EQUIPMENT, EDUCATIONAL LEVEL, USES OF MOBILE PHONE OF DOCTORAL STUDENTS FROM PEDAGOGIC EXPERIMENTAL LIBERTADOR UNIVERSITY
EQUIPAMIENTO, FORMACIÓN Y USOS DEL TELÉFONO MÓVIL EN ESTUDIANTES DE DOCTORADO DE LA UNIVERSIDAD PEDAGÓGICA EXPERIMENTAL LIBERTADOR

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Abstract: This article is part of a quantitative and descriptive investigation, whose main objective was to classify doctoral students from Pedagogic Experimental Libertador University (UPEL), working as teachers in different education subsystems in Venezuela. The investigation focused on the following elements from e-learning and m-learning: equipment, educational level, personal and educational use of mobile phone. As part of the methodology, multivariate analysis techniques were used: Categorical Principal Components Analysis (CATPCA) and Cluster Analysis. The results show that the doctoral students were equipped and used ICT and mobile phone in their daily lives. However, only 4% of the sample was innovative in the educational use of mobile phone, while 26% of the sample was not creative in the use of ICT on the Internet, and they did not use the mobile phone for the learning process. Likewise, 14% of the doctorates samples use very little technology in their educational practice. 98% did not have an educational level in m-learning, their only knowledge, in this area, was self-taught. They do not know in depth the educational use of ICT, and in particular, the learning opportunities offered by the mobile phone.Key words: Higher education; postgraduate education; e-learning; m-learning; multivariate analysis
Resumen: Este artículo es una investigación que forma parte de un proyecto, cuyo objetivo principal es clasificar los estudiantes doctorandos de la Universidad Pedagógica Experimental Libertador, quienes trabajan como docentes en los diferentes subsistemas de la educación venezolana. La investigación está focalizada a partir de los elementos: equipamiento, formación y uso personal y educativo, que conforman el proceso de m-aprendizaje (usando telefonía móvil). Como parte de la metodología se utilizaron técnicas de análisis estadístico multivariado: el Análisis de Componentes Principales Categóricos (CATPCA) y Análisis Cluster. Los resultados revelan que los doctorandos están equipados y usan las TIC y el móvil en su vida cotidiana; del mismo modo, el 14% de las muestras de doctorado utilizan muy poca tecnología en su práctica educativa. El 98% no tenían formación en m-learning, su único conocimiento, eran autodidactan. No conocen a profundidad el uso educativo de las TIC y en particular, de las oportunidades de aprendizaje que ofrece el teléfono móvil.Palabras clave: Educación superior; postgrado; e-learning; m-learning; análisis multivariado

1. Introduction.

The use of mobile devices in numerous areas of life has led important universities to take advantage of them as learning tools (Johnson, Adams, Estrada & Freeman, 2015; Benítez, Ramirez, Zamora & Delgadillo, 2015; and Sharples, Kloos, Dimitriadis, Garlatti & Specht, 2015). Also, there are expectations in these institutions that e-learning contributes to the creation and distribution of content, as well as the user adaptation to his / her learning pace, restrictions of time and geographical location (Navarro, Molina, Redondo, & Juárez, 2015; Area & Adell, 2009).

In this regard, Sharples, Arnedillo-Sánchez, Milrad & Vavoula (2009) and Kukulska-Hulme, et al. (2011) reflect on the broad context in which the current man participates, gets involved or exemplifies, in an increasingly mobile lifestyle: physical space mobility; technology mobility; mobility in conceptual space; and social space mobility.

In this matter, mobile technology offers a particularly promising way to train new teachers, to build capacities among practicing educators, and to support the teachers' work both inside and outside the classroom (UNESCO, 2013). In order to carry out these, two aspects were considered: The use of ICT in the academic field to promote learning, and the use of mobile phones in educational praxis. These two aspects are relevant, and given the high percentage of mobile phone diffusion in the world population, whose users represent nearly 7 trillion subscriptions, could be opportune their use, close with ICT, to promote the learning process. It is also to mention important to mention that in Venezuela´s case the diffusion of mobile phones exceeded 100% (see Figure 1).

