j - y_{ij}\right)\right)}{H_j} \quad (14)$$

$$b_{ij} = \frac{\max\left(0, \left(y_{ij} - H_j\right)\right)}{H_j} \quad (15)$$

Determine the weighted matrix

$$E_i = \sum_{j=1}^{n} a_{ij} w_j \quad (16)$$

$$F_i = \sum_{j=1}^{n} b_{ij} w_j \quad (17)$$

Determine the weighted normalized matrix

$$g_i = \frac{E_i}{\max(E_i)} \quad (18)$$

$$k_i = \frac{F_i}{\max(F_i)} \quad (19)$$

Determine the appraisal score

$$S_i = 0.5 * (g_i + k_i) \tag{20}$$

4. Case Studies

The study involved two university samples with a total of 550 participants. At University A, 250 undergraduate students were selected from the Departments of Social Sciences, Educational Studies, and Political Philosophy. While this group reflects disciplines where ideological and political education is emphasized, its limited disciplinary scope may affect the generalizability of the results. To address this, a broader sample of 300 students was collected at University B, including students from Law, Media, and Political Science.

Sampling in both universities followed a non-probabilistic, purposive strategy. Participants were selected based on their completion of at least two required IPE courses and their availability during the survey window. While this method ensured that respondents had relevant exposure to the subject matter, it may introduce selection bias, which is acknowledged as a limitation.

Demographic data was also collected to better understand the context behind student responses. The combined sample included:

a. Gender: 58% female, 42% male
b. Age range: 18–24 years (mean = 20.3, SD = 1.5)
c. Academic year: First to fourth-year students, with most in their second or third-year
d. Background: The majority of students came from urban areas, with diverse socioeconomic backgrounds

Although demographic variables were not the main focus of this study, they provide valuable context for interpreting the results and may be considered in future expansions of the model.

4.1. Case Study 1: Application at University A

University A is a large public institution in East Asia where ideological and political education is fully embedded in the undergraduate curriculum. For this pilot study, a total of 250 undergraduate students were surveyed. All participants were enrolled in social sciences, education, or political philosophy programs and had completed at least two mandatory courses in ideological education.

To assess their perceptions, a neutrosophic questionnaire was administered digitally and anonymously. Each of the ten statements asked students to assign a value from 0 to 1 for each of the three neutrosophic components: T, I, and F. These statements were organized into three thematic dimensions:

1. Ideological Alignment (4 items)
2. Critical Thinking (3 items)
3. Civic Behavior (3 items)

Table 1: Mean Neutrosophic Scores by Dimension (University A)

Dimension	Mean T	Mean I	Mean F
Ideological Alignment	0.68	0.20	0.12

Critical Thinking	0.53	0.35	0.12
Civic Behavior	0.70	0.18	0.12

Table 1 shows the average scores for truth, indeterminacy, and falsehood across the three dimensions. These values give a clear overview of how students cognitively engaged with each theme. The findings show a high level of acceptance in both ideological alignment and civic behavior, with T scores ranging from 0.68 to 0.70. However, in the critical thinking dimension, the indeterminacy score rises to 0.35, indicating noticeable uncertainty. This suggests that students may not have a clear sense of whether ideological education effectively supports their analytical development. Falsehood scores are consistently low across all dimensions, remaining at 0.12, which indicates limited rejection of the course content. Figure 1 illustrates how the three neutrosophic components are distributed across the ideological dimensions. It visually confirms the strong support for ideological and civic content, while also highlighting the higher degree of ambiguity associated with critical thinking. This suggests that, although students generally accept ideological messaging, they are less certain about its impact on deeper cognitive skills.

