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CLUSTER ANALYSIS TO DETERMINE THE RELATIONSHIP BETWEEN USE OF ICT AND ICT LITERACY

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ABSTRACT

This work was aimed at determining the relationship between use of ICT and ICT literacy, and the academic level of a group of teachers who develop their academic activities at a university in the city of Sincelejo, Department of Sucre, Colombia. A cluster analysis was applied with the KNN or K methods, closest neighbors, using the Metric Distance or Euclidean Distance as a measure of similarity. The information was collected through a survey applied to a sample of 354 teachers from the Municipality of Sincelejo, to inquire about the knowledge and skills they possess regarding the use of ICT and ICT LITERACY. As a result, it was possible to establish that there is no obvious pattern of correlation between the variables corresponding to the dimension "Use of ICT and Technology Literacy" and the Level of Training of University Teachers. In all the variables that make up the analyzed dimension, the scores of the Teachers varied independently of their professional training, which is reflected in the fact that several Teachers with Doctoral or Master's Training recorded a Low or Nil rating in both variables, while other Teachers, with Basic Professional Training or Specialization, reached Very High qualifications in the same variables

I. INTRODUCTION

The technological revolution and especially the vertiginous advance that Information and Communication Technologies (ICT) have experienced in recent years, together with the appearance of the so-called knowledge society, have highlighted the need for digital literacy to individuals in general terms and in a particular way for university teachers, protagonists, together with students of the teaching-learning process within university institutions (Perera-Cumera&Veciana-Pita, 2013), (Rangel Baca &Peñalosa Castro , 2013), (Marín, V., Vázquez, aI, Llorente, MC &Cabero, 2012).

The context described above implies that the teacher, in addition to having disciplinary, professional, and psycho-pedagogical competences, must have digital competences that allow them to plan, design and manage virtual spaces that facilitate the learning-teaching process (Aguirre Aguilar & Ruiz Méndez, 2012). In the words of (Carrera Farran& L., 2012) the university teacher must have a set of knowledge, skills, attitudes and strategies that allow them to put the tools offered by ICT at the service of their students' learning. In this regard, (Mas Torelló&Pozos Pérez, 2012) consider it necessary to establish a pedagogical competence profile of the university teacher, which includes digital competences in a transversal way; taking into account that this profile is essential to improve teaching and institutional quality, and that it is taken into account in the selection, promotion and training processes of said group.

According to (Fernández Márquez et al., 2018) today's society is immersed in a context of technological globalization. The use of technology as a means has invaded all areas (CastellanosAdarme et al., 2018); Therefore, for (Pérez et al., 2017), in the current educational context, digital competence could be described as one of the key competences of teaching, which implies the creative, critical and safe use of ICT, to achieve the objectives related to work activities, employability, learning-teaching, the use of free time and the development of independent activities, inclusion and participation in society. In this regard, (Jean & Jessica, 2016) suggests that the integration of ICT in university curricula helps to optimize student learning and achieve a qualitative improvement in teaching strategies.

The antecedents described show that, around the digital competences of university teachers, an academic and scientific discourse has been woven that starts from the premise that the teacher must hold, in addition to disciplinary and pedagogical competences, digital competences, which must put at the service of teaching-learning processes, but the Covid-19 pandemic has exacerbated the need for teachers to effectively hold these skills, in this sense, it is pertinent to ask: What is the level of literacy in the use of ICT of university teachers in the city of Sincelejo?, and How is the relationship between the use of ICT and the level of literacy in ICT and the level of professional training of university teachers in the city of Sincelejo?.

The purpose of this work was aimed at determining the relationship between the use of ICT and technological literacy and the academic level of a group of teachers who develop their academic activities in the city of Sincelejo, Department of Sucre, Colombia, through a cluster analysis. The cluster analysis has been used in multiple and varied studies, the work carried out by (Aguado-Moralejo, I., Echebarría, C., &Legarreta, JM, 2019) is evidence of this, in which they applied a cluster analysis for the study of social segregation in the municipality of Bilbao in Spain, in order to carry out a characterization and taxonomy of the neighborhoods of Bilbao from the treatment and purification of different statistical sources: local, regional and national. Their analysis suggested that it is the variables related to income and

immigration status that, fundamentally, condition said segregation. The identification of the different types of neighborhoods would allow reorienting local policies to try to solve the affected areas.