Adjoined with these aspects mentioned previously, as well the demands of the knowledge society intervene, in such a way that the competencies, qualities and effective fulfillment of the teacher, who participates in the educational process, and specifically in m-learning, have great implications. These that have to do with the success or the failure of the students, participants of his/her actions, where the geographical, time and mobility limitations are overstep (Garcia, et al., 2010, Castaño & Cabero, 2013, Yot & Marcelo, 2013; and Hernández, García, & Navarrete, 2015 and Sánchez, Alba, & Paredes, 2016).

All the more, the educational institutions need to solve problems in their different educational levels, which are increasingly difficult and complex. The training and the fundamental educational processes of the professoriate need to be developed when changes in the educational praxis with technology are suggested (Velandia, Serrano & Martínez, 2017). In this sense, Morles (2004) Brunner (2014) sustains that many of these problems require new or increasing knowledge, skills, techniques, and technologies. Consequently, it is convenient to remember that doctoral studies, immersed in postgraduate education, are of the highest level and can be considered as one of the most effective ways to face these situations when developing more advanced and sophisticated educational processes.

In this regard, is very important to consider the possibilities of using specific data from the doctoral students' characteristics referred to ICT and mobile phone: equipment, personal use, education use, access to Internet, education level. Besides, the knowing the how they customize their e-learning or m-
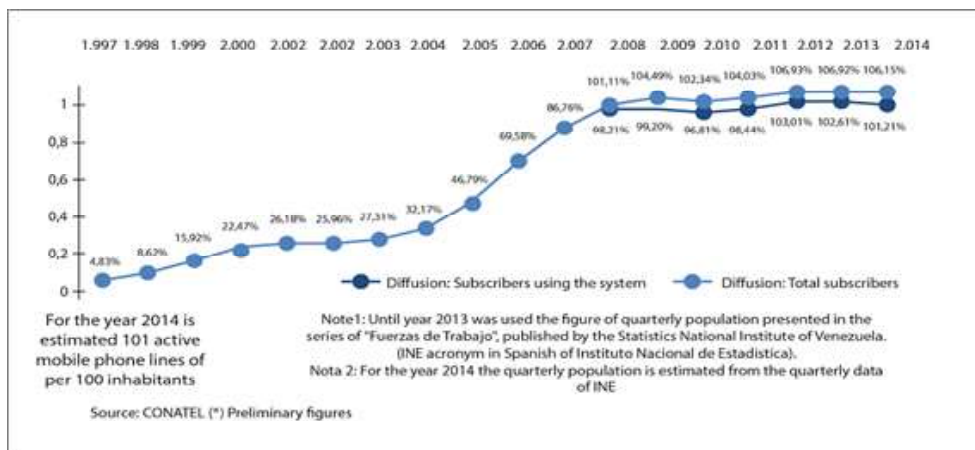
Figure 1. Mobile phone users in Venezuela (CONATEL, 2016)

learning platforms. These elements could give information to help recommend (rigorously) resources, strategies, educational level courses to doctoral students, in the same way that companies do recommendations to their customers (Johnson, et al., 2015).

Thus, the objective of the present investigation was classify, in the m-learning, the Doctoral students from Pedagogic Experimental Libertador University.

2. Methodology

This is a quantitative research, with a descriptive focus, whose population´s range was composed by the doctoral students of the Introductory Course 2011 from Pedagogic Experimental Libertador University (UPEL), Maracay campus, Venezuela. The number of subjects (N) was sixty (N=60). Given that the population was small and controllable, the sample of size (n) was fifty (n=50). The sample was selected by non-probability, directed sampling, as indicated by Hernández, Fernández, & Baptista (2010). It was appropriate to clarify

that the sample was comprised by fifty (50) out of the sixty (60) individuals, since the researchers rejected ten questionnaires because they were incomplete. Fifty doctoral students participated in this study, which allowed working with a representative sample of the study population (83.33%). It is important to indicate that the questionnaires, that were answered anonymously, were numbered.