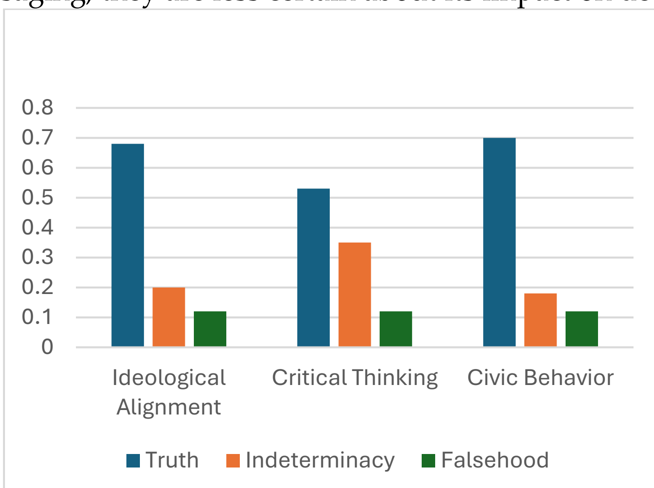

Figure 1: Neutrosophic Scores per Dimension

4.2. Ideological Coherence Matrix (ICM): Internal Alignment Analysis

While traditional models can assess performance in each dimension, they cannot reveal whether a student's ideological stance is self-consistent across multiple themes. The ICM fills that gap.

Consider the following neutrosophic responses from Student A:

Dimension 1 (Ideological Alignment): T_1=0.70, I_1=0.20, F_1=0. Dimension 2 (Civic Behavior): T_2=0.50, I_2=0.35, F_2=0.15. Using eq (2):

$ICM_{1,2}=|0.70-0.50|+|0.20-0.35|+|0.10-0.15|=0.20+0.15+0.05=0.40$

This result indicates moderate inconsistency between the students' agreement with ideological principles and their practical civic behavior. The student agrees in theory but hesitates or diverges in the application.

4.2.1 Coherence Classification

In this part, we show how students are grouped based on how consistent their answers are across different parts of ideological education. By looking at their average ICM scores, we can tell if a student's views are mostly consistent, somewhat mixed, or clearly conflicting. Table 2 shows this classification, dividing students into three groups: high, moderate, and low coherence. This helps us understand how stable or scattered their opinions are across the topics they were asked about.

Table 2: Student Distribution by ICM Level (University A)

Coherence Level	ICM Range	Percentage of Students
High Coherence	0.00–0.25	38.7%
Moderate Coherence	0.26–0.50	44.1%
Low Coherence	> 0.50	17.2%

The results suggest that while most students show a good level of consistency, about 17.2% hold views that conflict with each other. For instance, a student might agree with ideological messages but reject their social implications or feel unsure about how logically connected the ideas are. What makes the ICM framework valuable is that it doesn't just measure how much students agree, but also whether their agreement makes sense across different themes. This kind of insight is especially important in ideological education, where both understanding and emotional connection play a role in real learning.

4.3. Case Study 2: Cross-Validation at University B

To evaluate whether the neutrosophic framework performs consistently across different academic environments, a second case study was conducted at University B. This institution, located in a different region, features a more diverse student body and broader disciplinary representation.

A total of 300 students took part, representing departments such as Law, Media, and Political Science. The same questionnaire was administered, with only slight contextual adjustments to ensure relevance. Table 3 summarizes the average neutrosophic scores recorded at University B. As in the previous case, students showed higher levels of agreement in ideological and civic dimensions.

However, the critical thinking scores again reflect more uncertainty and disagreement, with indeterminacy and falsehood values noticeably elevated compared to other areas. These results help demonstrate the model's reliability across different academic settings. Figure 2 presents a comparison between the critical thinking scores of students from both universities. Despite differences in institutional context and student demographics, the distribution of neutrosophic responses is remarkably similar.

In both cases, the critical thinking dimension shows greater cognitive ambiguity. This pattern reinforces the conclusion that challenges related to ideological reasoning and analysis are common, not isolated, across higher education institutions.

