Neutrosophic model based on the ideal distance to measure the strengthening of values in the students of Puyo university.

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Abstract. The formation of values has been a constant concern of humanity throughout history through different theoretical positions and today has become a dilemma of vital importance for the education of new generations. The objective of the research was to propose educational strategies to strengthen the value systems, expressed in the interests and motivations of university students who study Accounting, Auditing and Business Administration through the subjects received and their link with social reality, at the Universidad Regional Autónoma de los Andes, Puyo extension, offering axiological phenomena such as friendship, moral ethics, generosity, solidarity, honesty, responsibility, respect, tolerance and cooperation. In order to measure the strengthening of the values in the students of Puyo University, a neutrosophic model based on the ideal distance is developed. The study was developed on a descriptive basis, using methods, techniques and instruments, documentary analysis, interview, survey and direct observation. The proposal contributes to the strengthening of the integral formation and values of the students.

Keywords: value formation, educational strategies, value systems, neutrosophic model, distance to ideal.

1 Introduction

During man's very existence he has questioned how to be conscious, the meaning of his life, the objectives to be achieved, his motivations, as well as the ends and goals that mobilize his performance and behavior. These and other questions have accompanied the course of the human existence in its practical and transforming activity propitiating the interest of the philosophers towards the axiological problems from the antiquity, considering the beginning of the axiological polemic next to the birth of the philosophy.

The term axiology comes from the Greek axia which means value and logos (study, treatise). Historically in the study of the nature of values, there have existed different philosophical positions: bourgeois philosophy characterizes the idealistic interpretation of value and its social significance and the dialectical-materialist explains the objective and subjective nature of values in an integrated and complex way [1].

Some authors, such as [2], argue that there is a crisis of values where behavioural marginalism, skepticism, apathy, discrepancy and the desire for profit, double standards, formalism, hypocrisy, deceit, lack of family communication, inequity, injustice, poverty, destruction of the environment and the indigenous values of cultures, xenophobia linked to the growth of racism, by ethnic origin, culture, sexual inclination; sexual harassment, hunger, migrations, among others.

Values are not stable and eternal; they change as a result of historical-social practice and the needs of the subject; they depend to a great extent on the historical epoch; each society, class and social group in its educational conception defends and empowers the values it considers necessary to form in its citizens [3].

Values are motivational formations of human development, in which teachers have responsibility from the curricular and extracurricular activities, in the context of the professional formation of university students because of the positive social transcendence, by regulating and orienting their attitude toward humanist growth and human perfection.

There are different classifications of values, the most frequent of which refer to the content of different spheres in which theoretical-cognitive, ethical and moral, aesthetic, economic, socio-political and religious values are manifested [4].

Love for the profession, responsibility, honesty, are essential values that regulate the performance of a competent professional. Some of the recommendations given to teachers to help students make moral decisions are: listening to the experiences of the students, being a model to follow, making value judgments, motivating the reading of some books, asking good questions, helping young people to discover themselves, stimulating imagination, talking about life's subjects, stimulating commitment to society and the Fatherland and accentuating responsibility [3], in addition, for [5] one cannot think about the future if one does not know what is happening today, hence the need for this planning to arise from a diagnosis of the environment.

In the Global Monitoring Report on Education for All, the topic "The importance of having good values" was addressed, pointing out that training in values should take on a priority role such as academic training, which is why they propose training better citizens who respect the environment, the fight for peace and the training of soft skills, which is the integrated implementation of skills, personality traits, knowledge and acquired values, this requires educational programs where teachers plan, organize and manage their own teaching-learning processes, having to rely on proper training and experience, cognitive skills, knowledge, attitudes, values [5].