The main objective of this research was to classify doctoral students from the following constituents: equipment, educational level, and personal and educational use, which are constituent elements from the e-learning and m-learning processes (with the use of mobile phones).

A set of three (3) questionnaires was used as a technique for collecting information. This set of questionnaires consisted of closed questions grouped into thematic blocks:

·   Personal equipment (at home) in relation to ICT.

·   Classroom equipment or working environment in relation to ICT for educational purposes.

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· Personal equipment in relation to the mobile phone.

· Access to ICT.

· Educational level in relation to ICT (e-learning).

· Educational level in relation to the mobile phone (m-learning).

· Personal use in relation to ICT.

· Personal use in relation to the mobile phone.

· Use related to ICT in education.

· Use related to mobile phone in education.

In order to know the content validity of this set of questionnaires, an expert panel, consisted in three experts, carried out the evaluation. They used a validation form, where the congruence, clarity and bias of each item were reviewed. All three experts considered the instrument presented to be valid.

To measure the first instrument reliability, the Kuder-Richardson formula was used and a reliability KR-20 = 0.8383 was obtained. Therefore, this instrument was high reliable. To measure the second and third instruments, Cronbach's Alpha was used, which lead to á = 0.96. This represented a high reliability.

All items with positive numbers were coded to prepare them for the subsequent multivariate analysis (Hernández et al., 2010). Regarding the implemented methodology, multivariate analysis techniques were used. This method allowed to reduce a high number observed variables collected, in the set of instruments previously mentioned, into a much smaller number and to be able to identify a group of new variables (synthetic mega-variables) also referred as components, factors or dimensions that are formed from the combination of the original variables (Vicente-Villardón, 2002; Molina & Espinosa

de los Monteros, 2010; Díaz, 2002; and Etxeberría & Tejedor, 2005).

These variables were first transformed by the method called optimal scaling. Then, new variables were generated, and the components with the highest variances were selected. A component with a greater variance implies that it contains a greater amount of information (Vicente-Villardón, 2002; and Meulman & Heiser, 1989). This statistical analysis used is called Categorical Principal Component Analysis (CATPCA). The original data set was replaced by a new «smaller» data set with a minimal loss of information (Cuadras, 1991; Pla, 1986; and Johnson, 1998).

This investigation was complemented by another analysis known as multivariate statistical method of automatic classification. This method is called cluster analysis, allowed to enrich the information, obtained through the components, to reach the planned objective (Anderberg, 2014; Zaveri & Jariwala, 2016; and Dutt, Ismail, & Herawan, 2017).

Categorical Principal Component Analysis (CATPCA)

To work with CATPCA, the file containing the database was loaded into the program SPSS 20, which included information about the individuals in the sample with all data collected. It was possible to reduce from one hundred fifty-two (152) original variables (observable) to forty-nine (49) components (non-observable, synthetic or mega-variables). Out of these, nineteen (19) were selected that meet the criteria mentioned by Lopez, 2013; Bojórquez, López, Hernández, & Jiménez, 2013; Porras, 2013; Mendoza, 2011; Molina & Espinosa de los Monteros 2010;

Morales, 2004; Bernal, Martínez & Sánchez, 2004; González-Martin, Díaz-Pascual, Torres-Lezama, and Garnica-Olmos, 1994; and Mardia, Kent, & Bibby, 1979. These criteria included that percentage of variability most be at least 75%, the condition that its eigenvalue must be is greater than one (1), and with a positive Cronbach's alpha.

Besides the above criteria, it was considered important to address other aspects related to the nature of the research. For example, the Component 19 (see Table 1) had very little contribution, but could be highly correlated with some important variables in the research. It would not be advisable to dismiss this component in the final analysis (González, Díaz, Torres, & Garnica, 1994).

Based on the above information, the components choices were justified (see Table 1), because all components had their

eigenvalue greater than one (1), and all had a positive Cronbach's alpha. It was observed that Component 1 was the synthetic variable that had greater explained variance, 19.395, and had an eigenvalue equal to 28.899.