Table 3: Mean Neutrosophic Scores (University B)

Dimension	Mean T	Mean I	Mean F
Ideological Alignment	0.60	0.24	0.15
Critical Thinking	0.49	0.29	0.22
Civic Behavior	0.59	0.23	0.18

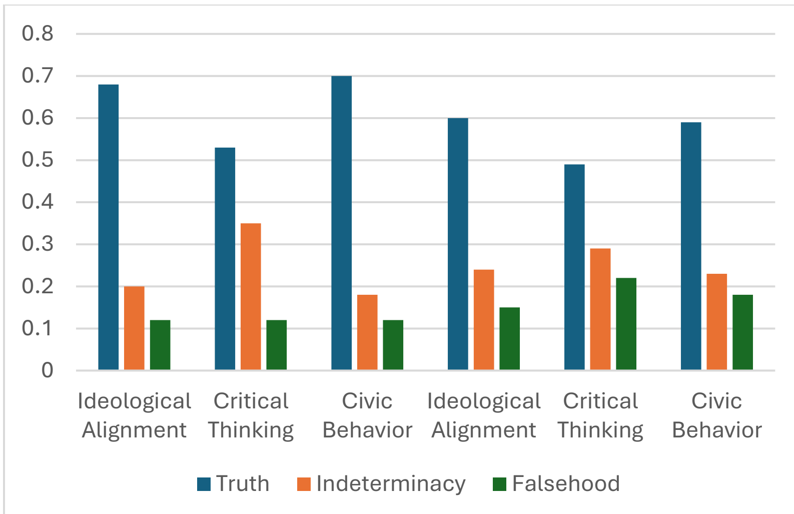

Figure 2: Neutrosophic Score Comparison (University A *vs* B)

4.4 **Understanding Uncertainty and Coherence Gaps**

The results showed that students reported the highest levels of uncertainty in the critical thinking dimension. This may suggest more than just hesitation—it could reflect deeper issues related to how this skill is introduced and supported in the classroom. Unlike ideological alignment or civic behavior, which often involve clear messages and structured expectations, critical thinking requires students to analyze, question, and reflect. If they are not given enough space or support to develop this kind of thinking, it is understandable that they would feel unsure when asked to evaluate their abilities in this area.

In some cases, the learning environment itself may limit how freely students feel they can think or speak. When critical thinking is encouraged in theory but not truly practiced in class, students may hesitate to respond with confidence. This hesitation may appear in the form of indeterminacy not as a rejection of the content, but as a sign of uncertainty about what is acceptable or how to respond.

Another important observation is that 17.2% of students showed low ideological coherence. These students gave responses that were inconsistent across the different dimensions. For example, they might agree with ideological values in principle but show low engagement in civic behavior. This kind of mismatch does not necessarily mean that they oppose the content. It may indicate that they are struggling to connect different aspects of what they have learned, or that they find it hard to relate ideas to their real-life experiences.

From a teaching point of view, these findings are valuable. Uncertainty and inconsistency are not signs of failure they are signs that students need more support. Educators can respond by creating open classroom discussions, encouraging personal reflection, and helping students see how different parts of ideological education fit together.

It is also important to recognize that the study interprets indeterminacy as a possible sign of reflective thinking or openness. However, this is only one possible explanation. High uncertainty might also be caused by confusion, unclear teaching, or lack of experience with critical topics. Since this study used only a structured questionnaire, we cannot be certain what the indeterminacy values truly mean for each student.

Therefore, neutrosophic scores especially indeterminacy should be seen as indicators that help identify areas for further attention, not conclusions. Future research can add qualitative tools such as interviews or open-ended questions to explore the reasons behind uncertainty more deeply. By identifying these possibilities, the model becomes more flexible and realistic. It shows not only how students respond, but where educators can step in to support more meaningful learning.

4.5 Case Study 3

This section shows the results of the proposed approach to rank the alternatives. Figure 3 shows ten criteria and six alternatives. Three experts create the decision matrix as shown in Tables 4-6. Compute the criteria weights using the average method as shown in Figure 4.

