



Study of knowledge and preservation of traditional stories of the Shipibo-Konibo culture in primary school students based on neutrosophic logic

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Abstract. This paper aims to determine the knowledge and preservation of traditional stories of the Shipibo-Konibo culture in students of the Primary Educational Institution No. 64161-Bilingüe Nuevo Nazareth de Iparia, Peru in 2023. A population of 119 students from the educational institution was considered, whom we interviewed personally after filling out a questionnaire to collect information regarding their knowledge of traditional stories of the Shipibo-Konibo culture. The opinions of the children surveyed are given in the form of linguistic values associated with Single-Valued Neutrosophic Numbers. The data is processed with the help of some propositions according to the neutrosophic logic. The advantage of this logic is that it allows us to deal with indeterminacy explicitly. The results show that children tell stories, fables, myths, and legends belonging to the Shipibo-Konibo culture and that they are transmitted from generation to generation so that their knowledge, beliefs, and teachings are still preserved through morals learned from the traditional stories of this culture.

Keywords: Traditional stories, record literary, Shipibo-Konibo culture, neutrosophy, neutrosophic logic, single-valued neutrosophic number.

1 Introduction

The ancient times of Peru were characterized by traditions, customs, knowledge, and other ways of expressing their culture through oral folklore. The most relevant events of each era were narrated about various actions of the Andean and Amazonian populations. Tradition is the soul of the people, of a society, of a country, a nation. It is their way of thinking, feeling, and acting; oral tradition is a dynamic concept, it renews itself without losing its essence. So we can say that it is born and develops within the community as a natural expression that seeks to preserve and endure identities beyond the oblivion and disappearance of successive generations.

For a clear understanding of this topic, it is necessary to distinguish three concepts: history, understood as narrative content; story, as a narrative signifier or the text itself; narration, as the productive instance of the story. Three categories are also used: time, mode, and voice.

The practices of traditions in a community are diverse, starting with their knowledge, their history, their creators, the events that served the group and consolidate, and strengthen their best customs and ways of being, which are part of the sociocultural characteristics that allow to identify each community, region, and locality.

Like all myths and tales, the stories of ancient Peru have the function of providing listeners (nowadays readers) with an ethical and aesthetic message. They offer a comprehensive worldview, for example, of what was considered socially legitimate, what behaviors were morally reprehensible, or how competitions between men and divinities were recognized.

The essence of traditional stories is the transmission of knowledge from generation to generation. We are not unaware of the complexity of the concept of tradition and its richness when approaching marginalized literature such as national literature. We have proof of this whole world of symbolism and inner reality in the existence of myths, initiation rites, religions, philosophical thoughts, or artistic creations that humanity shares.

In ancient cultures, narrative was the first way of expressing various thoughts, knowledge, facts, stories, and a whole range of understanding of a people when they did not have writing. Narrative thought, on the other hand, produces good stories, dramatic works, and credible chronicles although not necessarily true. As we mentioned before, it deals with human intentions and actions and the vicissitudes and consequences that mark their course. There is an essential element in this modality that modulates human actions: emotions. Narrative thought weaves the basic experience of living, and gives meaning to that experience, to the world in general, and to us as individuals.

Consequently, within cultures, it is possible to develop a living expression through words, which are related to education to achieve communicative skills through the use of oral traditions in their mother tongue, as in the Shipibo-Konibo culture of Peru.

Shipibo-Konibo culture is an indigenous people located in the Peruvian Amazon around the banks of the Ucayali River. In the past, it was made up of three different ethnic groups that were united into one through marriage between their members. They all belong to the same linguistic family called *Pano*. Their main economic activities are fishing, agriculture, crafts, and hunting.

Significant pedagogical actions involving the use of oral communication in the language that the child masters most at school are developed extra-curricular and help in the research of oral traditions and this contributes to the preservation of our culture.

This article interviews and applies a questionnaire to 119 children who study at the Primary Educational Institution No. 64161-Bilingue Nuevo Nazareth de Iparia in Peru. The aim is to determine whether they know traditional stories, tales, and fables and whether they are capable of transmitting them to their peers or to the generations that follow them.