It is also very important to mention that in the saturation matrix, obtained by CATPCA, there are correlations between each component with its respective original variables (these correlations take values among -1 and 1). Furthermore, it was chosen that the absolute value contributions of each variable should not be less than 0.3. Next, the non-common variables of higher contribution were selected for each component (i.e. they were chosen in a disjoint way, in relation to the rest of the components).

The selected components, numbered from 1 to 19, are the new variables (non-observable or mega-variables). They were described with

COMPONENTS	CRONBACH´S ALPHA	VARIANCE EXPLAINED		% ACUMULATIVE VARIANCE
		TOTAL (EIGENVALUES)	% VARIANCE	
1	0.972	28.899	19.395	19.395
2	0.901	9.502	6.377	25.773
3	0.878	7.837	5.260	31.033
4	0.875	7.645	5.131	36.163
5	0.845	6.229	4.181	40.344
6	0.814	5.235	3.513	43.857
7	0.803	4.943	3.317	47.175
8	0.800	4.861	3.262	50.437
9	0.783	4.490	3.013	53.450
10	0.757	4.035	2.708	56.159
11	0.739	3.760	2.524	58.682
12	0.721	3.525	2.366	61.048
13	0.716	3.467	2.327	63.375
14	0.681	3.093	2.076	65.451
15	0.678	3.064	2.056	67.507
16	0.664	2.934	1.969	69.475
17	0.654	2.855	1.916	71.391
18	0.640	2.742	1.840	73.232
19	0.620	2.603	1.747	74.979

Table 1. Summary of CATPCA: information for 19 components

COMPONENT (WEIGHT WEIGHTED %)	NAME OF THE COMPONENT	DEFINITIVE VARIABLES
1 (19.4%)	Connection to groups/social networks-Learning Management with mobile phone-Personal/educational use of ICT with the computer	Uses voice files (personal use of mobile phone)
		Works with online interest groups (computer educational use)
		Works with forums (computer educational use)
		Makes assessments using cell phone (educational use of mobile phone)
2 (6.38%)	Access of the doctorates´ students with their own computer to the ICT in the classroom, and the mobile phone equipment with functional accessories	Accesses the Internet (mobile phone equipment)
		Doctorates´ students use their own computers in class (educational access to ICT)
3 (5.26%)	Innovative pedagogical role by doctorates in the use of mobile phone (treatment and use of resources in m-learning)	Use social networks by mobile phone in their educational praxis
		Promote the exchange of information among their students (educational use of the mobile phone)
4 (5.13%)	Software equipment and functional multimedia accessories for computers and mobile phones	Has touch screen (mobile phone equipment)
5 (4.18%)	Selection of information on the Internet to prepare classes	Look for information on the Internet to prepare their classes (educational access to ICT)
6(3.51%)	Educational level in e-learning and m-learning	Educational level in e-learning
		Educational level in m-learning
7 (3.32%)	Use of the computer in their classroom	Use of the computer in their classroom
8 (3.26%)	Existence of computers (personal or institutional) in their workplace	Computers in their workplace
9 (3.01%)	Management of Internet content systems	Keep up their web
10 (2.71%)	Own computer equipment with multimedia design software	Has graphic design software
11 (2.52%)	Educational use of web pages	Uses web pages (use educational of computer)
12 (2.37%)	Use in the educational praxis of virtual resources such as laboratories, and/or virtual whiteboards	Uses virtual laboratories
13 (2.33%)	Access to selected educational content via Internet	Accesses to educational content via Internet
14 (2.08%)	Uses the computer at home	Uses computer at home
15 (2.06%)	Internet connection with mobile device and/or broadband	Internet connection types
16 (1.97%)	Learning management and/or evaluation with the portfolio via computer, and videoconferencing via mobile phone	Uses portfolio
17 (1.92%)	Equipment with professional network applications iin the mobile phone	Has LinkedIn
18 (1.84%)	Equipment with basic office software	Has word processor
19 (1.75%)	Games/Entertainment Online	Plays online