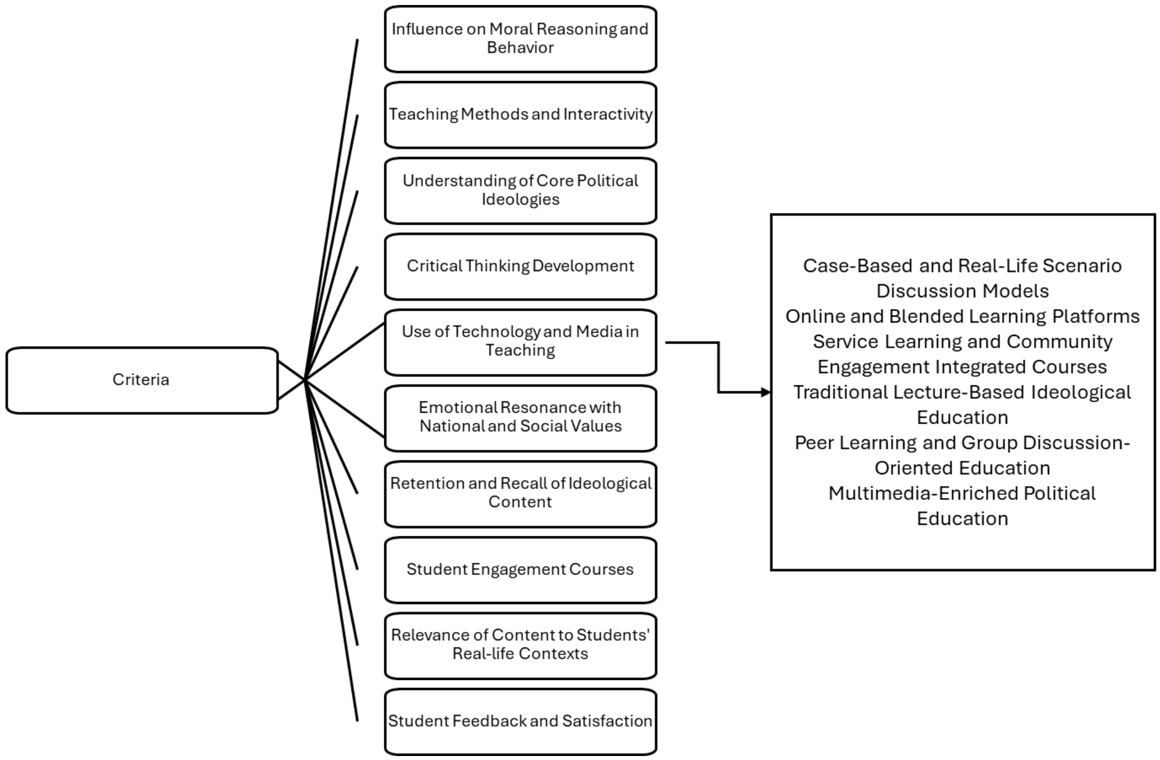

Figure 3. Criteria and alternatives.

Table 4. First decision matrix.

	C_1	C_2	C_3	C_4	C_5	C_6	C_7	C_8	C_9	C_{10}
A_1	(0.8,0.2,0.3)	(0.7,0.3,0.4)	(0.6,0.4,0.5)	(0.5,0.5,0.5)	(0.4,0.5,0.6)	(0.3,0.6,0.7)	(0.4,0.5,0.6)	(0.4,0.5,0.6)	(0.8,0.2,0.3)	(0.4,0.5,0.6)
A_2	(0.3,0.6,0.7)	(0.9,0.1,0.2)	(0.8,0.2,0.3)	(0.7,0.3,0.4)	(0.6,0.4,0.5)	(0.5,0.5,0.5)	(0.5,0.5,0.5)	(0.8,0.2,0.3)	(0.7,0.3,0.4)	(0.5,0.5,0.5)
A_3	(0.4,0.5,0.6)	(0.9,0.1,0.2)	(0.6,0.4,0.5)	(0.5,0.5,0.5)	(0.4,0.5,0.6)	(0.4,0.5,0.6)	(0.6,0.4,0.5)	(0.9,0.1,0.2)	(0.6,0.4,0.5)	(0.6,0.4,0.5)
A_4	(0.5,0.5,0.5)	(0.8,0.2,0.3)	(0.7,0.3,0.4)	(0.8,0.2,0.3)	(0.9,0.1,0.2)	(0.8,0.2,0.3)	(0.7,0.3,0.4)	(0.5,0.5,0.5)	(0.5,0.5,0.5)	(0.7,0.3,0.4)
A_5	(0.6,0.4,0.5)	(0.9,0.1,0.2)	(0.5,0.5,0.5)	(0.4,0.5,0.6)	(0.3,0.6,0.7)	(0.4,0.5,0.6)	(0.3,0.6,0.7)	(0.6,0.4,0.5)	(0.9,0.1,0.2)	(0.3,0.6,0.7)
A_6	(0.7,0.3,0.4)	(0.5,0.5,0.5)	(0.6,0.4,0.5)	(0.8,0.2,0.3)	(0.3,0.6,0.7)	(0.8,0.2,0.3)	(0.4,0.5,0.6)	(0.7,0.3,0.4)	(0.8,0.2,0.3)	(0.4,0.5,0.6)