For this purpose, some predicates or logical propositions are used to determine whether this knowledge exists in the students surveyed. To facilitate the completion of the surveys, they were asked to respond based on a linguistic scale where each element has a Single-Valued Neutrosophic Number associated with it [1]. The advantage of dealing with the neutrosophic logic is that it allows dealing with indeterminacy obtained explicitly from different origins that can be due to neutrality, ignorance, contradiction, inconsistency, paradox, and so on. We rely on neutrosophic logic to carry out the study [2-8].

This article is divided into the following sections; the following section is dedicated to explaining the basic notions of neutrosophic logic and neutrosophy in general. The Results section follows. At the end, there is a Conclusions section.

2 Preliminaries

Definition 1: ([1]) Let X be a universe of discourse. A *Neutrosophic Set* (NS) is characterized by three membership functions, $u_A(x), r_A(x), v_A(x) : X \rightarrow]^{-}0, 1^{+}[$, which satisfy the condition $^{-}0 \leq \inf u_A(x) + \inf r_A(x) + \inf v_A(x) \leq \sup u_A(x) + \sup r_A(x) + \sup v_A(x) \leq 3^{+}$ for all $x \in X$. $u_A(x), r_A(x)$ and $v_A(x)$ are the membership functions of truthfulness, indeterminacy, and falseness of x in A , respectively, and their images are standard or non-standard subsets of $]^{-}0, 1^{+}[$.

Definition 2: ([1]) Let X be a universe of discourse. A *Single-Valued Neutrosophic Set* (SVNS) A on X is a set of the form:

$$A = \{(x, u_A(x), r_A(x), v_A(x)) : x \in X\} \quad (1)$$

Where $u_A, r_A, v_A : X \rightarrow [0, 1]$, satisfy the condition $0 \leq u_A(x) + r_A(x) + v_A(x) \leq 3$ for all $x \in X$. $u_A(x), r_A(x)$ and $v_A(x)$ denote the membership functions of truthfulness, indeterminate, and falseness of x in A , respectively. For convenience, a *Single-Valued Neutrosophic Number* (SVNN) will be expressed as $A = (a, b, c)$, where $a, b, c \in [0, 1]$ and satisfy $0 \leq a + b + c \leq 3$.

Regarding the neutrosophic logic, if p is a proposition, then a *neutrosophic valuation* of p is defined as:

$$v_N(p) = (t, i, f) \quad (2)$$

Such that $(t, i, f) \subseteq [0, 1]^3$ and in particular $(t, i, f) \in [0, 1]^3$, where t means the degree of truthfulness, i is the degree of indeterminacy, while f is the degree of falseness.

Given the universe of discourse X and $x(T_x, I_x, F_x), y(T_y, I_y, F_y)$ two SVNN, we say that $x \leq_N y$ if and only if $T_x \leq T_y, I_x \geq I_y$ and $F_x \geq F_y$, (X, \leq_N) is a *poset*. Whereas, (L, \wedge, \vee) is a lattice, because it is a triple direct product of lattices, see [9, 10]. $x \wedge y = (\min\{T_x, T_y\}, \max\{I_x, I_y\}, \max\{F_x, F_y\})$ and $x \vee y = (\max\{T_x, T_y\}, \min\{I_x, I_y\}, \min\{F_x, F_y\})$. Moreover, it is easy to prove that it is complete.

Let us remark that this definition is valid for interval-valued neutrosophic sets when we substitute their operators with interval-valued operators.

See also that there exist two special elements, viz., $0_N = (0, 1, 1)$ and $1_N = (1, 0, 0)$, which are the infimum

and the supremum, respectively, of every SVNS concerning \leq_N .

Given two neutrosophic sets, A and B, three basic operations over them are the following, [10, 11]:

1. $A \cap B = A \wedge B$ (Conjunction),
2. $A \cup B = A \vee B$ (Disjunction),
3. $\bar{A} = (F_A, 1 - I_A, T_A)$ (Complement).