According to the World Declaration on Higher Education, universities have two responsibilities where they combine the ethical commitment with that of anticipating the future, creating and disseminating knowledge, since for [6] this conception of relevance implies conceiving the dynamic in the university as a space of construction of meaning and meaning among the subjects involved. The aspiration of a human and cultural institution must consider the contradictions and challenges demanded by the existence of universities tempered to their social and historical time. On the other hand, the formation of values is that integral process, where people are capable of improving and carrying out knowledge, skills, attitudes and values (know how to be) [7].

In the article "Concepciones teóricas y metodológicas para la implementación de un modelo pedagógico para la formación de valores en estudiantes universitarios" (Theoretical and methodological concepts for the implementation of a pedagogical model for the formation of values in university students), the result was aimed at determining a pedagogical model, sustained on theoretical and scientific bases, contributing from academia to the development of professional responsibility value in university students of Sciences and Engineering.

In the value responsibility as a unit of analysis of the integral formative process in students of the university of medical sciences studied by [4], it refers that the process of education in values constitutes a problem of the education of the personality, and poses a series of positive conditions that favor it, in addition to taking into account some pedagogical premises and assuming some essential didactic principles that guide this educational activity in the university praxis [8].

Some results of [9] contribute to the formation of values in university students and professors through the systematization of knowledge, criteria and reflections that serve as a general theoretical platform.

In the Ecuadorian context, the Plan for Good Living becomes a theoretical platform for working with values, which it declares "... Good Living will require that individuals, communities, peoples, and nationalities effectively enjoy their rights and exercise their responsibilities within the framework of interculturality, respect for their diversities, and harmonious coexistence with nature [10].

It is a concern of the scientific community of the University of study, reflecting on the formation of values of future university professionals. There are many aspects that reflect the urgency for students to begin the process of strengthening and applying values, so that, with them, they can improve their university coexistence and their family environment. Each human being internalizes that which satisfies his personal needs and, on this basis has interests (interests are needs made aware), forms convictions, specifies his future aspirations and comes to analyze the possibilities he has to reach them: this is how values are manifested.

The formation of values is a complex process in the development of personality, which takes place in social relations through activity and communication. When it comes to the formation of values it is necessary to assume the close relationship that exists between value, value capacity and value orientation. Thus, in the process of value formation in the Ecuadorian context, it is tempered by the profound transformations that have taken place since the Citizen's Revolution, for which reason it is necessary to develop coherent educational strategies aimed at forming a citizen in accordance with the social demands of the country [3].

According to previous studies, it was considered important to research the values and their strengthening in the students of the Regional Autonomous University of the Andes, Puyo extension, through the development of educational strategies developed in the students, from the subjects taught.

In order to measure student values, a neutrosophic model based on ideal distance is proposed, which is useful because it provides quantitative results that facilitate the ordering of the different alternatives according to the results obtained in a flexible manner. The models and theories developed in the field of neutrosophy point to the rational support for making complex decisions [11]. It is in this sense that the model is proposed in this research.

2 Methods

It is based on qualitative and quantitative approaches, combining methods, techniques and tools that facilitated

the collection of data, such as: documentary analysis that allowed collecting and assessing all the knowledge of the different authors who have addressed the issue of value formation in different contexts.

The data were collected through surveys with closed-ended questions to the students, in which the formation of values was investigated, and they were analyzed quantitatively using statistics to describe the variables that characterized the population studied and to obtain a result in order to draw conclusions that would allow a correct decision making.

The interview, survey, and observations allowed the objective processing of the data that provided the information to develop educational strategies to strengthen the value system in the students of the Accounting, Auditing, and Business Administration careers through the subjects received at the Universidad Regional Autónoma de los Andes, Puyo extension.

This study was based on previous research used to support the theory, was developed based on the descriptive type, specifying properties, characteristics and important traits of the population analyzed, being useful to accurately show the angles or dimensions of the context, in addition to measure or collect information independently or jointly on the concepts and variables to which they refer.

