



Neutrosophic Research Method for the Analysis of Indeterminacy on Academic Visibility for Quality Digital Inclusion

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Abstract. This paper aims to promote educational inclusion and achieve a positioning that makes visible the actions involved in this academic process. It has as a reference a project aimed at families of students with SEN during their schooling, this need arises due to the difficulties that parents have to deal with the academic performance of children and adolescents. Technology in the educational context is the new trend in the process of teaching and learning in students, the media and digital education are the tools now to promote educational inclusion in the Ecuadorian context. It is intended to implement the activities immersed within the programs covered by the project, reach homes, regionally, nationally, and internationally on the management carried out in the chosen population, which are children with SEN. This study corresponds to a mixed research design, The neutrosophic research method was used for the analysis and indeterminacy through the neutrosophic descriptive statistics. The results obtained indicate a clear interest of students in the virtual environment and make use of the various tools that can be provided to improve learning conditions.

Keywords: digital visibility, advertising, inclusion, virtual education, social networks, neutrosophic research method, neutrosophic descriptive statistics

1 Introduction

The digital world has become a trend nowadays, given the health circumstances that are experienced in all contexts; for this reason, it has been necessary to migrate human activities to the screen environment to somehow continue with the development of social systems. In the educational field, it has been proposed that all kinds of academic activities be carried out through platforms to maintain the educational system of children and adolescents[1].

This new form of teaching has represented a real challenge for parents, given that they must guide their children in the academic accompaniment of their activities, especially in the case of those families who have infants with Special Educational Needs (SEN) associated with disability[2]. The role of parents has always been to provide the necessary tools for the optimal development of their children; however, they are not prepared to be able to meet their needs from the educational environment, thus being one more need that is generated in the sector community.

This research deals with the demonstration of the development of a project that meets the satisfaction of those needs that parents require, an orientation through a preparation process to be able to meet the educational needs of their children. It is important to highlight that assisted education at home where the leading figures are the guide for the children, in this case, their parents, must have a specific preparation to understand the nature of education in the sense of personalized teaching that should be imparted to this population of children and adolescents[3].

For the authors [4], from the perspective of educators, attention must be paid to the possibility that students leave their role and responsibilities at school if they are not encouraged appropriately. Ideally, the school should add the student and take him with it, not leave him behind at the end of each class. Therefore, parents must be included and understand that it is also on their part to encourage the study and active participation in the learning process of their children [5].

According to [6] it is essential that the family understand the role of the student in school and understand that they have duties, responsibilities and that they assume these commitments. As has been said, the family and the institution must work together, but from the moment that the parents interfere in the process that is focused between the school and the student, new problems tend to arise and the most affected is the student himself[7].

Communication should go beyond applying activities and asking parents to supervise their children. Make space for parents to talk about the educational institution and give their opinion on everything that is being done. This feedback is of utmost importance to improve this methodology of distance classes, which was little explored by schools until then, especially at the levels of basic education, secondary and early childhood education[6]. In this work, a study of these phenomena is carried out using the neutrosophic research method and neutrosophic statistics.

Synchronous tools

Synchronous Tools require the participation of teachers and students in scheduled events, with specific times for their completion. They are carried out in real-time (online), for years, for some of the EADs and teachers, as well as for all those involved in the institution, the groups and communities interact instantly and with the feeling of perseverance in the continuity of their course[7].

The chat (chat room), with educational potential to be studied, that is little used in pedagogical activities, allows synchronous communication between different people who are connected at any given time. Literature studies or the pedagogical use of chat are still incipient, most of these materials are limited to assimilate their specific characteristics, they will go into details about their specific possibilities. In addition, it is necessary to carry out experimental studies related to its use as a communication tool and pedagogical tool, generating learning and mechanisms to overcome the difficulties and limitations it offers, not using Chat for learning[8].

Videoconferencing is a form of interactive communication that allows two or more people to be in different places, where they can meet face to face with auditory and visual communication in real-time. Its use presents a series of benefits: saving time, avoiding physical relocation to a special place, and saving, with the reduction of two expenses with more travel resources, so that the meeting can be recorded and available later[9].