Definition 3. A *neutrosophic norm* or *n-norm* N_n [9, 10], is a mapping $N_n: (]^{-0}, 1^+[\times]^{-0}, 1^+[\times]^{-0}, 1^+[]^2 \rightarrow]^{-0}, 1^+[\times]^{-0}, 1^+[\times]^{-0}, 1^+[$, such that $N_n(x(T_x, I_x, F_x), y(T_y, I_y, F_y)) = (N_n T(x, y), N_n I(x, y), N_n F(x, y))$, where $N_n T$ means the degree of membership, $N_n I$ the degree of indeterminacy, and $N_n F$ the degree of non-membership of the conjunction of both, x and y.

For every x, y, and z belonging to $]^{-0}, 1^+[\times]^{-0}, 1^+[\times]^{-0}, 1^+[$, N_n must satisfy the following axioms:

1. $N_n(x, 0_N) = 0_N$ and $N_n(x, 1_N) = x$ (Boundary conditions),
2. $N_n(x, y) = N_n(y, x)$ (Commutativity),
3. If $x \leq_N y$, then $N_n(x, z) \leq_N N_n(y, z)$ (Monotonicity),
4. $N_n(N_n(x, y), z) = N_n(x, N_n(y, z))$ (Associativity).

Definition 4. A *neutrosophic conorm* or *n-conorm* N_c [9, 10], is a mapping $N_c: (]^{-0}, 1^+[\times]^{-0}, 1^+[\times]^{-0}, 1^+[]^2 \rightarrow]^{-0}, 1^+[\times]^{-0}, 1^+[\times]^{-0}, 1^+[$, such that $N_c(x(T_x, I_x, F_x), y(T_y, I_y, F_y)) = (N_c T(x, y), N_c I(x, y), N_c F(x, y))$, where $N_c T$ means the degree of membership, $N_c I$ the degree of indeterminacy and $N_c F$ the degree of non-membership of the disjunction of x with y.

For every x, y, and z belonging to $]^{-0}, 1^+[\times]^{-0}, 1^+[\times]^{-0}, 1^+[$, N_c must satisfy the following axioms:

1. $N_c(x, 0_N) = x$ and $N_c(x, 1_N) = 1_N$ (Boundary conditions).
2. $N_c(x, y) = N_c(y, x)$ (Commutativity).
3. If $x \leq_N y$, then $N_c(x, z) \leq_N N_c(y, z)$ (Monotonicity).
4. $N_c(N_c(x, y), z) = N_c(x, N_c(y, z))$ (Associativity).

According to [10] a Singled-Valued Neutrosophic Negator is defined as follows:

Definition 5. A *Single-Valued Neutrosophic Negator* is a decreasing unary neutrosophic operator $N_N: [0, 1]^3 \rightarrow [0, 1]^3$, satisfying the following boundary conditions:

1. $N_N(0_N) = 1_N$.
2. $N_N(1_N) = 0_N$.

It is called *involution* if and only if $N_N(N_N(x)) = x$ for every $x \in [0, 1]^3$.

In the following, we show the neutrosophic negators that we have extracted from the literature, see [9, 10]. Given an SVNS A (T_A, I_A, F_A) , we have:

1. $N_N((T_A, I_A, F_A)) = (1 - T_A, 1 - I_A, 1 - F_A)$, $N_N((T_A, I_A, F_A)) = (1 - T_A, I_A, 1 - F_A)$, $N_N((T_A, I_A, F_A)) = (F_A, I_A, T_A)$ and $N_N((T_A, I_A, F_A)) = (F_A, 1 - I_A, T_A)$ (Involution negators).
2. $N_N((T_A, I_A, F_A)) = (F_A, \frac{F_A + I_A + T_A}{3}, T_A)$ and $N_N((T_A, I_A, F_A)) = (1 - T_A, \frac{F_A + I_A + T_A}{3}, 1 - F_A)$ (Non-Involution negators).

In the literature, we found neutrosophic implicators, which extend only the notion of S-implications [10, 12]. Furthermore, we did not find a general definition of neutrosophic implicators except in [10, 13]. In the following, we conclude this section with definitions and properties.

Definition 6. A *single-valued neutrosophic implicator* is an operator $I_N: [0, 1]^3 \times [0, 1]^3 \rightarrow [0, 1]^3$ which satisfies the following conditions, for all $x, x', y, y' \in [0, 1]^3$:

1. If $x' \leq_N x$, then $I_N(x, y) \leq_N I_N(x', y)$,
2. If $y \leq_N y'$, then $I_N(x, y) \leq_N I_N(x, y')$,
3. $I_N(0_N, 0_N) = I_N(0_N, 1_N) = I_N(1_N, 1_N) = 1_N$,
4. $I_N(1_N, 0_N) = 0_N$.