For the development of the investigation a population conformed by 91 students of the careers of Accounting Audit and Administration of companies of the levels 1 - 9 of the presential modality was used, using a representative sample of 74 students, using the techniques of intentional sampling and random sampling, directed from the specific interests of the investigation.

Course	Number of students
Accounting and Auditing	55
Business Administration	36
Total	91

Table 1: Population distribution. Source: Own elaboration

To determine the size of the sample, an estimation of proportions was made, for a finite population, where:
n = sample size,
N = population size, in this case it is 91
z = coefficient of the confidence level with a value of 95% for which z = 1,96
p = percentage of the population that meets the characteristics of interest for the study. Assuming 50%.
q = percentage that does not meet the characteristics that is 50%.
e = working error, in this case 5%.
The formula applied to determine the sample size is the one shown through equation 1.

$$n = \frac{z^2 \cdot p \cdot q \cdot N}{e^2 \cdot (N-1) + z^2 \cdot p \cdot q} = 74 \qquad (1)$$

The result indicates that the sample selected for research was 74 students.

After the analysis that is carried out and the obtaining of results in linguistic terms, a neutrosophic model based on ideal distance is developed, which includes typical activities such as:

1. The definition of decision-making problems.
2. Problem analysis and identification of alternative solutions $X = \{x1, x2, ..., xn\}$ $(n \geq 2)$.
3. Establishment of evaluation criteria.
4. Selection of expert(s).
5. Evaluation of alternatives.
6. Sorting and selecting the best alternative.
7. Implementation and follow-up.

The model based on distance from the ideal, which is proposed in this paper has a workflow that is represented in Figure 1. Linguistic terms and indetermination through SVN numbers and based on the construction of an ideal option, is described according to the workflow of the proposed model. It should be noted that with the purpose of facilitating practical application to decision-making and engineering problems, the proposal was made for single-value neutrosophic sets [12] (SVNS) which allow the use of linguistic variables which contributes to an increase in the interpretability of recommendation models and the use of indetermination.

In this sense, and taking into account a universe of discourse, called X. A SVNS A on X is an object of the way it is mathematically described through equation 2.

$$A = \{\langle x, uA(x), rA(x), vA(x)\rangle : x \in X\} \; d \qquad (2)$$

Where:

$uA(x)$: $X \rightarrow [0,1]$, $rA(x)$, :$X \rightarrow [0,1]$ y $vA(x)$: $X \rightarrow [0,1]$ with $0 \leq uA(x) + rA(x) + vA(x) \leq 3$ for all $x \in X$.

The intervals (x), $rA(x)$ and $vA(x)$ denote memberships to true, indeterminate and false x in A, respectively.

So an SVN number, then will be expressed as $A = (a, b, c)$, where $a, b, c \in [0,1]$ y $+ b + c + c \leq 3$.

SVN numbers have presented multiple applications in the field of Artificial Intelligence (AI). AI is one of the most strategic technologies of the 21st century. A definition of AI according to [13] is the science that seeks the deep understanding of Intelligence. The definition of this capacity, the understanding of its limits and scopes, as well as its characterization constitute a highly complex problem.

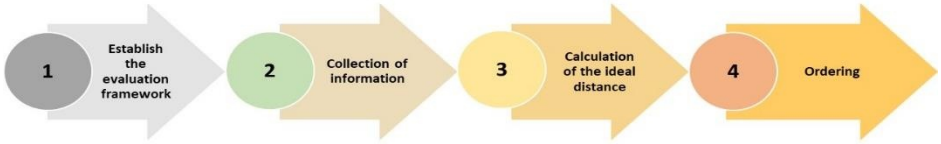

Figure 1: Workflow of the proposed model. Source: Own elaboration.