Research method basics and neutrosophic statistics

The neutrosophic research method is a generalization of Hegel's dialectic (dynamics of opposites: $\langle A \rangle$ and $\langle \text{anti}A \rangle$). It suggests that scientific and humanistic research will progress by studying not only opposing ideas but also the neutral ideas related to them to have a broader vision of the whole problem to be solved. These ideas are based on neutrosophy (study of opposites and their neutrals: $\langle A \rangle$ and $\langle \text{anti}A \rangle$ and $\langle \text{neut}A \rangle$), a new philosophy created by the Romanian researcher Florentin Smarandache [10]

In neutrosophy, to resolve the contradiction between opposites $\langle A \rangle$ and $\langle \text{anti}A \rangle$ (thesis and antithesis), the neutral $\langle \text{neutral}A \rangle$ contributes to one side or the other or both (neutrothesis). The contradiction is resolved in neutrosynthesis. Thus, the triad of dialectics (synthesis, thesis, and antithesis) is expanded to a quadruple by neutrosynthesis (thesis, antithesis, neutrothesis, and neutrosynthesis) providing a better reflection of reality.

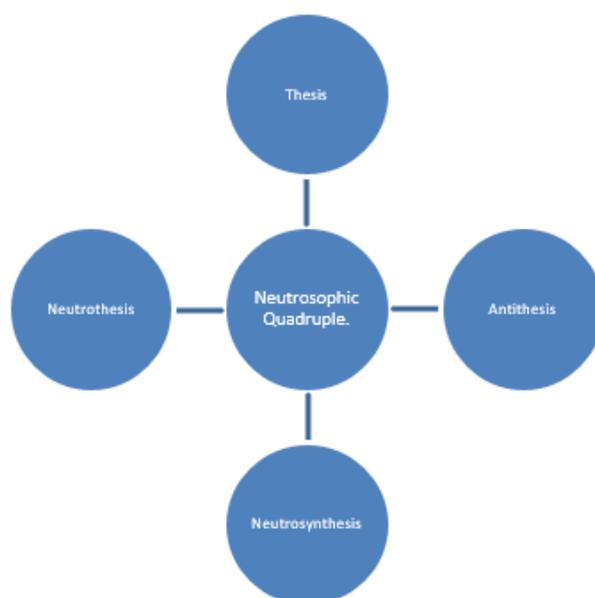


Figure 1. Neutrosophic Quadruple.

Neutrosophic Statistics extends the classical statistics, such that we deal with set values rather than crisp values. Neutrosophic Descriptive Statistics is comprised of all techniques to summarize and describe the neutrosophic numerical data characteristics and Neutrosophic Inferential Statistics consists of methods that allow the generalization from a neutrosophic sampling to a population from which it was selected the sample.

Neutrosophic Descriptive Statistics comprises all the techniques to summarize and describe the characteristics of neutrosophic numerical data [11]

To calculate the neutrosophic absolute frequency, as there is imprecise information, it is necessary to calculate the extremes (min and max) of the absolute or estimated frequencies.

$$\text{mín}_{f_n} = 15 + 20 + 25 + 10 = 70$$

$$\text{máx}_{f_n} = 15 + 30 + 25 + 24 = 84$$

Then, to calculate the neutrosophic relative frequencies, we must calculate the minimum and maximum values of these for each tabulated result. For this, the following formula will be applied:

$$\text{mín}_{f_{nri}} = \frac{\text{mín}_{f_{ni}}}{\text{máx}_{f_n}}, \text{ and } \text{máx}_{f_{nri}} = \frac{\text{máx}_{f_{ni}}}{\text{mín}_{f_n}}$$

For the case of frequencies that do not present indeterminacy, it is true that:

$$\text{mín}_{f_{ni}} = \text{máx}_{f_{ni}} = f_{ni}$$

The value of the accumulated neutrosophic relative frequency was obtained by adding the observed neutrosophic relative frequencies, for example:

$$Frna = [0.179, 0.214] + [0.238, 0.429] + [0.298, 0.357] + [0.119, 0.2] = [0.833, 1.2]$$

2 Materials and methods

The neutrosophic research method was used for the analysis and indeterminacy through the neutrosophic descriptive statistics [12-16]. The information obtained for the preparation of the research is from bibliographic information and the data collection through instruments that contain qualitative indicators. An observation record of the development of behavioral skills was also designed, both instruments with multiple alternatives.