Neutrosophic R-implicators can be read in [14-16].

Herein we use the term *neutrosophic implicator* or *n-implicator* to mean single-valued neutrosophic implicator.

It can satisfy the following properties for every $x, y, z \in [0, 1]^3$:

1. $I_N(1_N, x) = x$ (Neutrality principle),
2. $I_N(x, y) = I_N(N_{IN}(y), N_{IN}(x))$, where $N_{IN}(x) = I_N(x, 0_N)$ is an n-negator (Contrapositivity),
3. $I_N(x, I_N(y, z)) = I_N(y, I_N(x, z))$ (Interchangeability principle),
4. $x \leq_N y$ if and only if $I_N(x, y) = 1_N$ (Confinement principle),
5. I_N is a continuous mapping (Continuity).

3 The study

The study included 119 students from the Primary Educational Institution No. 64161-Bilingue Nuevo Nazareth de Iparia during the year 2023.

Each student was assessed on their knowledge of the traditional narratives shown in Table 1.

Table 1: Traditional stories of the Shipibo-Konibo Culture. Source: Literary registration form.

No.	Konibo culture (in their native language)	Konibo culture (in English)
1	<i>Joni jonobaon boní</i>	The man who was taken by the peccaries
2	<i>Awajonin westiora ainbo jenemea nokoni</i>	The Sachava man who found the mermaid.
3	<i>Xawan kiss manxaman bachi bii kax xono jivi bochiki baneni</i>	Xawan benxo who stayed high up in the lupuna tree when he went to collect heron eggs
4	<i>Atapa betan nonon iní</i>	The hen and the duck
5	<i>Chosko joni yapan tetaibo iní</i>	The four fishermen
6	<i>Mananxawenin wiso ino paraanan sapenman pup-pets ninimani</i>	The fight between the black tiger and the sea cow mama, under the lie of the turtle
7	<i>Shipibo winoni</i>	The occurrence of the little lion monkeys
8	<i>Rononkoniax kené pikoni</i>	The origin of design from the viper
9	<i>Joni wanoax mishki kani</i>	The married man who went fishing with a hook
10	<i>Joni kabori bachi benai kax wetsa jonin mapon tatí iní</i>	The man who went looking for taricaya eggs tripped over another man's head
11	<i>Jonin, boka jawen awin bona kokoai merani</i>	The man who found the one-handed man giving honey to his wife
12	<i>Joxo ainbo iní</i>	The story of the white woman
13	<i>You are my friend</i>	Grandfather Korin's story
14	<i>Rabé ranon iní</i>	The story of two young people
15	<i>Ishtonbires bakebo anipaoni</i>	Child development in the historical past
16	<i>Jawen chain yoiresabi joni rekooni</i>	The man who was the victim of his brother-in-law's saying

According to Table 1, it is observed that 16 traditional stories are recorded in primary level students that are the subject of research, which belong to traditional stories of their community in the Shipibo-Konibo language and are tales, fables, and myths.

All literary records are events that occurred in the Amazonian setting, which means that these teachings come from generation to generation, most of the characters are people and animals from the jungle, also, the teachings are consistent with the life of the population of the Shipibo-Konibo culture. The source of the record of stories, myths, and fables was in the mother tongue (Shipibo-Konibo) for research purposes it is translated into English.

Each of these narratives was classified from the point of view of the literary genre as follows as shown in Table 2:

Table 2: Classification of traditional short and medium-length narrative stories. Source: Literary registration form.