The detailed description of the workflow of the proposed model to measure the strengthening of values in Puyo University students is presented below:

1. Establish evaluation framework

The criteria and alternatives to be evaluated are selected in order to prioritize the latter. The framework is defined as follows:

C={c1,c2,...,cn} with n≥2 , a set of criteria

E={e1,e2,...,ek} with k≥1, a set of experts

X={x1,x2,...,xm} with m≥2, a finite set of alternatives

2. Collection of information

Information on the preferences of decision-makers is obtained. The utility vector (80) is represented as follows:

$Pj = \{p_{j1}, p_{j2}, \dots, p_{jk}\}$, where p_jk is the preference in relation to criterion c_k of the alternative x_j

Ratings are given using SVN numbers.

3. Calculation of the ideal distance

To evaluate the alternatives we propose to build the ideal option. The criteria can be classified as cost or benefit type. Let $C+$ be the set of criteria of type benefits and $C-$ of criteria of type cost. The ideal alternative is defined as follows:

$$I = \left\{\left(max_{i=1}^{k} T_{U_j} | j \in C^{+}, min_{i=1}^{k} T_{U_j} | j \in C^{-}\right), \left(min_{i=1}^{k} I_{U_j} | j \in C^{+}, max_{i=1}^{k} I_{U_j} | j \in C^{-}\right), \left(min_{i=1}^{k} F_{U_j} | j \in C^{+}, max_{i=1}^{k} F_{U_j} | j \in C^{-}\right)\right\} = [v_1, v_2, \dots, v_n] \quad (3)$$

4. Sort the alternatives using the Euclidean distance between single-value neutrosophic numbers (SVN), [11, 12].

Sea $A* = (A1*, A2*, ...)$ is a vector of SVN numbers such that $Aj* = (aj*, An*, cj*)$ j=(1,2, ... , n) and $Bi = (Bi1, Bi2, \dots, Bim)$ (i = 1,2, ... , $bj*$) or m vectors of n SVN numbers such that and Bij = (aij, m, bij) (i = 1,2, ... , cij), (j = 1,2, ... , n) then the Euclidean distance is defined as. The Bi and $A*$ is [21]:

$$s_i = \left(\frac{1}{3}\sum_{j=1}^{n}\left\{\left(|a_{ij} - a_j^*|\right)^2 + \left(|b_{ij} - b_j^*|\right)^2 + \left(|c_{ij} - c_j^*|\right)^2\right\}\right)^{\frac{1}{2}} \quad (4)$$

$(i = 1,2, \dots, m)$

The sorting is carried out from lowest to highest from the overall distance value obtained. The closer the alternative of Ai is to the ideal point (si minor), the better it will be, allowing an order to be established between alternatives.

3 Results

With the results of the survey applied to the students object of study in the courses of Accounting and Auditing and Business Administration of the Regional Autonomous University of the Andes, Puyo extension, the statistical analysis was carried out, based on the descriptive ordering of absolute frequencies, proportions and percentages by category, of the variables and indicators of the same. In this way, table 2 shows the results derived from the opinion issued by the74 students chosen in the sample, where, in the ethic-moral indicator, 50% know that ethics is related to moral values and 30% consider that it is almost always related to morals and behavior, 20% express that sometimes these relationships are fulfilled. 100% said that there is always mutual respect between teachers

and students and that there is a kind and courteous treatment; considering respect as the essence of human relations, of community life, of teamwork, of conjugal life, of any interpersonal relationship.

Regarding the responsibility indicator, they recognize that this indicator allows them to reflect, administer, guide, and assess the consequences of their actions. 68% admitted that they almost always assume the consequences of the actions of their academic performance in compliance with the duties assigned by the teacher, 20% always comply, and 12% sometimes comply.

As for the solidarity indicator, 64% admitted that they always exercise mutual support among their peers, especially in compromised or difficult situations (academic insufficiency, family problems, among others). 34% think they do it almost always; 2% almost never.

On the other hand, in the indicator friendship, 54% stated that a harmonious atmosphere is always maintained in class spaces, promoting union among classmates, 26% almost always; 15% raised sometimes.