For the information processing, as for the scientific papers, a careful reading of their key aspects was carried out, such as the objectives, the methodology, and the results obtained. This way it can be perceived how these documents can significantly contribute to the theoretical construction of this research its processing through the interpretive hermeneutical method to synthesize information and be able to know reality. On the other hand, for the information collected through observation, the Microsoft Excel program was used through the descriptive analysis of neutrosophic frequencies, to be able to analyze the data quantitatively and include the determination, and thus to be able to contrast results with regard to the problem.

Analysis of results

The information obtained from the observation is summarized below, including the indeterminacy of the observation process. In this table, you can see the ability to handle didactic tools for learning

Use alternative language (Sign Language, Braille, or Sign Language)		
	Frequency	Neutrosophic absolute frequency
Always	[2.4]	[0.143, 0.5]
Sometimes	[3.7]	[0.214, 0.875]
Never	3	[0.214, 0.375]
Total	[8.14]	[0.571, 1.75]

Table 1. Descriptive neutrosophic statistics on the use of teaching resources

The use of goes from 3 to 7 students who use it sometimes, never 3 and always from 3 to 4. The information is represented graphically below

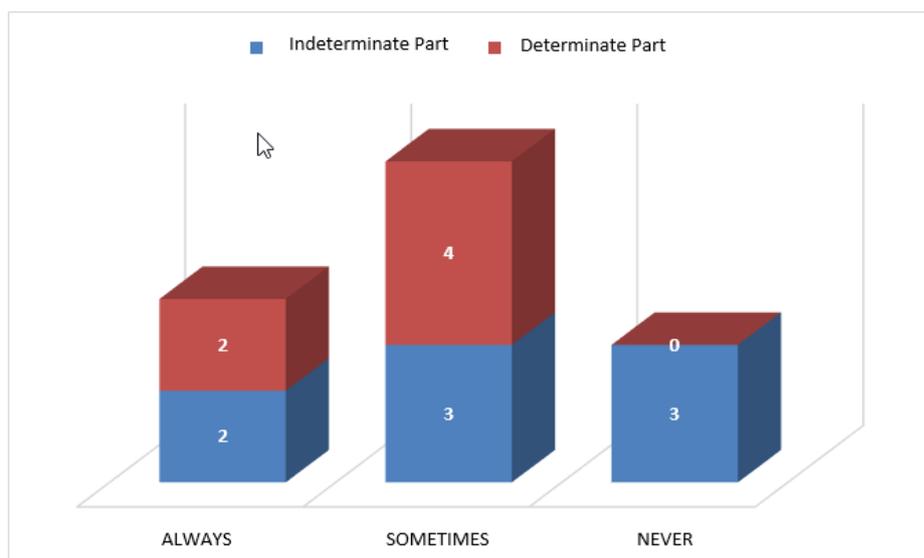


Figure 2. Descriptive neurosophic graph of use of teaching resources

This table shows the ability to read through the use of pictograms (logos, brands, or symbolic aspects).

Read pictographically (logos, brand, or symbolic locations)		
	Frequency	Neurosophic absolute frequency
Always	[2.6]	[0.143, 0.75]
Sometimes	3	[0.214, 0.375]
Never	[3.5]	[0.214, 0.625]
Total	[8.14]	[0.571, 1.75]

Table 2. Descriptive statistics of pictographic reading ability.