II. METHODOLOGY

A survey was applied to a sample of 354 teachers from the city of Sincelejo, to inquire about the knowledge and skills they possess, regarding the use and technological literacy. The dimension "Use and Technological Literacy" has 45 variables, which are mentioned below:

- Knowledge and use of the basic components of ICT: [Peripheral elements]; Knowledge and use of the basic components of ICT: [External storage (hard disk, USB)]; Knowledge and use of the basic components of ICT: [Blackboards or digital boards]; Knowledge and use of the basic components of ICT: [Digital projectors]; Knowledge, use and management of the operating system [Word processors]; Knowledge, use and management of the operating system [Images and presentations].
- Knowledge, use and management of the operating system [Spreadsheets]; Knowledge, use and management of the operating system [Databases]; Use of the web and its basic tools [Email and distribution lists]; Use of the web and its basic tools [Browsers and search engines]; Use of the web and its basic tools [File sharing tools]; Knowledge and use of social networks [Facebook].
- Knowledge and use of social networks [Instagram]; Knowledge and use of social networks [WhatsApp]; Knowledge and use of social networks [Twitter]; Management and distribution of resources through web 2.0 applications [Blogs]; Management and distribution of resources through web 2.0 applications [Wikis]; Management and distribution of resources through web 2.0 applications [Forums].
- Management and distribution of resources through web 2.0 applications [VideoBlogs]; Online presentations; Management and use of tools and storage within cloud environments [Google Drive]; Management and use of tools and storage within cloud environments [Dropbox]; Management and use of tools and storage within cloud environments [iCloud]; Management and use of tools and storage within cloud environments [Office 365 and SkyDrive].
- Management and use of tools and storage within cloud environments [Other]; Knowledge of social bookmarking to share information and resources [Delicious, Mister Wong, Diigo]; Knowledge of social bookmarking to share information and resources [Netvibes, Feed Reader, Digg Reader, RSS Owl]; Knowledge and use of management platforms [Moodle]; Knowledge and use of management platforms [Blackboard, WebCT]; Knowledge and use of management platforms [Microsoft Team].
- Knowledge and use of management platforms [Other virtual platforms]; Management of device protection software and care in data protection; Mastery of databases and thesauri in the search for information; Knowledge and use of tools for creating QR codes; Knowledge of Personal Learning Environments; Use of ICT in a collaborative way.
- Preparation of materials through presentations, multimedia, videos, podcasts, others.; Knowledge of copyright and intellectual property; Management of bibliographic managers (Zotero, Mendeley, Refworks); Effective search and discrimination of relevant information on the web; Management and online publishing tools [Picassa]; Management and online publishing tools [Pinterest].

- Management and online publishing tools [Instagram]; Management and online publishing tools [Flickr]; Management and online publishing tools [SlideShare].
- Management and distribution of resources through web 2.0 applications [VideoBlogs]; Online presentations; Management and use of tools and storage within cloud environments [Google Drive]; Management and use of tools and storage within cloud environments [Dropbox]; Management and use of tools and storage within cloud environments [iCloud]; Management and use of tools and storage within cloud environments [Office 365 and SkyDrive].
- Management and use of tools and storage within cloud environments [Other]; Knowledge of social bookmarking to share information and resources [Delicious, Mister Wong, Diigo]; Knowledge of social bookmarking to share information and resources [Netvibes, Feed Reader, Digg Reader, RSS Owl]; Knowledge and use of management platforms [Moodle]; Knowledge and use of management platforms [Blackboard, WebCT]; Knowledge and use of management platforms [Microsoft Team].
- Knowledge and use of management platforms [Other virtual platforms]; Management of device protection software and care in data protection; Mastery of databases and thesauri in the search for information; Knowledge and use of tools for creating QR codes; Knowledge of Personal Learning Environments; Use of ICT in a collaborative way.
- Preparation of materials through presentations, multimedia, videos, podcasts, others; Knowledge of copyright and intellectual property; Management of bibliographic managers (Zotero, Mendeley, Refworks); Effective search and discrimination of relevant information on the web; Management and online publishing tools [Picassa]; Management and online publishing tools [Pinterest].
- Management and online publishing tools [Instagram]; Management and online publishing tools [Flickr]; Management and online publishing tools [SlideShare].