In the Tolerance indicator, 50% state that they always have the capacity to listen and accept others, valuing the different ways of understanding and positioning themselves in the way of acting, 34% almost always and 16% sometimes.

The indicator Cooperation, 61% answered that they work together giving mutual help in an organized way for the promotion of common ends in this way the success of one depends on the success of the others, 20% almost always and 20% sometimes.

Indicators	*Always*		*Almost always*		*Sometimes*		*Almost never*		*Never*	
	FA	FR %	FA	FR %	FA	FR %	FA	FR%	FA	FR%
Ethics - Moral	37	50	22	30	15	20	0	0	0	0
Respect	74	100	0	0	0	0	0	0	0	0
Liability	15	20	50	68	9	12	0	0	0	0
Solidarity	47	64	25	34	0	0	2	2	0	0
Friendship	40	54	19	26	15	20	0	0	0	0
Tolerance	37	50	25	34	12	16	0	0	0	0
Cooperation	45	61%	15	20%	14	19%	0	0%	0	0%

Table 2: Formation of values in the students of the careers of Accounting and Auditing and Business Administration. Source: Diagnosis

The overall results of the current state of the values of the students in the sample studied reflect that despite maintaining important values ingrained, it is necessary to strengthen them for social and professional development.

The proposal of educational strategies to strengthen the system of values in the students through the subjects received in the careers of the Regional Autonomous University of the Andes, Puyo extension, was based on the following actions:

1. Elaboration of didactic guides based on problematic situations that demand reflection and analysis in the students.
2. Workshop on the formation of values that facilitate the assimilation of attitudes and values, such as: respect, solidarity, collaboration, among others.
3. Debates on the value system.
4. Group dynamics.
5. Develop interpersonal communication.
6. To deepen the feeling of national identity.
7. To raise the professional quality in the solution of the country's problems.
8. Encourage the participation of students to debate opinions and ideas on the different aspects of learning (the relevance or not of learning a certain content, objectives, customs, use of common spaces, evaluations).
9. Facilitate through the learning of the subjects of certain important attitudes, such as cooperation, solidarity, equity, fraternity, taking into account the human and professional values of each of the careers.
10. Promote the development of values in each of the students or from the empowerment of the development of self-esteem, self-valuation and self-education from the knowledge of the possibilities of personal fulfillment and the real conditions to materialize them.

Based on the characteristics of the proposal of educational strategies to strengthen the value system, the neutrosophic model based on the ideal distance is developed in the students of Puyo University. According to the workflow of the proposed model, represented in figure 1, one has to:

The establishment of the evaluation framework according to the domain in which the information is verbalized, is in linguistic terms which are shown in table 1.

Linguistic Term	SVN Numbers
Extremely good (EG)	(1,0,0)
Very very good (VVG)	(0.9, 0.1, 0.1)
Very good (VG)	(0.8,0,15,0.20)
Good(G)	(0.70,0.25,0.30)
Medium good (MDG)	(0.60,0.35,0.40)
Medium(M)	(0.50,0.50,0.50)
Medium Bad (MDB)	(0.40,0.65,0.60)
Bad (B)	(0.30,0.75,0.70)
Very bad (VB)	(0.20,0.85,0.80)
Very very bad (VVB)	(0.10,0.90,0.90)
Extremely bad (EB)	(0,1,1)

Table 3: Linguistic terms used [21].

Once the terms in which the information is verbalized are defined, we proceed with the evaluation of the three fundamental actions to be taken into account for the development of educational strategies, in order to strengthen the system of values in the students of the Universidad Regional Autónoma de los Andes, Puyo extension.

$c1$: Factors are analyzed, identified and defined for the development of proposed educational strategies to strengthen the value system in students.

$c2$: Factors for the development of educational strategy proposals are put into practice.

$c3$: The actions to be developed to elaborate the proposal of educational strategies to strengthen the system of values in the students are planned.

Once the prioritization framework is established, the information is obtained.