Table 5. Second decision matrix.

	C_1	C_2	C_3	C_4	C_5	C_6	C_7	C_8	C_9	C_{10}
A_1	(0.9,0.1,0.2)	(0.7,0.3,0.4)	(0.6,0.4,0.5)	(0.5,0.5,0.5)	(0.4,0.5,0.6)	(0.8,0.2,0.3)	(0.4,0.5,0.6)	(0.9,0.1,0.2)	(0.3,0.6,0.7)	(0.4,0.5,0.6)
A_2	(0.8,0.2,0.3)	(0.4,0.5,0.6)	(0.8,0.2,0.3)	(0.7,0.3,0.4)	(0.6,0.4,0.5)	(0.5,0.5,0.5)	(0.5,0.5,0.5)	(0.9,0.1,0.2)	(0.7,0.3,0.4)	(0.5,0.5,0.5)
A_3	(0.7,0.3,0.4)	(0.4,0.5,0.6)	(0.6,0.4,0.5)	(0.5,0.5,0.5)	(0.4,0.5,0.6)	(0.9,0.1,0.2)	(0.5,0.5,0.5)	(0.5,0.5,0.5)	(0.6,0.4,0.5)	(0.5,0.5,0.5)
A_4	(0.6,0.4,0.5)	(0.8,0.2,0.3)	(0.7,0.3,0.4)	(0.3,0.6,0.7)	(0.9,0.1,0.2)	(0.3,0.6,0.7)	(0.7,0.3,0.4)	(0.6,0.4,0.5)	(0.5,0.5,0.5)	(0.7,0.3,0.4)
A_5	(0.5,0.5,0.5)	(0.4,0.5,0.6)	(0.5,0.5,0.5)	(0.9,0.1,0.2)	(0.8,0.2,0.3)	(0.7,0.3,0.4)	(0.3,0.6,0.7)	(0.7,0.3,0.4)	(0.9,0.1,0.2)	(0.8,0.2,0.3)
A_6	(0.7,0.3,0.4)	(0.3,0.6,0.7)	(0.9,0.1,0.2)	(0.8,0.2,0.3)	(0.7,0.3,0.4)	(0.6,0.4,0.5)	(0.4,0.5,0.6)	(0.8,0.2,0.3)	(0.8,0.2,0.3)	(0.4,0.5,0.6)

Table 6. Third decision matrix.