No.	Traditional stories	Classification		
		Tale	Fables	Myths or legends
1	<i>Joni jonobaon boní</i>	X		
2	<i>Awajonin westiora ainbo jenemea nokoni</i>			X
3	<i>Xawan kiss manxaman bachi bii kax xono jivi bochiki baneni</i>	X		
4	<i>Atapa betan nonon iní</i>		X	
5	<i>Chosko joni yapan tetaibo iní</i>	X		

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No.	Traditional stories	Classification		
		Tale	Fables	Myths or legends
6	<i>Mananxawenin wiso ino paraanan sapenman puppets ni-nimani</i>		X	
7	<i>Shipibo winoni</i>		X	
8	<i>Rononkoniak kené pikoni</i>			X
9	<i>Joni wanoax mishki kani</i>	X		
10	<i>Joni kabori bachi benai kax wetsa jonin mapon tatí iní</i>	X		
11	<i>Jonin, boka jawen awin bona kokoai merani</i>	X		
12	<i>Joxo ainbo iní</i>	X		
13	<i>You are my friend</i>	X		
14	<i>Rabé ranon iní</i>	X		
15	<i>Ishtonbires bakebo anipaoni</i>			X
16	<i>Jawen chain yoiresabi joni rekooni</i>	X		

Table 2 shows the classification of traditional stories of the Shipibo-Konibo culture, which are narratives of the experiences and knowledge that the population has throughout their lives. This table shows that boys and girls record 10 stories, 3 fables, and 3 myths or legends, which means that the highest weighting in traditional stories in the Shipibo-Konibo culture is the story with the greatest conservation.

Of the 16 different records of traditional stories, all belong to the narrative genre, including tales, fables, and legends. All the stories present a moral, where the story teaches knowledge that will be useful for daily practice. Through the stories, values can be taught to the population of the Shipibo-Konibo culture.

Because the children in the study were of different ages, each of them was given an evaluation form, although the tests were different depending on their age. In the end, we obtained evaluations for each child on the same variables regardless of age, although the results are relative to the age of the child. For example, children who do not yet know how to read and write or do not know how to read and write well enough were given oral tests. Older children took written tests. In general, the following variables were evaluated:

1. The child has a good command of oral expression in his (her) indigenous mother tongue.
2. The child knows the stories that are being proposed to him (her).
3. The child can recognize the moral of the stories proposed in Table 1.
4. The child can effectively and motivatingly repeat the stories offered in Table 1.
5. The child knows other stories besides those proposed.
6. The child enjoys telling stories that he (or she) knows to other people.
7. The child recognizes the stories and the essence of what they want to express as part of his (or her) cultural identity.
8. The child can recognize other aspects of his (or her) culture and shows identification with them, such as pottery, and traditional farming methods, among others.
9. The child can explain these stories in Spanish.

Let us denote as V_{ij} the result obtained by the i th student ($i \in \{1, 2, \dots, 119\}$) for each of the j th variables, following the order that appears above $j \in \{1, 2, \dots, 9\}$.

The values of V_{ij} are obtained from Table 3 that are shown below:

Table 3: Scale of linguistic terms associated with neutrosophic values. See [17].

Linguistic expressions	(T, I, F)
Very Bad (VB)	(0.10, 0.75, 0.85)
Bad (B)	(0.25, 0.60, 0.80)
Medium Bad (MB)	(0.40, 0.70, 0.50)
Medium (M)	(0.50, 0.40, 0.60)
Medium Good (MG)	(0.65, 0.30, 0.45)
Good (G)	(0.80, 0.10, 0.30)
Very Good (VG)	(0.95, 0.05, 0.05)

The linguistic elements appearing in Table 3 are those used by the evaluators for each of the V_{ij} . On the other hand, the SVN associated with them are those used in the processing of the results.

The algorithm used to carry out the evaluations is the following, see Table 4:

Table 4: Algorithm for obtaining and processing the data from the study carried out.