The teachers surveyed have various levels of academic training among which are: Undergraduate, Specialist, Master, Doctor and Postdoctoral.
According to the knowledge and ability they possess in managing each of the variables that make up said dimension, a score is assigned that ranges from 1 to 4 and has the following interpretation:

1 = Null
2 = Low
3 = High
4 = Very High

To determine the relationship between the levels of teacher training and the scores obtained in each of the 45 variables that make up the "Use and Technological Literacy" dimension, a cluster analysis was applied with the KNN or K-plus neighbor methods. close, using as a measure of dissimilarity the Metric Distance or Euclidean Distance, whose equation according to (Johnson, D. 1998) is:

$$d_{rs} = [(X_r - X_s)'(X_r - X_s)]^{\frac{1}{2}}$$

Where:
d_{rs}, is the distance between points r and s.
X_r, is point r.
X_s,is point s.

The nearest neighbor method according to [1] is carried out as follows:

a) We start with N clusters, where each of them contains exactly one given point.
b) The two closest points are linked according to one of the three selected distance measures, which are the Metric Distance, Standardized Metric Distance and Mahalanobis Distance.
c) The distance between this new grouping and any other point is defined, as the minimum distance between the two points of the grouping and this point.
d) The groupings that are closest to each other continue to be combined, so that, in each stage, the number of groupings is reduced by one and the distance between any two of them is always defined as the distance between their closest members.

Thus, the nearest neighbor method starts with N clusters, each containing one observation and continues combining the points and clusters until all the observations are in a single cluster.

III. ANALYSIS OF RESULTS

Table 1 shows the percentages of the data that were selected to perform the corresponding partition and thus be able to apply the KNN technique for their classification. 73.7% of the data were selected as training while 26.3% of them were used as test or reserve data.

Table 1. Summary of case processing

		N	%
Sample	Training	261	73,70%
	Reservation	93	26,30%
Valid		354	100,00%
Excluded		0	
Total		**354**	

The following graphs show the groups that were formed according to each of the variables evaluated, the maximum academic level reached by the teacher and their scores in each of them:

Graph 1. Homologous Graph 1

	PERIPHERALS		
4	Masters		Masters
4	Masters	Masters	Masters
3			
3	Masters	Masters	Masters
2	Specialization		Masters
2	Masters	Masters	Masters
1		Masters	Masters

	EXTERNAL STORAGE		
4			
4	Specialization	Masters	Professional
3			
3		Masters	Masters
2	Postdoc		Professional
2		Masters	Masters
1	Postdoc		

	DIGITAL BOARD		
4	Professional		Professional
4		Masters	
3			
3	Masters	Doctorate	Masters
2			
2	Masters	Specialization	
1	Professional		Masters

	DIGITAL PROJECTOR		
4			Masters
4	Specialization	Masters	
3			
3		Masters	Postdoc
2	Masters		
2	Masters	Masters	Masters
1	Specialization	Masters	Masters

	TEXT PROCESSOR		
4			Masters
4	Specialization	Masters	Masters
3			
3	Professional	Professional	Masters
2	Masters	Masters	Masters
2		Masters	
1	Specialization	Masters	Masters

	IMAGE PRESENTATION		
4	Masters		
4	Professional	Masters	Specialization
3	Masters	Doctorate	Masters
3	Masters	Specialization	Doctorate
2	Masters	Masters	
2			Postdoc
1			

As can be seen in the homologous graph 1 (Graph 1), with respect to "Knowledge and use of the basic components of ICT: [Peripheral elements]", some teachers with master's degree training obtain a null score in this variable, while other teachers also with training in masters and specialization obtain a low qualification; In the same way, other teachers with a master's degree obtain a high qualification and other teachers with a master's degree also obtain a very high qualification in this variable.

Regarding "Knowledge and use of the basic components of ICT: [External storage (hard drives, USB)]", a teacher with doctoral training obtains a null score in this variable, other teachers with professional training, master's and postdoctoral degrees obtain a low score on this variable; while, other teachers with master's degree training obtain a high qualification and others with professional training, specialization and master's degree obtain a very high qualification in this variable.

Regarding "Knowledge and use of the basic components of ICT: [Blackboards or digital boards]", some teachers with professional training, specialization and master's degrees, obtain a null score in this variable, while other teachers with training in Master's degree obtains a low qualification in this variable, in the same way, other teachers with master's and doctorate training obtain a high qualification and other teachers with professional and master's training obtain a very high qualification in this variable.

Regarding the variable "Knowledge and use of the basic components of ICT: [Digital projectors]", some teachers with specialization and master's training obtain a null score in this variable, other teachers with master's training obtain a low score in this variable; while, other teachers with master's and post-doctorate training obtain a high score and other teachers with specialization and master's training obtain a very high score in this variable.

