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Abstract. This paper is dedicated to studying the stages that Telafer University has gone through at using E-learning. The challenges of converting traditional learning (i.e. classical learning with realistic student attendance in their teaching programs) to E-learning over google classrooms. The efforts to maintain the quality teaching and their outcomes were a very ambiguous experiment that led the authors after more than two years for spreading the Covid-19 Pandemic to evaluate the University's performance using the most modern mathematical tools in uncertainty systems that called the Neutrosophic theory and logic. Finally, the flexibility of the neutrosophic mathematical methods has been applied to analyze the recorded issued data of E-learning in the University.

Keywords: E-Learning in Telafer University, Neutrosophic Theory, Neutrosophic Logic, Neutrosophic Soft Sets, Comparison Matrix.

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1. Introduction

Telafer University has been established since 2014, exactly after four months of establishing Telafer university, civilians suffered from forced immigration because of the ISIS occupation. this led to the infrastructures of the university have vanished. However, now we do all administrative issues and teaching tasks in alternative buildings despite challenges and bad situations.

At the beginning of quarantine in Iraq (i.e. Feb. 28, 2020) Telafer University represented by all academic staff, and their employees were eager to provide a private electronic platform for all facilities of the university, since the spread of the COVID-19 pandemic, the providing of private virtual platform was an urgent requirement to reconvert the traditional teaching to remote e-learning for enabling the teachers and students to communicate smoothly. However, the console of Telafer University's platform has been administrated by the team of engineering that they enable to provide almost all supporting programs for both teachers and students to avoid any lacking in the teaching procedures, as well as the private domain for the university has the extension (@uotelafer.edu.iq) to use the Google Workspace. The committee of e-learning in Telafer University has equipped e-mails accounts within the domain of the university to all students and the university's members, as well as, they uploaded all lecturers (either synchronous or non-synchronous lectures) for the academic staff to the google classrooms, the university e-learning council guided the examinations committees in the scientific departments by follow up the google classrooms to present help for the teachers and students at holding the examinations and any other logistic help for them.

The neutrosophic theory, neutrosophic probability, neutrosophic sets, neutrosophic mathematical programming and neutrosophic logic have firstly originated by the polymath Florentin Smarandache, the mathematical professor in New Mexico University at 1995 by his first publications [1- 4], the main notion that neutrosophic theory stands on is that every problem can be formulated by three functions, truth function, indeterminacy function and its falsity function, this broad insight gives the neutrosophic theory the flexibility and wide ability to analyses the data giving problems solving in new modern mathematics, the following example regarded as a good demo for the readers to understand how the neutrosophic logic and theory can view and solve the problems.

The example that firstly stated in [5], Let's consider the population of a country $C1$. Most people in this country have only the citizenship of the country, therefore they belong 100% to $C1$. But there are people that have double citizenships, of countries $C1\ and\ C2$. Those people belong 50% to $C1$, and 50% to $C2$. While citizens with triple citizenships of countries $C1, C2$, and $C3$ belong only 33.33% to each country. Of course, considering various criteria these percentages may differ. Also, there are countries with autonomous zones, whose citizens in these zones may not entirely consider

themselves as belonging to those countries. But there is another category of people that have been stripped from their $C1$ citizenship for political reasons and they have other citizenship, while still living (temporarily) in $C1$. They are called paria, and they do not belong to $C1$ (not having citizenship), but still belong to $C1$ (because they still living in $C1$). They form the indeterminate part of neutrosophic population of country $C1$.

This paper has been arranged to recognized the performance of the scientific departments in the colleges of Telafer University in Iraq versus to its efforts in e-learning and how these departments implementation the new methods of remote teaching, where the section 2 has been dedicated to the basic mathematical notions which represents the basic tools for the next section, while section 3 represents the core of the article containing a case study using collected data for three studying courses during the spread of COVID-19 pandemic

2. Mathematical Preliminaries

In this section, the authors will focus on recalling the essential mathematical tools that should be used in the upcoming section to make a fairly estimation to evaluate the performance of the e-learning at Telafer University, it is worthy to know the notions of the neutrosophic soft sets where the soft set theory was firstly introduced by D. Molodtsov at 1999 [7], while the neutrosophic soft set was set up by P. K. Maji at 2013 [8], also there are some other definitions as follows:

2.1 Definition [6]

A neutrosophic set A on the universe of discourse X is defined as $A = \{< x, T_A(x), I_A(x), F_A(x) > , x \in X\}$, where $T, I, F: X \rightarrow]^{-}0, 1^{+}[$ and $^{-}0 \leq T_A(x), +I_A(x) + F_A(x) \leq 3^{+}$.

From philosophical point of view, the neutrosophic set takes the value from real standard or non-standard subsets of $]^{-}0, 1^{+}[$. But in real life application in scientific and engineering problems it is difficult to use neutrosophic set with value from real non-standard subset of $]^{-}0, 1^{+}[$. Hence we consider the neutrosophic set which takes the value from the subset of $[0,1]$.