Proposed algorithm for studying the acceptance of traditions	
1.	The values of the variables are obtained V_{ij} as a result of the questionnaire and the interviews with the children studied.
2.	The following logical predicates are evaluated: $p_{1i} := V_{i1} \wedge_N V_{i2} \wedge_N V_{i3} \wedge_N V_{i4} \wedge_N V_{i9} \quad (3)$ $p_{2i} := V_{i5} \wedge_N V_{i6} \quad (4)$ $p_{3i} := V_{i7} \wedge_N V_{i8} \quad (5)$ $p_{4i} := p_{1i} \wedge_N (p_{1i} \rightarrow_N p_{3i}) \quad (6)$ $p_{5i} := p_{2i} \wedge_N (p_{2i} \rightarrow_N p_{3i}) \quad (7)$ <p>The predicate in Equation 3 is used to assess students' speaking skills. The predicate in Equation 4 is used to assess children's communication skills and willingness to learn about their culture. It is the attitude. The predicate of Equation 5 indicates the child's identification with his (or her) culture. The predicate in Equation 6 is a Modus Ponens to measure how cultural identity is inferred from children's speaking skills. The predicate of Equation 7 is also a Modus Ponens where the premise is changed by the children's ability to communicate. For the neutrosophic conjunction \wedge_N the minimum n-norm is used: $N_n((T_A, I_A, F_A), (T_B, I_B, F_B)) = (\min(T_A, T_B), \max(I_A, I_B), \max(F_A, F_B))$, and together with the maximum n-conorm $N_c((T_A, I_A, F_A), (T_B, I_B, F_B)) = (\max(T_A, T_B), \min(I_A, I_B), \min(F_A, F_B))$, and the neutrosophic negation $N_N((T_A, I_A, F_A)) = (F_A, I_A, T_A)$, the Neutrosophic S-implication $SI_N((T_A, I_A, F_A), (T_B, I_B, F_B)) = N_c(N_N((T_A, I_A, F_A)), (T_B, I_B, F_B))$ is used in \rightarrow_N.</p>
3.	The results of each predicate are aggregated for all children, using the arithmetic mean operator. So, we get: $\bar{p}_1, \bar{p}_2, \bar{p}_3, \bar{p}_4, \bar{p}_5$ such that the components $T, I, \text{ and } F$ are obtained from the means of these components for all the components of the students.
4.	The results are interpreted according to the one that has the smallest distance from one of the SVN values in Table 3. Where: $\text{distance}((T_A, I_A, F_A), (T_B, I_B, F_B)) = \sqrt{(T_A - T_B)^2 + (I_A - I_B)^2 + (F_A - F_B)^2} \quad (8)$

The final results are summarized in Table 5.

Table 5: Final results of the evaluation of the predicates and their linguistic interpretation.

Predicate	SVNN obtained from the algorithm	Linguistic interpretation (distance)
\bar{p}_1	(0.82, 0.13, 0.23)	Good (<i>distance</i> = 0.079)
\bar{p}_2	(0.70, 0.22, 0.38)	Medium Good (<i>distance</i> = 0.117)
\bar{p}_3	(0.76, 0.19, 0.30)	Good (<i>distance</i> = 0.098)
\bar{p}_4	(0.76, 0.13, 0.30)	Good (<i>distance</i> = 0.098)
\bar{p}_5	(0.70, 0.22, 0.38)	Medium Good (<i>distance</i> = 0.117)

From the results shown in Table 5, it can be inferred that all the predicates had values between “Medium Good” and “Good” and that there is also a logical relationship between the children's ability to communicate and their cultural identity, in addition to the children's attitude to communicate with their identification with their culture, with valuations “Medium High” and “High”.

Conclusion

The preservation of the cultural heritage of each ethnic group or society is as important as the preservation of the individual identity of each person. This prevents the uprooting of people and communities. In this paper, we set out to study the degree of identification of a group of 119 children descended from the indigenous Shipibo-Konibo ethnic group of the Peruvian Amazon, all of whom are students at the Primary Educational Institution No. 64161-Bilingue Nuevo Nazareth de Iparia during the year 2023. Specifically, knowledge of the traditional stories of this culture was measured. A linguistic scale was used with elements associated with Single-Valued Neutrosophic Numbers. The use of SVNN allows for inclusion in the evaluation of the uncertainty that exists in decision-making. Five predicates on nine variables were used to evaluate the oral skills of the students in their mother tongue, the ability of the students to express their ideas and knowledge about their culture, and the identification of the children with their culture. In addition, two predicates were added to indicate the deductions corresponding to "if there are oral communication skills then there is identification with their culture" and "if there is an attitude to communicate then there is identification with their culture." It was concluded that all these predicates have values between Medium High (or Medium Good) and High (Good). Therefore, the students of this institution still preserve their cultural identity, which is an encouraging result.

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