Regarding the variable "Knowledge, use and management of the operating system [Word processors]", some teachers with specialization and master's training obtain a null score in this variable, while other teachers with master's training obtain a qualification low in this variable, others with professional training and masters obtain a high qualification and other

teachers with specialization and masters training obtain a very high qualification in this variable.

Regarding "Knowledge, use and management of the operating system [Images and presentations]", some teachers with postdoctoral training obtain a low score in this variable, other teachers with specialization, master's and doctorate training obtain a high score and other teachers with professional training, specialization, master's and doctorate obtain a very high score in this variable.

Graph 2. Homologous Graph 2.

	SPREADSHEET		
4	Masters		
4		Specialization	Professional
3			
3	Professional	Masters	Masters
2			
2	Masters	Masters	Masters
1	Professional		Specialization

	DATABASES		
4	Masters		Professional
4		Specialization	
3			
3	Specialization	Masters	Specialization
2	Masters		
2		Specialization	Masters
1	Masters		Masters

	EMAIL BROADCASTING LISTS		
4		Doctorate	
4	Doctorate	Masters	Masters
3			
3	Masters	Doctorate	Masters
2			Masters
2	Specialization	Masters	Masters
1	Masters	Masters	Specialization

	SEARCH ENGINE		
4			
4	Professional	Masters	Specialization
3			
3		Masters	Specialization
2	Doctorate		Masters
2	Masters	Masters	Postdoc
1			

	EXCHANGE OF FILES		
4			Masters
4	Specialization	Masters	Masters
3			
3	Doctorate	Specialization	Masters
2	Specialization		
2	Masters	Masters	Masters
1	Masters		Specialization

	FACEBOOK		
4		Masters	
4	Professional	Masters	Masters
3			
3	Masters	Specialization	Masters
2	Specialization		Masters
2	Masters	Doctorate	Doctorate
1			

As can be seen in the homologous graph 2 (Graph 2), as can be observed with respect to "Knowledge, use and management of the operating system [Spreadsheets]", some teachers with professional training, specialization and master's degree obtain a Null qualification in this variable, while other teachers also with master's degree training obtain a low qualification; in the same way, other teachers with professional training and masters obtain a high qualification and other teachers with professional training, specialization and masters, obtain a very high qualification in this variable.

Regarding "Knowledge, use and management of the operating system [Databases]", some teachers with master's degree training obtain a null score in this variable, other teachers with specialization and master's training obtain a low score in this variable; while, other teachers with training in specialization and masters obtain a high qualification and others with professional training, specialization and masters obtain a very high qualification in this variable.

With regard to “Use of the web and its basic tools [Email and distribution lists]”, some teachers with specialization and master's training obtain a null score in this variable, while other teachers with specialization training and Master's degree obtain a low score in this variable, in the same way, other teachers with master's and doctorate training obtain a high qualification and other teachers with master's and doctorate training obtain a very high score in this variable.

Regarding the variable "Use of the web and its basic tools [Explorers and search engines]", some teachers with master's, doctorate and post-doctorate training obtain a low score on this variable, other teachers with specialization and master's training obtain a high qualification and others with professional training, specialization and masters obtain a very high qualification in this variable.

With regard to the variable "Use of the web and its basic tools [File exchange tools]", some teachers with specialization and master's training obtain a null score in this variable, while other teachers with specialization training and Master's degrees obtain a low qualification in this variable, others with training in specialization, masters and doctorates obtain a high qualification and other teachers with training in specialization and masters obtain a very high qualification in this variable.

Regarding "Knowledge and use of social networks [Facebook]", some teachers with training in specialization, master's and doctorate obtain a low score in this variable, other teachers with training in specialization and master's obtain a high score and other teachers with professional training and master's degrees obtain a very high rating on this variable.

Graph 3. Homologous Graph 3.

	INSTAGRAM		
4		Masters	
4	Professional	Masters	Masters
3			
3	Masters	Specialization	Specialization
2	Masters		
2	Specialization	Doctorate	Masters
1			Masters

	WHATSAPP		
4			
4	Professional	Masters	Specialization
3			
3	Masters	Masters	Masters
2	Masters	Masters	Masters
2		Masters	Specialization
1	Doctorate		

	TWITTER		
4			
4	Specialization	Masters	Professional
3			
3	Masters	Masters	Specialization
2			Masters
2	Masters	Postdoc	Masters
1	Masters		Masters

	BLOGS		
4	Masters		
4	Masters	Masters	Specialization
3			
3	Postdoc	Professional	Masters
2			
2	Specialization	Masters	
1			Doctorate