	$x1$	$x2$	$x3$
$c1$	MDG	B	VVG
$c2$	G	VVG	G
$c3$	G	MDG	VG

Table 4: Preferences obtained. Source Own preparation.

From the obtained information (table 2) the ideal alternative is selected which resulted:

$E+= (VVG, VVG, VG)$

The results of the calculation of the distances, allows sorting the actions to develop according to the development of educational strategies. For our case study is obtained in order of priority, $x3 \succ x1 \succ x2$. This means that when debates on the value system are carried out, it is possible to elaborate didactic guides based on problematic situations that demand reflection and analysis in the students, to implement it through workshops on the formation of values that facilitate the assimilation of attitudes and values such as: respect, solidarity, collaboration, among others.

On the other hand, it should be noted that the formation of values begins at an early age where the individual becomes part of a culture, internalizing it, respecting its rules and procedures. It is a process that begins in the family, becoming the first space of socialization where we learn to live in collectivity and build our cultural identity, renewing every day our affections, ways of thinking and action, playing a decisive role in the development of personality and societies, for which it lasts a lifetim[14].

The results obtained demonstrate that the formation of values is a process that is developed in the personality of the individual, in his social and cultural life, which must be systematic not only in the acquisition of knowledge but in the determination of interpersonal behavior that expresses individual or collective interests and their education must be continuous and permanent with the responsibility of each and every one of the members of the educational community that helps the integral formation of the student.

It is also noted that education in values has to be a systematic task that must be welcomed with responsibility, starting from the integral formation of the person, who needs the acquisition of scientific knowledge, and the learning of cultural patterns that contribute to be useful. Educating in values means helping people to construct their own scale of values in a reasoned and autonomous way, so that they are capable of making moral decisions in conflictive moments of their lives, helping people to relate effectively, achieving coherence between their thoughts and values with their actions.

On the other hand, it stands out that an adequate formation of values is not achieved but we are examples of transmission of the same ones with our daily act, not only in the classrooms, but also with our general behavior in our society, acting in consequence with the historical moment. In order to develop our values, it is important to

have a critical thought where the capacities of creativity and logic are strengthened, which allows us to process new strategies in the ways of seeing and perceiving things, analyzing, understanding and interpreting the world in which we live.

After the theoretical analysis and the results of procedures and techniques applied to the sample under study, it was corroborated that analogous topics have been addressed in other institutional contexts. These studies have had their contribution to the analysis of the formation of values, being a necessary element in any of the stages of its formation in the university, as well as the subjects that conform the academic programs, we consider that it is a subject in which we have to particularize according to the radius of action that we find ourselves.

The analyzed values have great importance for the development of the personality, they represent modes of behavior in general that must govern in the conduct and determine consequently their attitudes and their way of acting.

The application of strategies in a systematic manner allows reflection, the assimilation of attitudes, fostering companionship, promoting the strengthening of the development of self-esteem, self-esteem and self-education, to achieve the values that we must promote with greater acuity such as ethics, morals, responsibility, respect, solidarity, friendship, tolerance, cooperation, the spirit of sacrifice and justice [14].

Conclusion

The education of values in higher education is a subject of great topicality and importance in the training of professionals needed by society. Values are beliefs, principles founded on man for his social action, is a pattern of behavior before the action of selecting a certain situation, be it positive or negative, therefore, it comes to make its axiological model that leads to motivation and satisfaction to the full, providing a guideline that guides the formulation of personal or collective goals or purposes.

The proposed educational strategies will contribute to strengthening the integral formation of students, offering from their learning axiological sources such as friendship, moral ethics, generosity, solidarity, honesty, responsibility, respect, tolerance and cooperation taking into account the human and professional values of each of the careers.

The development of the neutrosophic model based on ideal distance to measure the strengthening of the values in the students of the Puyo University contributed to determine the actions to take into account for the development of educational strategies.

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