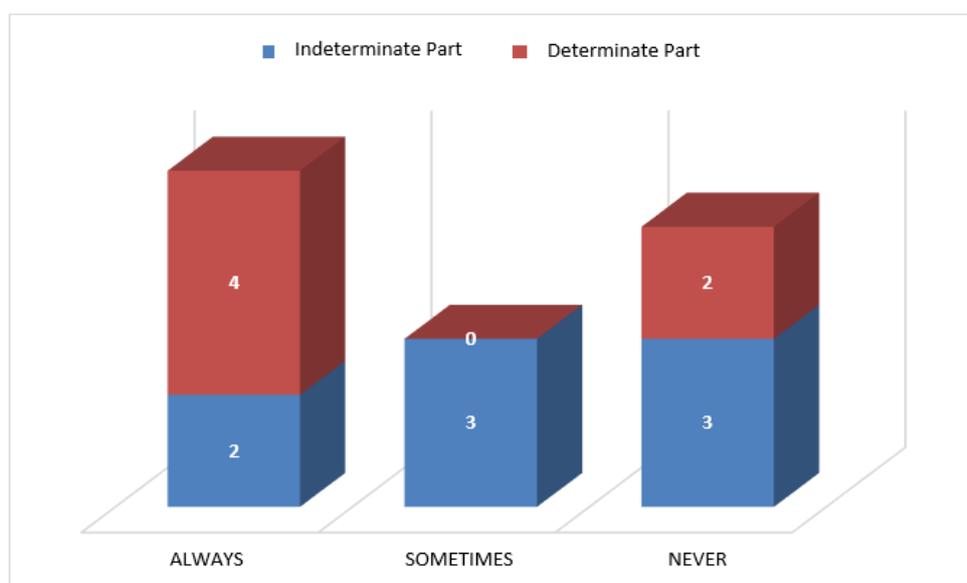


Figure 3. Neurosophic graph of pictographic reading ability.

Where 2-6 students always refer to making use of this methodology, and on the other hand, those who have never used 3 to 5, and finally there are those who sometimes use 3.

Discussion

Some investigations have analyzed this type of tool within the school context. For this, the authors [19] carried out a study on the various school activities that can most serve as a means of knowledge in students and selected reading. Their methodology was action research, for which they designed a blog and uploaded certain contents of a subject, after which the students were given the same physical material, as results were obtained that the students visited the web page more to read the content.

They conclude that the virtual environment in a correct adaptation and with attractants of interest such as the subjects taught captures people's attention, above the traditional reading media. This research agrees with the need for a better implementation of virtual activities for better learning.

Another research developed by [20] deals with trends in virtual education applied through the design of institutional platforms. His work focused on being able to locate educational institutions that promote virtual practice through the implementation of school and secondary activity using the online modality. Its research model was qualitative because it collected information from statistically proven facts, such as the effectiveness of the use of the platform, the new forms of interaction on the pages, the dissemination of information through social networks and the expansion of academic advertising in the Web.

Results indicate that few education centers allocate digital resources to complement the teaching process of students in the Latin American context. For this reason, the prevailing need to be able to promote and open spaces that allow increasing the interest and need for power is perceived connect education with virtuality.

Conclusions

Education in current times has had to reinvent itself, the modality that is being lived is nothing more than an approach that has had an unexpected impact on the student community, however, despite the sanitary conditions that are currently being experienced, it has become a unique choice to be able to continue with the studies.

The results obtained indicated an evident interest on the part of the students in being increasingly involved in the online modality, since, far apart from education in recent years, the increase in the use of technology has appropriated the interest and attention of people, nowadays in all ages. Therefore, implementing the educational model through this trend has not been a very complex work, but it is not very adaptive, due to the lack of a culture of participation in virtuality.

The use of the neutrosophic method and the neutrosophic statistics allow adequate management of the uncertainty and indeterminacy in the observation process. In future work, the use of new statistical methods based on neutrosophic theory will be proposed.