	WIKIS		
4	Masters		
4	Doctorate	Masters	Masters
3			Specialization
3	Masters	Specialization	Masters
2			
2	Professional	Masters	Masters
1			Masters

	FORUMS		
4			
4	Specialization	Masters	Specialization
3			
3	Masters	Doctorate	Masters
2	Specialization		Doctorate
2	Postdoc	Masters	
1			Specialization

As can be seen in the homologous graph 3 (Graph 3), with respect to “Knowledge and use of social networks [Instagram]”, some teachers with master's degree training obtain a null score in this variable, while other teachers with training in specialization, masters and doctorates obtain a low qualification; In the same way, other teachers with specialization and master's

degrees obtain a high qualification and other teachers with professional and master's degrees obtain a very high qualification in this variable.

In what has to do with "Knowledge and use of social networks [WhatsApp]", a teacher with doctoral training obtains a null score in this variable, other teachers with specialization and master's training obtain a low score in this variable; while other teachers with a master's degree obtain a high qualification and others with professional training, specialization and a master's degree obtain a very high qualification in this variable.

Regarding “Knowledge and use of social networks [Twitter]”, some teachers with master's training obtain a null score in this variable, while other teachers with master's and post-doctorate training obtain a low score in this variable, in the same way, other teachers with training in specialization and masters obtain a high score and other teachers with professional training, specialization and masters obtain a very high score in this variable.

With respect to the variable "Management and distribution of resources through web 2.0 applications [Blogs]", a teacher with doctoral training obtains a null score in this variable, while other teachers with specialization and master's training obtain a low score in this variable, others with professional, master's and post-doctorate training obtain a high qualification and other teachers with specialization and master's training obtain a very high qualification in this variable.

With regard to the variable “Management and distribution of resources through web 2.0 applications [Wikis]”, a teacher with a master's degree obtained a null score in this variable, while other teachers with professional training and a master's degree obtain a qualification low in this variable, other teachers with specialization and master's training obtain a high qualification and other teachers with masters and doctorate training obtain a very high qualification in this variable.

In what has to do with "Management and distribution of resources through web 2.0 applications [Forums]", a teacher with training in specialization obtained a null score in this variable, other teachers with training in specialization, master's degree, and post-doctorate obtain a low score on this variable; while other teachers with master's and doctorate training obtain a high rating and other teachers with specialization and master's training obtain a very high rating on this variable.

Similarly, in the homologous graphs 4, 5, 6, 7 and 8, the distribution of the academic levels achieved by the teachers can be seen, with their respective scores in each of the variables that appear in the following order:

Management and distribution of resources through web 2.0 applications [VideoBlogs]; Online presentations; Management and use of tools and storage within cloud environments [Google Drive]; Management and use of tools and storage within cloud environments [Dropbox]; Management and use of tools and storage within cloud environments [iCloud]; Management and use of tools and storage within cloud environments [Office 365 and SkyDrive].

Management and use of tools and storage within cloud environments [Other]; Knowledge of social bookmarking to share information and resources [Delicious, Mister Wong, Diigo]; Knowledge of social bookmarking to share information and resources [Netvibes, Feed

Reader, Digg Reader, RSS Owl]; Knowledge and use of management platforms [Moodle]; Knowledge and use of management platforms [Blackboard, WebCT]; Knowledge and use of management platforms [Microsoft Team].

Knowledge and use of management platforms [Other virtual platforms]; Management of device protection software and care in data protection; Mastery of databases and thesauri in the search for information; Knowledge and use of tools for creating QR codes; Knowledge of Personal Learning Environments; Use of ICT in a collaborative way.

Preparation of materials through presentations, multimedia, videos, podcasts, others; Knowledge of copyright and intellectual property; Management of bibliographic managers (Zotero, Mendeley, Refworks); Effective search and discrimination of relevant information on the web; Management and online publishing tools [Picassa]; Management and online publishing tools [Pinterest].

Management and online publishing tools [Instagram]; Management and online publishing tools [Flickr]; Management and online publishing tools [SlideShare].