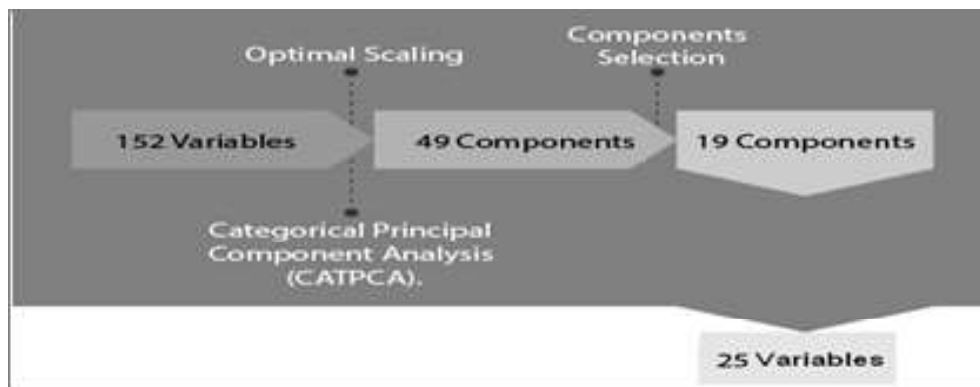*Table 2. Summary of components: names and definitive observable variables*

Figure 2. Schematic summary of the selection process of components in the CATPCA

their name and with the original variables that represent them in Table 2.

The following synthetic mega-variables stand out: Component 3 and Component 19. For the first one, the name of Component 3 was valuable for this research: Innovative pedagogical role by doctoral students in the use of mobile phone (control and use of resources in m-learning). For this component the following variables were selected: a) Uses social networks on the mobile phone in his/her educational praxis; b) Promotes the exchange of information among his/her students (educational use of the mobile phone).

For the second one, the name in Component 19 was: Games/Internet Entertainment. This component could be relevant because today the gamification is considered of high value in improvements in educational technology for Higher Education (Johnson, Adams, Estrada, & Freeman, 2015).

Another point was identifying each component; it was chosen a new subset of observable variables. This subset was the one with the least amount of variables, but that had a greatest contribution (from those that defined the component). For example, for the

Component 1 was chosen a new subset with 4 definitive observable variables, taken from the 48 that had been obtained previously in the process inside the research, and whose contributions oscillated between 0.5 and 0.8.

Hereinafter, this subset of variables will identify and explain each component. These variables were called definitive variables (see column 3, Table 2).

The following schematic summary shows the plan developed in this research for the Categorical Principal Component Analysis (CATPCA) (see Figure 2).

Cluster Analysis

Similarly, in order to work with the cluster analysis, it was necessary to load the file containing the database into SPSS20. This database included the information about the individuals in the sample, with all the data gather from the definitive variables described in Table 2.

The hierarchical (agglomerate) method was used: The Farthest Neighbor (Chain Complete). This method minimizes the distance between the individuals within the cluster (reduces the variance within the

group) and avoids forming long chains (Cuadras, 1991; and Johnson 1998).

Also, the measure used, given that the data are not quantitative, was the chi-square statistic c², known as the Pearson's correlation coefficient.

As a result from the process described above, loading the database into SPSS20, the Farthest Neighbor method, and the Pearson's correlation coefficient, a Dendogram was obtained (see Figure 3). According to the information provided in this diagram, it is observed on the abscissa axis, the numbered questionnaires. It is also shown, the similarities between responses and the organization of these similarities (see Figure 3).

In this Dendrogram, four partitions were used to obtain clusters or clusters of individuals, to classify the sample. That is, to classify the doctoral students gathering information from the components, equipment, educational level and use of computers and mobile phones, comprising the e-learning and m-learning processes.

For Partition 1 divided the sample into two (2) large clusters (60% of the sample for Cluster 1 and 40% of the sample for Cluster 2). Making up the Partition 4, can be seen that the first cluster of Partition 1 was divided into seven (7) clusters (2, 9, 4, 5, 10, 6, and 1). In contrast, the second cluster of Partition 1 was only divided into three (3) clusters (3, 8, and 7).