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
A1	(0.3,0.6,0.7)	(0.7,0.3,0.4)	(0.6,0.4,0.5)	(0.5,0.5,0.5)	(0.5,0.5,0.5)	(0.8,0.2,0.3)	(0.4,0.5,0.6)	(0.4,0.5,0.6)	(0.8,0.2,0.3)	(0.9,0.1,0.2)
A2	(0.3,0.6,0.7)	(0.5,0.5,0.5)	(0.8,0.2,0.3)	(0.7,0.3,0.4)	(0.6,0.4,0.5)	(0.5,0.5,0.5)	(0.5,0.5,0.5)	(0.8,0.2,0.3)	(0.7,0.3,0.4)	(0.5,0.5,0.5)
A3	(0.9,0.1,0.2)	(0.6,0.4,0.5)	(0.6,0.4,0.5)	(0.5,0.5,0.5)	(0.7,0.3,0.4)	(0.6,0.4,0.5)	(0.6,0.4,0.5)	(0.4,0.5,0.6)	(0.6,0.4,0.5)	(0.6,0.4,0.5)
A4	(0.5,0.5,0.5)	(0.7,0.3,0.4)	(0.5,0.5,0.5)	(0.8,0.2,0.3)	(0.8,0.2,0.3)	(0.7,0.3,0.4)	(0.7,0.3,0.4)	(0.5,0.5,0.5)	(0.5,0.5,0.5)	(0.7,0.3,0.4)
A5	(0.6,0.4,0.5)	(0.3,0.6,0.7)	(0.6,0.4,0.5)	(0.5,0.5,0.5)	(0.5,0.5,0.5)	(0.8,0.2,0.3)	(0.8,0.2,0.3)	(0.6,0.4,0.5)	(0.4,0.5,0.6)	(0.8,0.2,0.3)
A6	(0.7,0.3,0.4)	(0.5,0.5,0.5)	(0.7,0.3,0.4)	(0.6,0.4,0.5)	(0.6,0.4,0.5)	(0.5,0.5,0.5)	(0.4,0.5,0.6)	(0.7,0.3,0.4)	(0.4,0.5,0.6)	(0.4,0.5,0.6)

Figure 4. The criteria weights.

The mean solution is determined using eq. (11).

The distances are computed for beneficial and non-beneficial criteria using eqs. (12-15) as shown in Tables 7-8.

Determine the weighted matrix using eqs. (16 and 17) as shown in Tables 9-10.

Determine the weighted normalized matrix using eqs. (18 and 19).

Determine the appraisal score using eq. (20). We rank the alternatives as shown in Figure 5.

Table 7. The values of a_{ij}.

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
A1	0.116719	0.107692	0	0	0	0.046729	0	0	0	0.036545

A_2	0	0	0.232143	0.114551	0	0	0	0.263158	0.071429	0
A_3	0.116719	0.033846	0	0	0	0.046729	0.069091	0	0	0
A_4	0	0.218462	0	0.040248	0.461039	0	0.309091	0	0	0.196013
A_5	0	0	0	0.003096	0	0.046729	0	0	0.160714	0.116279
A_6	0.135647	0	0.125	0.170279	0	0.028037	0	0.105263	0.053571	0

Table 8. The values of b_{ij}.

	C_1	C_2	C_3	C_4	C_5	C_6	C_7	C_8	C_9	C_{10}
A_1	0	0	0.089286	0.164087	0.201299	0	0.149091	0.087719	8.93E-11	0
A_2	0.18612	0.003077	0	0	0.006494	0.158879	0.018182	0	0	0.10299
A_3	0	0	0.089286	0.164087	0.103896	0	0	0.052632	0.089286	0.023256
A_4	0.11041	0	0.017857	0	0	0.009346	0	0.175439	0.196429	0
A_5	0.072555	0.095385	0.160714	0	0.064935	0	0.061818	0.052632	0	0
A_6	0	0.261538	0	0	0.084416	0	0.149091	0	0	0.222591

Table 9. The values of E_i.

	C_1	C_2	C_3	C_4	C_5	C_6	C_7	C_8	C_9	C_{10}
A_1	0.011621	0.010992	0	0	0	0.004711	0	0	0	0.003455
A_2	0	0	0.024497	0.011621	0	0	0	0.028266	0.007538	0
A_3	0.011621	0.003455	0	0	0	0.004711	0.005967	0	0	0
A_4	0	0.022299	0	0.004083	0.044598	0	0.026696	0	0	0.01853
A_5	0	0	0	0.000314	0	0.004711	0	0	0.01696	0.010992
A_6	0.013505	0	0.013191	0.017274	0	0.002827	0	0.011307	0.005653	0

Table 10. The values of F_i.