Graph 4. Homologous Graph 4

	VIDEOBLOGS		
4	Professional		Masters
4	Masters	Masters	Masters
3			
3	Masters	Doctorate	Masters
2			
2	Masters	Masters	
1	Masters		Masters

	ONLINE PRESENTATION		
4	Professional		
4		Masters	Specialization
3			
3	Professional	Masters	Specialization
2	Masters		
2		Masters	Masters
1		Masters	Postdoc

	GOOGLE DRIVE		
4			
4	Masters	Professional	Masters
3			
3	Specialization	Masters	Masters
2			
2	Masters	Masters	Masters
1	Doctorate		Professional

	DROPBOX		
4	Masters		
4		Masters	Specialization
3			
3	Specialization	Masters	Masters
2			
2		Masters	Specialization
1	Masters		

	ICLOUD		
4	Masters		Professional
4		Masters	Masters
3	Masters		
3	Masters	Doctorate	Doctorate
2			
2	Masters	Specialization	
1			Masters

	OFFICESKYDRIVE		
4	Masters		Professional
4	Masters	Masters	Masters
3			
3	Masters	Specialization	Specialization
2	Professional		
2	Specialization	Masters	Masters
1			Doctorate

Graph 5. Homologous Graph 5

	OTHERS		
4			Specialization
4	Postdoc	Masters	
3			Masters
3	Masters	Doctorate	Masters
2			
2	Masters	Specialization	
1	Masters		Masters

	MISTERDIIGO		
4	Masters	Doctorate	Doctorate
4			Specialization
3	Masters		Masters
3	Masters	Specialization	
2			Masters
2	Specialization	Masters	
1			Doctorate

	NETVIBESDIGG		
4	Masters		Masters
4	Masters	Specialization	Masters
3		Masters	
3	Masters	Specialization	Masters
2			
2	Masters	Postdoc	Masters
1			Masters

	MOODLE		
4	Masters		
4	Masters	Specialization	
3			
3	Specialization	Masters	Masters
2			
2		Doctorate	Doctorate
1	Masters		Specialization

	BLACK BOARD WEB		
4	Masters	Masters	Doctorate
4	Professional	Masters	Professional
3			
3	Masters	Professional	Doctorate
2		Masters	
2	Masters	Specialization	
1			

	MICROSOFT TEAM		
4	Doctorate		Doctorate
4		Masters	Masters
3	Specialization		
3	Postdoc	Masters	Postdoc
2			
2	Masters	Specialization	Masters
1			Masters

Graph 6. Homologous Graph 6

	OTHER VIRTUAL		
4	Masters		Professional
4	Masters	Masters	Masters
3			
3	Specialization	Doctorate	Professional
2			
2	Professional	Masters	Specialization
1	Masters		

	DATA PROTECTION		
4	Doctorate		Professional
4	Professional	Masters	
3	Specialization	Specialization	Masters
3			Masters
2			
2	Masters	Masters	Specialization
1	Doctorate		Masters

	TESAUROS		
4	Masters	Masters	Postdoc
4		Specialization	Masters
3			
3	Masters	Masters	Masters
2	Professional		Professional
2		Masters	
1	Masters		

	QR CODE CREATION		
4	Masters	Masters	Doctorate
4	Masters	Masters	
3	Masters		Masters
3	Professional	Masters	Masters
2			
2	Masters	Specialization	Doctorate
1			

	PROFESSIONAL LEARNING		
4		Masters	
4	Professional	Masters	Specialization
3			
3	Masters	Specialization	Specialization
2	Masters		Professional
2		Masters	
1	Doctorate		Specialization

	COLLABORATIVE		
4		Masters	
4	Specialization	Masters	Masters
3			Masters
3	Masters	Specialization	Masters
2	Professional		Masters
2		Masters	
1	Specialization		Doctorate

Graph 7. Homologous Graph 7

	MULTIMEDIA PODCATS		
4			Masters
4	Professional	Masters	Masters
3			
3	Masters	Masters	Postdoc
2	Masters		Masters
2		Masters	
1	Masters	Masters	Masters

	COPYRIGHT		
4	Specialization		Professional
4	Masters	Masters	Masters
3			
3	Specialization		Specialization
2	Masters		Masters
2		Masters	
1	Specialization		Masters

	MENDELEY ZOTERO		
4	Professional		Professional
4		Masters	
3	Masters		Masters
3	Specialization	Doctorate	Masters
2			
2		Professional	Masters
1	Masters		Masters

	RELEVANT INFORMATION		
4	Masters	Masters	Professional
4	Masters		
3			
3	Specialization	Masters	Specialization
2			
2	Masters	Masters	Masters
1	Specialization	Professional	

	PICASSA		
4		Masters	Masters
4	Professional	Masters	
3	Masters	Masters	Specialization
3	Professional	Masters	Professional
2			
2	Masters	Specialization	Doctorate
1			

	PINTEREST		
4			Professional
4	Specialization	Masters	Masters
3		Masters	
3	Postdoc	Masters	Masters
2			
2	Masters	Specialization	Masters
1			