It is opportune to clarify, that for the Partition 4, the clusters were separated into ten (10) highlighted blocks in the Dendogram (Figure 3); where the numbered clusters 1, 2, 4, 5, 6, 9, and 10 have all individuals with «inherited» characteristics and properties of clusters 1, 2 and 4 of Partition 3.

In contrast, for the Partition 4, the clusters 3, 7, and 8 were separated into three (3) highlighted blocks. The union of the individuals, that compose the mentioned cluster, has characteristics and properties that
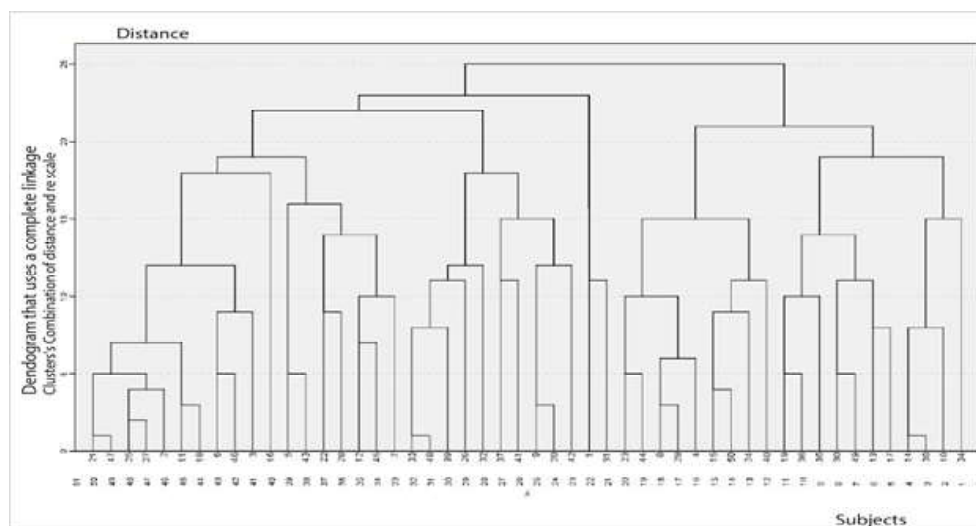

Figure 3. Dendrogram

correspond to the Clusters 3 and 5 of Partition 3.

The figure below, was elaborated with details from the Dendrogram, and it has a tree structure (see Figure 4), where each Partition n, with n = 2, 3, 4, is contained in all Partitions i with i = 1, 2, ..., (n-1). In this case, the «inheritances» of Partitions 2, 3, 4 are shown starting from Partition 1. The percentages of each cluster by partition are also shown in this figure. Besides, this tree structure will help to understand the classification of the sample.

In order to achieve the objective of this research and to establish the characterization of the variables per cluster, in each of the four (4) partitions, several processes were used. These variables obtained were called sorter variables.

It is also important to point out that a graphing process took place. These graphics were histograms, each one with well differentiated columns, and they were built applying the statistical value Mode, for each variable per cluster. As part of these processes, several criteria were included to select the variables that classify each partition.

Criterion 1

The variables that define Partition 1 must be separate from the rest and do not define Partitions 2, 3, and 4; similar process was followed for each partition. In other words, partitions should not have common variables.

· Criterion 2

In each partition, the Mode value of each variable per cluster was checked. If they were different, that variable was pre-selected.

· Criterion 3

Variables were chosen by clusters that fulfill the condition of «heritability» between partitions. Next, the selected variables were specified by partition and their respective Mode was given for each cluster. It is necessary to clarify that on the cases where the variables of some cluster do not have Mode, since its corresponding column is not in these graphs, and it was decided that the values of the scale, that the members of the cluster responded for each variable, would be used.
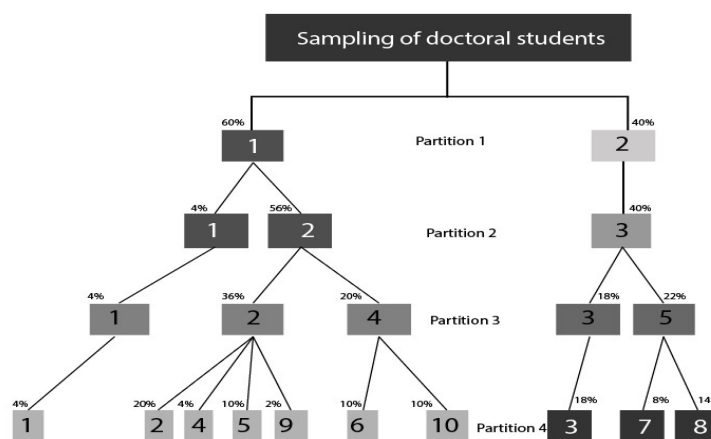