	C_1	C_2	C_3	C_4	C_5	C_6	C_7	C_8	C_9	C_{10}
A_1	0	0	0.009422	0.016646	0.019472	0	0.012877	0.009422	9.42E-12	0
A_2	0.01853	0.000314	0	0	0.000628	0.016018	0.00157	0	0	0.009736
A_3	0	0	0.009422	0.016646	0.01005	0	0	0.005653	0.009422	0.002198
A_4	0.010992	0	0.001884	0	0	0.000942	0	0.018844	0.020729	0
A_5	0.007224	0.009736	0.01696	0	0.006281	0	0.005339	0.005653	0	0
A_6	0	0.026696	0	0	0.008166	0	0.012877	0	0	0.021043

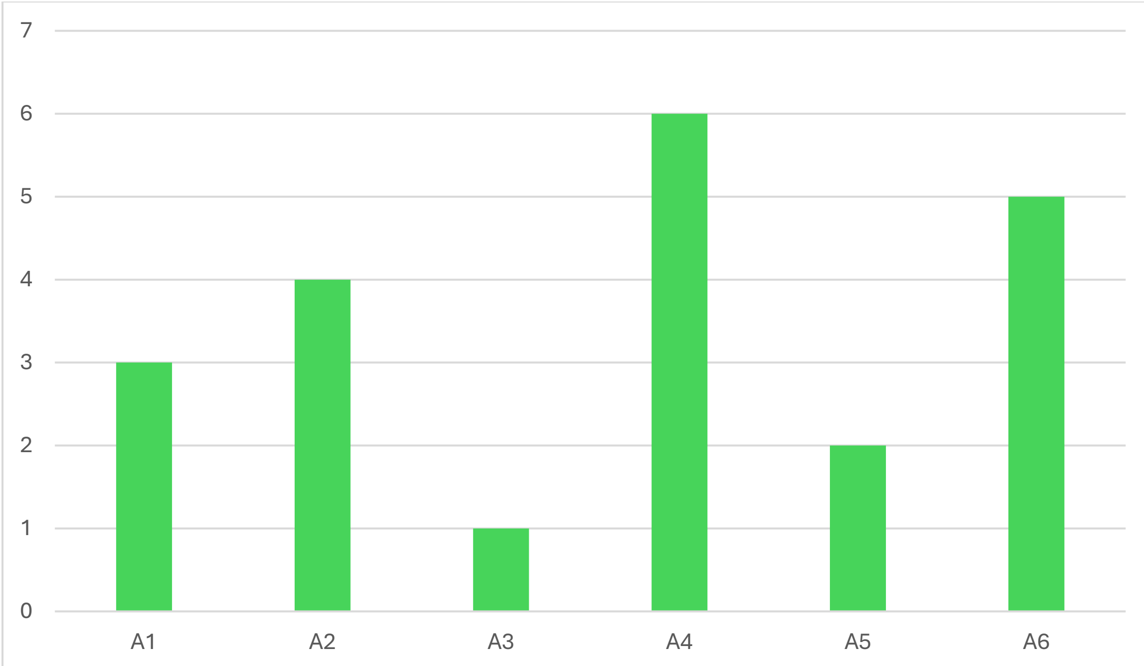

Figure 5. Rank of alternatives.

5. Sensitivity Analysis

To test how stable and reliable the proposed framework is, a sensitivity analysis was carried out by adjusting the indeterminacy penalty factor (α). This factor controls how much uncertainty affects the overall effectiveness score. In this analysis, α was varied from 0.3 to 0.7. For each value, the model recalculated the scores to see how sensitive the results were to changes in how ambiguity is treated.

When applied to the critical thinking dimension, the results showed a noticeable decline in effectiveness as α increased. The score dropped from approximately 0.42 when α was 0.3 to about 0.30 when α reached 0.7. This trend is illustrated in Figure 6, and it confirms that this dimension is especially sensitive to how uncertainty is handled. This makes sense since critical thinking often involves reflection, doubt, and complex reasoning factors that naturally produce indeterminacy.

However, to make the analysis more complete, the same test was also applied to the ideological alignment and civic behavior dimensions. The effect of changing α in those areas was more moderate, indicating that uncertainty plays a smaller role in shaping how students respond to those themes. Agreement and disagreement were more stable.