Graph 8. Homologous Graph 8

	INSTAGRAM		
4	Masters		Professional
4	Doctorate	Masters	Masters
4	Masters	Masters	Masters
4	Masters	Doctorate	Masters
3			
3	Masters	Specialization	Specialization
3	Masters	Professional	Specialization
3	Masters	Masters	Masters
2			
2	Doctorate	Masters	Professional
2	Masters	Masters	Masters
2	Doctorate	Masters	Masters
1	Masters		Masters

	FLICKR		
4	Masters		Professional
4	Professional	Masters	Professional
4		Specialization	Masters
4	Specialization	Masters	
3	Professional		Professional
3			
3	Specialization	Masters	Professional
3	Specialization	Masters	Masters
2			
2	Specialization	Masters	Professional
2	Masters	Specialization	Masters
2	Masters	Masters	Masters
1			

	SLIDESHARE		
4	Professional		Professional
4	Professional	Masters	
4	Specialization	Masters	Masters
4	Specialization	Masters	Masters
3			
3	Professional	Professional	Professional
3	Masters	Specialization	Specialization
3	Masters	Specialization	Masters
2			
2	Professional	Masters	Masters
2	Specialization	Doctorate	Masters
2	Masters	Masters	Specialization
1	Masters		Professional

Table 2 shows the number of cases per cluster, in this case 5 clusters were formed and each of them is made up of teachers with various academic levels achieved. Thus, within cluster 1 there were 31 teachers distributed, within cluster 2 there were 58 teachers, within cluster 3 there were 57 teachers, within cluster 4 there were 65 teachers and within cluster 5 there were 143 teachers for a total of 354 teachers who were part of the sample.

Table 2. Number of cases in each cluster

Conglomerate	1	31
	2	58
	3	57
	4	65
	5	143
Valid		354
Lost		0

Table 3 shows the distribution of teachers in each of the clusters, according to the maximum academic level reached.

Table 3. Distribution of Teachers in Clusters by Academic Profile

	Conglomerate				
	1	**2**	**3**	**4**	**5**
ELEMPERIFERICOS	3	2	3	4	3
ALMACEXTERNO	4	3	4	4	3
PIZARRADIGITAL	3	2	3	3	2
PROYECDIGITAL	3	2	3	4	3
PROCESATEXTO	3	2	3	4	3
IMAGENPRESEN	3	3	3	4	3
HOJACALCULO	3	2	3	3	3
BASESDATOS	3	2	3	3	3
EMAILISTASDIS	4	3	4	4	3
MOTORBUSQUE	4	3	4	4	3
INTERCARCHIVOS	3	2	3	4	3
FACEBOOK	4	2	3	4	3
INSTAGRAM	3	2	2	4	3
WHATSAPP	4	3	3	4	3
TWITTER	3	2	2	3	3
BLOGS	3	1	3	4	2
WIKIS	2	1	2	3	2
FOROS	3	2	3	4	3
VIDEOBLOGS	2	1	2	3	2
PRESENLINEA	3	2	3	3	3
GOOGLEDRIVE	4	2	3	4	3
DROPBOX	3	2	3	4	3
ICLOUD	3	1	2	3	2
OFFICESKYDRIVE	3	1	2	3	2
OTRO	2	1	2	3	2

MISTERDIIGO	2	1	1	2	2
NETVIBESDIGG	2	1	2	2	1
MOODLE	3	2	3	3	2
BLACKBOARDWEB	2	1	2	3	2
MICROSOFTTEAM	3	1	2	3	2
OTRASVIRTUALES	3	2	3	3	2
PROTECDATOS	3	2	3	3	2
TESAUROS	3	2	3	3	2
CREACIONQR	2	1	2	3	1
APRENDPERSONAL	3	2	3	3	2
TICOLABORATIVA	3	2	3	3	2
MULTIMEDIAPODCATS	3	2	3	4	3
DERECHOSAUTOR	3	2	3	3	2
MENDELEYZOTERO	2	1	3	3	2
INFORMARELEVANTE	3	2	3	3	3
PICASSA	2	1	2	3	2
PINTEREST	3	1	2	3	2
INSTAGRAM2	3	1	2	3	2
FLICKR	2	1	2	3	2
SLIDESHARE	3	1	2	3	2

As can be seen, in cluster 1 there are 2 teachers with doctoral training, 8 with specialization, 15 with master's degree, 1 with post-doctorate and 5 professionals. In cluster 2 there are 10 teachers with doctoral training, 15 with specialization, 32 with master's degree and 1 professional.