2.2 Definition [7] Let U be an initial universe set and E be a set of parameters. Let $P(U)$ denotes the power set of U. Consider a nonempty set $A, A \subset E$. A pair (F, A) is called a soft set over U, where F is a mapping given by $F: A \rightarrow P(U)$.

2.3 Definition [8]

Let U be an initial universe set and E be a set of parameters. Consider $A \subset E$. Let $P(U)$ denotes the set of neutrosophic sets of U. The collection (F, A) is termed to be the soft neutrosophic set over U, where F is a mapping given by $F: A \to P(U)$.

The following definitions have been adapted to consider the upcoming case study section in which the best scientific department in Telafer University who can apply the strategical of e-learning in their classes to get the best performance in the studying pedagogy. In this paper we have six numbers of parameters out of five numbers of studying fields (i.e. Mathematics, Arabic Language, General Nursing, Field Crops, Animal Production). We still have the assumptions that the parameters are $d_1, d_2, d_3, d_4, d_5, and\ d_6$, while the scientific departments are $u_1, u_2, u_3, u_4, and\ u_5$.

2.4 Definition [8]

A comparison matrix is a matrix whose rows labelled by the object names $d_1, d_2, d_3, d_4, d_5, d_6$ and the columns are labelled by the parameters u_1, u_2, u_3, u_4, u_5. The entries c_{ij} are calculated by $c_{ij} = a + b - c$, where $'a'$ is the integer calculated as ' how many times $T_{d_i}(u_j)$ exceeds or equal to $T_{d_k}(u_j)'$, for $d_i \neq d_k, \forall\ d_k \in U$, 'b' is the integer calculated as ' how many times $I_{d_i}(u_j)$ exceeds or equal to $I_{d_k}(u_j)'$ for $d_i \neq d_k, \forall\ d_k \in U$ and 'c' is the integer calculated as ' how many times $F_{d_i}(u_j)$ exceeds or equal to $F_{d_k}(u_j)'$, for $d_i \neq d_k, \forall\ d_k \in U$.

2.5 Definition [8]

The score of an object d_i is S_i and is calculated as $S_i = \sum_j c_{ij}$, then the most appropriated or best selection of an object u_j which own to the maximum value of S_i.

3. Algorithm

The following algorithm will be the basic road map for the upcoming case study in section 4,

Step-1- Consider the logical parameters $D = \{d_1, d_2, d_3, d_4, d_5, d_6\}$.

Step-2- Consider the department names $u = \{u_1, u_2, u_3, u_4, u_5\}$.

Step-3- Compute all $T_{d_1}, \dots, T_{d_6}, I_{d_1}, \dots, I_{d_1}, F_{d_1}, \dots, F_{d_6}$ for all departments u_1, u_2, u_3, u_4, u_5, the result of this computation step are 30 elements of the kind $(T_{d_j}(u_i), I_{d_j}(u_i), F_{d_j}(u_i))$.

Step -4- For each column j=1,2,3,4,5,6 compute how many times that the $\boldsymbol{T_{d_k} \geq T_{dj}\ \forall\, k \neq j}$ $\boldsymbol{(1)}$, consider $''\,a\,''$ is the times for the satisfaction of condition (1).

Step -5- For each column j=1,2,3,4,5,6 compute how many times that the $\boldsymbol{I_{d_k} \geq I_{dj}\ \forall\, k \neq j}$ $\boldsymbol{(2)}$, consider $''\,b\,''$ is the times for the satisfaction of condition (2).

Step -6- For each column j=1,2,3,4,5,6 compute how many times that the $\boldsymbol{F_{d_k} \geq F_{dj}\ \forall\, k \neq j}$ $\boldsymbol{(3)}$, consider $''\,c\,''$ is the times for the satisfaction of condition (3).

Step-7- Compute $''\,a+b-c\,''$ that have been considered for all departments of the table 2.

Step- 8- The score of the performance for each department is the summation of the corresponding row in table (2). The results of these summations labeled in table (3).

Step -9- Reorder the best performance to the poor performance depending upon the scores of these departments from maximum score to the minimum score.

Step -10- End

4. Case Study to Evaluate the Performance of Telafer University in E-learning

This section has been originated to summarize the performance of the e-learning in five scientific departments (math dept., Arabic language dept., general nursing dept., animal production dept., and fields crops dept.) belonging to three colleges (College of Basic Education, College of Nursing, and College of Agriculture) in Telafer University during the spread of COVID-19 pandemic and its several mutations through the time period from Feb. 28, 2020, to present, where the coronavirus actually entered to Iraq since Feb. 2020, and the quarantine processes were applied which led the Iraqi universities to adopt the e-learning.

4.1 Example

Let U be the set of five Scientific Departments in three colleges of Telafer University as follow:

$u = \{u_1, u_2, u_3, u_4, u_5\}$ where

u_1 represents the department of general nursing.

u_2 represents the department of Arabic language.

u_3 represents the mathematical dept.

u_4 represents the animal's production dept.

u_5 represents the field crops dept.