Figure 4. Tree structure of 4 partitions

In summary, the sorter variables for each partition were selected using the Mode as the statistic value, the histograms, and the criteria mentioned before. The sorter variables obtained were called:

· Uses voice files with mobile phone
· Works with online interest groups
· Works with forums
· Uses social networks in their educational praxis by mobile phone
· Promotes the exchange of information among their students with the mobile phone
· Internet connection (mobile) with broadband/with mobile device
· Plays online
· Keeps up their web current
· Uses virtual laboratories
· Uses web page in their educational praxis
· Uses portfolio
· Has graphic design software
· Uses computers/Has own computer/ Has institutional computer in their workplace
· Has touch screen (mobile phone)
· Has LinkedIn (mobile phone)
· Educational level in e-learning
· Educational level in m-learning
· Doctoral students use their own computers in class (educational access to ICT)
· Makes evaluation using mobile phone

3. Results and Conclusions

In the results stand out the ones obtained in Table 2, where the components represent the processes that revitalize the behavior, such as: the personal and educational use of the technologies, ICT access, and doctoral students' equipment, in terms of their contribution to the total variance (weight by component in %).

Therefore, using these components, the classification of doctoral students was done in correspondence with the similarity/ dissimilarity of their characteristics or properties (variables), and in accordance with the proposed methodology. These details and the ten (10) clusters were arranged in a table. This table shows the sample classified using the sorter variables (See Table 3).

In order to emphasize the obtained results, Partition 4 is described, which shows a greater variation in the answers of the doctoral students. It comprised ten (10) clusters, and the percentages of the ten (10) clusters resulting from Partition 4, are specified as follow: clusters 1, 2, 4, 5, 6, 9, and 10 correspond 4%, 20%, 4%, 10%, 10%, 2% and 10% of the sample respectively. However, cluster 3 has 18% of the sample; cluster 7 has 8% of the doctoral students; and cluster 8 has 14% of these individuals.

Next, some details of the clusters, from the Partition 4, starting from the sorter variables, were:

Cluster 1: comprised by 4% of doctoral students, those who most aim to be innovative in the educational use of the mobile phone. For example, they manage learning and organize their students in social networks using mobile phones; they are creative in the use of ICT on the Internet; maintain their website current, in the implementation of activities, and in the use of mobile phone resources. It has an individual with a specialization, as educational level in e-learning. For m-learning: it has one individual with refresher courses, while the other one is self-taught.

Cluster 9 and 10: These contained 2% and 10% of the sample, respectively. They were creative in the use of ICT on the Internet but not in a consistent way, as well as in the

implementation of activities and in the use of resources on the Internet. However, they did not use the mobile phone to manage learning process. These characteristics contrast with the fact that they are self-taught (autodidact) or did not have educational level in neither e-learning nor in m-learning.

Cluster 2, 4, 5, and 6 are represented 20%, 4%, 10%, and 10% of the sample, respectively. They were not creative in the use of ICT on the Internet, for example they did not maintain a website current; they did not use the mobile phone to teach; and sometimes they carry out activities and use technological resources in education. It is important to highlight, in Cluster 4, that an individual has refresher courses in e-learning. Also, they were Internet players, which made them potential candidates to be trained as teachers in the process of gamification. They

had high probabilities of overcoming the barriers that affect the incorporation of the teaching staff to an innovative educational process.