References

- [1] M. Sánchez, J. García y E. Steffens, «Estrategias Pedagógicas en Procesos de Enseñanza y Aprendizaje en la Educación Superior incluyendo Tecnologías de la Información y las Comunicaciones,» *Información tecnológica* 30(3), pp. 277-286, 2019.
- [2] J. Raigosa, J. Saldarriaga y V. Valderrama, «ESTRATEGIAS DE ENSEÑANZA DEL DOCENTE EN LAS ÁREAS BÁSICAS: UNA MIRADA AL APRENDIZAJE ESCOLAR,» *Revista Eleuthera* 21(2), pp. 13-33, 2019.
- [3] H. Cárcamo y C. Rodríguez, «Rol parental educativo: aproximación a las percepciones que poseen los futuros profesores,» *Educación y Educadores*, pp. 447-452, 2015.
- [4] I. García y G. Blanco, «Las guías didácticas: recursos necesarios para el aprendizaje autónomo,» *Revista Edumecentro* 6(3), pp. 162-175, 2017.
- [5] M. Grasso, L. Pagola y A. Zanotti, «Políticas de inclusión digital en argentina. usos y apropiaciones dentro y fuera de la escuela,» *Pixel-Bit. Revista de Medios y Educación*, pp. 97-101, 2017.
- [6] F. Cabañas, «Recursos educativos digitales para la educación infantil,» *Revista horizonte educativo* 24(12), pp. 20-34, 2015.
- [7] A. García, «Recursos digitales para la mejora de la enseñanza y el aprendizaje,» *Universidad de Salamanca* 12(4), pp. 1-23, 2018.
- [8] Á. M. Chacón, J. A. Ordóñez y A. M. Anichiarico, «Hacia el reconocimiento de la inclusión digital como un derecho fundamental en colombia,» *Vniversitas*, pp. 141-146, 2017.
- [9] J. Areth, J. Castro y H. Rodríguez, «La educación virtual en Colombia: exposición de modelos de deserción,» *Apertura*, pp. 3-5, 2015.
- [10] Smarandache F. The Neutrosophic Research Method in Scientific and Humanistic Fields. MULTISPACE & MULTISTRUCTURE. NEUTROSOPHIC TRANSDISCIPLINARITY. 2010:732.

- [11] Smarandache, Florentin. "Plithogenic Probability & Statistics are generalizations of MultiVariate Probability & Statistics." *Neutrosophic Sets & Systems* 43 (2021).
- [12] A. Abdel-Monem and A. Abdel Gawad, "A hybrid Model Using MCDM Methods and Bipolar Neutrosophic Sets for Select Optimal Wind Turbine: Case Study in Egypt," *Neutrosophic Sets and Systems*, vol. 42, pp. 1-27, 2021.
- [13] P. E. D. P. Franco, A. J. P. Palacio, and I. A. C. Piza, "Neutrosophic Hypothesis to validate a Reform Project to Article 87 of the General Organic Code of Processes of Ecuador," *Neutrosophic Sets and Systems*, vol. 37, pp. 316-322, 2020.
- [14] [G. A. Gómez, J. F. G. García, S. D. Á. Gómez, and F. Smarandache, "Neutrosophic Sociogram for Group Analysis," *Neutrosophic Sets and Systems*, vol. 37, pp. 417-427, 2020.
- [15] P. A. Mena Silva, A. Romero Fernández, and L. A. Granda Macías, "Neutrosophic Statistics to Analyze Prevalence of Dental Fluorosis," *Neutrosophic Sets and Systems*, vol. 37, pp. 160-168, 2020.
- [16] A. S. Molina, W. A. C. Calle, and J. D. B. Remache, "The application of Microsoft Solution Framework Software Testing using Neutrosophic Numbers," *Neutrosophic Sets and Systems*, vol. 37, pp. 267-276, 2020.
- [17] A. Razeto, «El involucramiento de las familias en la educación de los niños. cuatro reflexiones para fortalecer la relación entre familias y escuelas,» *Páginas de Educación*, pp. 7-9, 2016.
- [18] S. Belli y M. Reyes Monreal, «La experiencia de lo virtual en la educación digitalizada. Cuestiones de confianza en contextos educativos online.,» *RED. Revista de Educación a Distancia*, pp. 3-10, 2015.
- [19] J. Ballesta y R. Céspedes, «Educación para los medios en un entorno digital. Investigación-acción en Compensación Educativa,» *Revista Lasallista de Investigación* 13(1), pp. 156-165, 2016.
- [20] J. Rosales, «Tendencias didácticas de la educación virtual,» *Propósitos y Representaciones* 6(1), pp. 463-484, 2018.

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