Let $D = \{d_1, d_2, d_3, d_4, d_5, d_6\}$ be the set of parameters, where each parameter is a neutrosophic sentence involving neutrosophic words defining as follow:

d_1= The percentage of the internet speed for the districts of the students' resident and it was ranged between (zero to 2.69 Mbps) depending upon the information that available in the website (https://www.cable.co.uk/broadband/speed/worldwide-speed-league/)

d_2 = The percentage of the students' attendance in the whole e-lectures through the studying course.

d_3 = Designing the e-lectures and harmonising them with principles of pedagogy and set up interactive courses.

d_4= The percentage of the syllabus coverage through the whole course by the lecturers.

d_5= The procedure that taken to reduce cheating during the performance of students' electronic examinations.

d_6 = Percentage of student satisfaction by launching questionnaires to measure the students' understanding for the e-lectures.

Table 1: This table demonstrates the performance of all scientific departments in e-learning using neutrosophic soft sets.

U \ D	d_1	d_2	d_3	d_4	d_5	d_6
u_1	(0.8, 0.6, 0.1)	(0.7, 0.5, 0.2)	(0.6, 0.4, 0.3)	(0.85, 0.53, 0.12)	(0.4, 0.9, 0.5)	(0.7, 0.51, 0.4)
u_2	(0.75, 0.55, 0.16)	(0.63, 0.5, 0.25)	(0.3, 0.6, 0.4)	(0.81, 0.37, 0.29)	(0.42, 0.87, 0.56)	(0.9, 0.4, 0.14)
u_3	(0.9, 0.44, 0.05)	(0.99, 0.16, 0.12)	(0.89, 0.4, 0.33)	(0.75, 0.44, 0.17)	(0.6, 0.49, 0.33)	(0.64, 0.7, 0.85)
u_4	(0.72, 0.57, 0.3)	(0.66, 0.3, 0.99)	(0.32, 0.53, 0.99)	(0.77, 0.49, 0.18)	(0.2, 0.4, 0.9)	(0.67, 0.57, 0.41)
u_5	(0.73, 0.61, 0.32)	(0.76, 0.45, 0.82)	(0.35, 0.44, 0.83)	(0.64, 0.77, 0.32)	(0.34, 0.52, 0.69)	(0.71, 0.61, 0.39)

Table 2: This table demonstrates the comparison matrix in the neutrosophic soft sets (u, D)

D / u	d_1	d_2	d_3	d_4	d_5	d_6
u_1	5	5	4	7	5	1
u_2	1	2	2	0	4	3
u_3	4	4	4	1	5	0
u_4	-1	-2	0	2	-4	0
u_5	1	2	-1	0	0	4

Table 3: The score of performance in each department u_i , where the values are the summation of each row for the above comparison matrix:

U	sum
u_1	27
u_2	12
u_3	18
u_4	-5
u_5	6

These values illustrate that the best performance in the e-learning issue was for the general nursing department which has 27 degrees, while in the second level was for the mathematical department, in the third grid was the department of the Arabic language. It is worthy to note that the department of animals' production which is one of agriculture college departments should review the strategy of teaching and trying to improve it.

4 Conclusion

This paper comes as an urgent need due to the ongoing global quarantine situation in the COVID-19 pandemic. where Telafer University's procedures in converting traditional learning to e-learning faced many challenges in different trends as qualifying the teaching staff, students and providing an electronic learning platform for the university, also edification in spreading the ethics of the e-learning, all these reasons led the authors to use the most modern mathematical logic that named Neutrosophic Theory to analyses the data which has been collected during the period Feb. 2020 to present, this article gave analysis, good feedback and deep insight to evaluate the experiment of e-learning in Telafer University.

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References

[1] Smarandache F., 1995. ''Neutrosophic Logic and Set''.

[2] F. Smarandache 1998. ''Neutrosophy. Neutrosophic Probability, Set, and Logic'', Amer. Res. Press, Rehoboth, USA, 105.

[3] F. Smarandache & Huda E. Khalid, 2018. "Neutrosophic Precalculus and Neutrosophic Calculus". Second enlarged edition, Pons asbl 5, Quai du Batelage, Brussels, Belgium, European Union.

[4] F. Smarandache, H. E. Khalid & A. K. Essa, 2018. "Neutrosophic Logic: The Revolutionary Logic in Science and Philosophy", Proceedings of the National Symposium, EuropaNova, Brussels.

[5] F. Smarandache, 2014. "Introduction to Neutrosophic Statistics'', Sitech & Education Publishing.

[6] F. Smarandache, Neutrosophic set, a generalization of the intuitionistic fuzzy sets, Inter. J. Pure Appl. Math. 24 (2005) 287-297.

[7] Molodtsov D., 1999. ''Soft set theory-first results'', Computers & Mathematics with Applications 37(4/5), 19 – 31, DOI: 10.1016/s0898-1221(99)00056-5.

[8] Maji P. K., 2013. ''Neutrosophic soft set'', Annals of Fuzzy Mathematics and Informatics, 5(1), 157-168.

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