In cluster 3 there are 13 teachers with doctoral training, 7 with specialization, 26 with master's degree, 5 with post-doctorate and 6 professionals. In cluster 4 there are 6 teachers with doctoral training, 14 with specialization, 33 with master's degree, 1 with post-doctorate and 11 professionals.
In cluster 5 there are 13 teachers with doctoral training, 35 with specialization, 83 with master's degrees, and 12 professionals.

Table 4 shows the average scores obtained in each of the variables, according to the number of teachers that made up each cluster.

Thus, for example, for the first variable "Knowledge and use of the basic components of ICT: [Peripheral elements]", the average score for this, which was obtained from the scores obtained by the teachers who made up cluster 1, was 3, that is, a high score in this variable with respect to this cluster; likewise, the average score for the same variable in cluster 2 was 2, that is, a low score; meanwhile, the average score for this variable in cluster 3 was 3, that is, a high score; In cluster 4, the average score for this variable was 4, that is, a very high score in this cluster, and in cluster 5, the average score for this variable was 3, that is, a high score.

Similar analyzes can be made with each and every one of the 45 variables that make up the "Use of ICT and Technological Literacy" dimension.

Table 4. Centers of the final clusters

	Conglomerate				
	1	**2**	**3**	**4**	**5**
ELEMPERIFERICOS	3	2	3	4	3
ALMACEXTERNO	4	3	4	4	3
PIZARRADIGITAL	3	2	3	3	2
PROYECDIGITAL	3	2	3	4	3
PROCESATEXTO	3	2	3	4	3
IMAGENPRESEN	3	3	3	4	3
HOJACALCULO	3	2	3	3	3
BASESDATOS	3	2	3	3	3
EMAILISTASDIS	4	3	4	4	3
MOTORBUSQUE	4	3	4	4	3
INTERCARCHIVOS	3	2	3	4	3
FACEBOOK	4	2	3	4	3
INSTAGRAM	3	2	2	4	3
WHATSAPP	4	3	3	4	3
TWITTER	3	2	2	3	3
BLOGS	3	1	3	4	2
WIKIS	2	1	2	3	2
FOROS	3	2	3	4	3
VIDEOBLOGS	2	1	2	3	2
PRESENLINEA	3	2	3	3	3
GOOGLEDRIVE	4	2	3	4	3
DROPBOX	3	2	3	4	3
ICLOUD	3	1	2	3	2
OFFICESKYDRIVE	3	1	2	3	2
OTRO	2	1	2	3	2
MISTERDIIGO	2	1	1	2	2
NETVIBESDIGG	2	1	2	2	1
MOODLE	3	2	3	3	2
BLACKBOARDWEB	2	1	2	3	2
MICROSOFTTEAM	3	1	2	3	2
OTRASVIRTUALES	3	2	3	3	2
PROTECDATOS	3	2	3	3	2
TESAUROS	3	2	3	3	2
CREACIONQR	2	1	2	3	1

APRENDPERSONAL	3	2	3	3	2
TICOLABORATIVA	3	2	3	3	2
MULTIMEDIAPODCATS	3	2	3	4	3
DERECHOSAUTOR	3	2	3	3	2
MENDELEYZOTERO	2	1	3	3	2
INFORMARELEVANTE	3	2	3	3	3
PICASSA	2	1	2	3	2
PINTEREST	3	1	2	3	2
INSTAGRAM2	3	1	2	3	2
FLICKR	2	1	2	3	2
SLIDESHARE	3	1	2	3	2

IV. CONCLUSION

As can be seen in the analysis of results, there is no obvious pattern of correlation between the variables corresponding to the dimension "Use of ICT and Technological Literacy" and the level of training of university teachers. Since in all the variables that make up this dimension, the teachers' scores varied independently of their professional training, which is reflected in the fact that several teachers with doctoral or master's training registered a low or null score in both variables, while other teachers with basic professional training or specialization reached very high marks on the same variables.It can also be seen that in certain variables, teachers with basic professional training or specialization reached low or no qualifications, while teachers with doctoral or master's training achieved very high qualifications in the same variables. The foregoing indicates that apparently, the academic or training level of the university teacher is very little related to the use and technological literacy. And that the skills and abilities that teachers acquire in the use of these technological tools, would be more linked to the particular and personal interest of each teacher for wanting to learn how to use them, as a didactic aid in their daily work or as personal growth.

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