Cluster 3 and 7: represented 18% and 8% of the sample, respectively. They were not creative in the use of ICT on the Internet; they did not use the mobile phone to teach; and they use the technology very little in their educational practice. The individuals of the Cluster 3 were all autodidact in e-learning. However, it is important to note that the doctoral students, who comprise Cluster 7, have a Master Degree in e-learning, that is, they have the highest educational level among the sample,   but it does not show on how they use technology in their educational praxis. All of them are autodidact in m-learning.

Table 3. Classification of the sample

Note. To read this table is advisable to begin from the clusters of Partition 4, then going to Partition 3, and 2 until getting to Partition 1 (from the bottom up)

	Cluster 1 (4%)	Cluster 2 (20%)	Cluster 4 (4%)	Cluster 5 (10%)	Cluster 6 (16%)	Cluster 9 (2%)	Cluster 10 (16%)	Cluster 3 (10%)	Cluster 7 (8%)	Cluster 8 (14%)
Partición 4 Variables	Does not Has graphic design software	Has graphic design software	Does not Has graphic design software				Has graphic design software		Does not Has graphic design software	
	In their workplace: not Uses computers/Have own computer/not Have institutional computer	In their workplace: Uses their own computer. Not Have institutional computer					In their workplace: not Have institutional computer	In their workplace: Uses their own computer. Not Have institutional computer		
	Has touch screen (mobile phone)	Has touch screen /Not has touch screen (mobile phone)	Does not Have touch screen (mobile phone)		Has touch screen (mobile phone)		Does not Have touch screen (mobile phone)		Has touch screen (mobile phone)	
	Does not Have LinkedIn (mobile phone)	Has LinkedIn (mobile phone)	Does not Have LinkedIn (mobile phone)							
	Specialization/ Autodidact in e-learning	Autodidact in e-learning	Actualization courses/ Autodidact e-learning	Autodidact in e-learning		No formation in e-learning	Autodidact in e-learning	Magister in e-learning	Autodidact in e-learning	
	Actualization courses /Autodidact in m-learning	Autodidact in m-learning				No formation m-learning	Autodidact in m-learning			
	Students with own computer in class	Students do not have own computer in class	Students with own computer in class	Students do not have own computer in class					Students with own computer in class	
	Always Makes evaluation with the mobile phone									Never Makes evaluation with the mobile phone

Table 3 (Continuation). Classification of the sample

Note. To read this table is advisable to begin from the clusters of Partition 4, then going to Partition 3, and 2 until getting to Partition 1 (from the bottom up)

Cluster 8: consists of 14% of the sample. Individuals in this cluster use very little technology in their educational practice. This cluster is the only one whose individuals do not use the mobile phone to evaluate. All of them are autodidact in e-learning and m-learning processes.

It is important to emphasize that the classification of the sample was organized in a table (See Table 3). It explains itself in terms of the relevant variables that classified each cluster. In order to read the table, it is essential to do it from the bottom up, starting from the clusters of Partition 4, then going to Partition 3 and 2 until getting to Partition 1 (see *Note* in Table 3).

In the classification of the sample (see Table 3) stand out the following: only 4% of the sample was innovative in the educational use of mobile phone, while 26% of the sample was not creative in the use of ICT on the Internet, and they did not use the mobile phone in the learning process. Likewise, 14% of the sample uses very little technology in their educational practice. On the other hand, 98% did not have an educational level in m-learning, their only knowledge, in this area, was self-taught.

They do not know in depth the educational use of ICT, and in particular, the learning opportunities offered by the mobile phone.

4. Recommendations

Considering the results mentioned above, it is recommended to increase the possibilities

to create and organize projects using e-learning and m-learning, to take advantage of the potentialities of the doctorates, in order to improve creativity/innovation in the use of ICT with computers and mobile phones. Furthermore, it is recommended to contribute, in the different groups of doctoral students, to the development of investigations in didactic lines in the areas of e-learning and m-learning. Besides, it is recommended the characterization and classification of teachers, who do not belong to the sample of the present investigation, starting from the information the sorter variables that appear contained in Table 3.

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