In a second test, the model was evaluated under different weighting strategies for each survey item:

1. Equal weights for all items
2. Higher weights for questions with greater policy or classroom relevance
3. Weights based on how important students rated each question during a pilot

Across all these variations, the model showed consistent patterns and no extreme deviations. This means it can be used flexibly across different contexts without losing its reliability.

Overall, the sensitivity analysis shows that the framework is not overly dependent on a single parameter. It performs well even when key values are adjusted, which strengthens its credibility as a practical tool for evaluating ideological education.

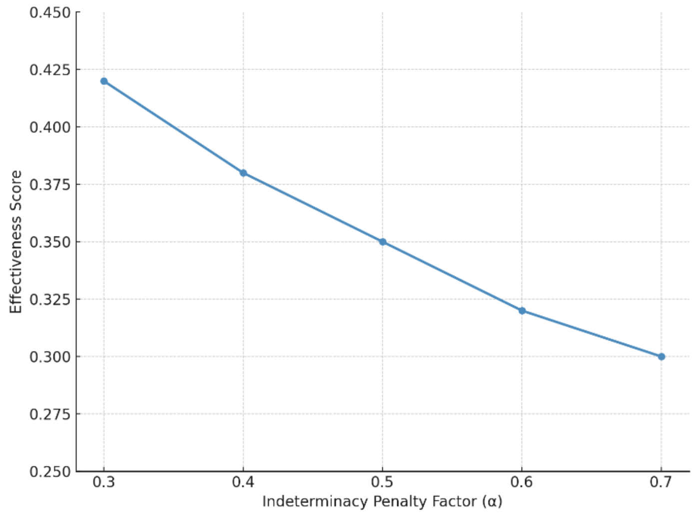

Figure 6: Effectiveness Score vs. α for Critical Thinking

6. Model Validation and Expert Feedback

To assess the validity of the neutrosophic framework, traditional Likert-scale surveys were administered alongside the neutrosophic instrument across both university samples. The results showed a moderate positive correlation between neutrosophic truth scores and Likert-based agreement responses ($r \approx 0.56$). However, the correlation between ICM scores and traditional measures was weak and even slightly negative ($r \approx -0.21$). This suggests that conventional evaluation tools fail to capture internal inconsistencies and the nuance present in students' ideological reasoning.

In addition, three independent experts in education and curriculum design were invited to review the model. All agreed that the approach provides greater clarity in detecting uncertainty and contradictions in student responses. They also emphasized its usefulness for diagnosing learning gaps and informing curriculum improvements. The inclusion of the ICM was noted as a particularly original contribution that adds diagnostic value beyond what is available in standard assessment tools.

7. Conclusion and Future Work

This study introduced a new way to evaluate ideological and political education in universities using neutrosophic logic. Unlike traditional methods, which often reduce student responses to simple agreement or disagreement, this approach captures how much students agree, how unsure they are, and when they disagree giving a fuller picture of their real thoughts.

The model was tested in two different universities, and the results were consistent. In both places, students were more uncertain when it came to critical thinking, which shows a possible gap between what the education aims to teach and how students understand or apply it. The use of the ICM also added a new layer of insight, helping us see how stable or conflicting each student's beliefs are across different parts of the course. This work can be useful in both theory and practice. It offers a deeper way to understand how students process ideological content and gives teachers and decision-makers a better tool to measure and support student learning.

We use the single valued neutrosophic sets to overcome the uncertainty information. We show operations of single valued neutrosophic numbers. Three experts create the decision matrix. We compute the criteria weights for ten alternatives. The EDAS method is used to rank six alternatives. The results show the Student Engagement Course is the best criterion. The EDAS results show Traditional Lecture-Based Ideological Education is the best alternative.

For future research, this model could be used over time to track how students grow in their understanding. It can also be combined with smart learning systems to give more tailored support. Testing it in different countries could show how students from other cultures respond to similar content. By recognizing that students can be unsure or even hold mixed views, this approach respects how people really think, especially when dealing with complex or sensitive ideas.

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