

RELATIONSHIP BETWEEN AGE AND ACADEMIC LEVEL OF UNIVERSITY TEACHERS AND THEIR TRAINING IN INFORMATION AND COMMUNICATIONS TECHNOLOGIES

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Abstract

This study aimed to examine the correlation between university educators' academic qualifications, age, and utilization of pedagogical techniques incorporating Information and Communication Technologies (ICT) in teaching. A cluster analysis was conducted on a sample of 354 instructors to determine whether a connection exists between their educational background, age, familiarity with, and application of ICT-based pedagogical methods. The research methodology involved administering a questionnaire to faculty members and assessing their knowledge and proficiency in 31 variables related to ICT-based pedagogical approaches. These variables encompassed aspects ranging from accessing educational materials to employing Web 2.0, tools, and evaluating ICT competencies. The findings revealed that the majority of instructors performed admirably across the evaluated variables irrespective of their academic credentials or age. Notably, even those with less advanced degrees demonstrated an exceptional understanding and implementation of ICT-based pedagogical techniques.

Keywords: Cluster Analysis, Pedagogical Methodologies, ICT in the classroom, Age.

1. Introduction

University educators' digital competencies have become a focal point in academic and scientific discussions. This discourse is founded on the notion that instructors must possess not only subject-specific and pedagogical expertise, but also digital skills to enhance teaching and learning processes.

The COVID-19 crisis has further highlighted the critical need for digital competencies among educators. In response to this unprecedented situation, it has become essential for teachers to acquire at least basic proficiency in utilizing new technological tools and information systems. Additionally, they need to develop skills in virtual classroom instruction to effectively carry out their academic responsibilities within the emerging educational landscape.

To address this issue, university administrators in Sincelejo conducted a survey in 2020 targeting 354 higher education instructors. The aim was to assess their training and knowledge of Information and Communication Technology (ICT) usage through a comprehensive dimension encompassing various aspects of virtual educational tools.

This study focuses on evaluating the "Training of University Professors in ICT" dimension. The primary objective was to determine how academic qualifications and age of university teachers correlated with the 25 variables comprising this dimension. The assessment of instructors' training and knowledge across these variables employed a rating scale with four

levels: "Null," "Low," "High," and "Very High." The main goal of this research was to investigate the relationship between university teachers' academic qualifications, age, and ICT training level.

2. Conceptual framework

2.1 Cluster analysis

Cluster analysis utilizing K-nearest neighbor (KNN) techniques is employed to assess the connection between the levels of two qualitative variables. This method uses the Metric Distance or Euclidean Distance as a similarity measure. According to [Johnson, 1998], the equation for this distance is:

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

Where:

d_{rs} , is the distance between points r and s.

X_r , is the point r.

X_s , is the point s

Johnson [1998] describes the nearest neighbor method as follows:

1. Beginning with N clusters, each containing a single data point.
2. The two closest points are connected using one of the three distance measures: Metric Distance, Standardized Metric Distance, or Mahalanobis Distance.
3. The distance between this newly formed cluster and any other point was calculated by determining the shortest distance between the point and either of the two points in the cluster.
4. Continue merging the closest clusters and reduce the total number of clusters by one at each step.

The distance between any two clusters was defined as the distance between the nearest members. In essence, the nearest neighbor method initiates with N single-observation clusters and progressively combines points and clusters until all observations are consolidated into a single cluster.

2.2 Training of University Professors in ICT

The dimension "University Teacher Training in ICT" comprised 25 variables:

- Self-directed learning and ICT experimentation.
- ICT-based problem solving capabilities.
- Utilizing ICT as an educational tool.
- Attending in-person ICT training provided by official educational institutions.
- Acquisition of ICT skills through online or blended learning methods.
- Familiarity with ICT-enabled "best practices."
- Incorporating ICT into the curriculum and aligning it with educational practices and curricular policies.
- Continuous learning and updating of digital competencies owing to evolving educational technologies.
- Instruction in using mobile devices for pedagogical purposes.
- Education in research-oriented software and data-handling tools.

- Recognizing various ICT applications: educational, recreational, communicative, etc.
- Engaging in ICT-centered innovation projects.
- Sharing online ICT experience
- Establishing and maintaining a professional network.
- Assessing teaching performance using ICT.
- Comprehending national and international digital competency standards and indicators.
- Awareness of reports predicting near- and mid-term ICT integration in education (Horizon Report).
- Competence in choosing appropriate classroom tools and information management systems.
- Addressing learning challenges and diverse student needs through ICT.
- Recognizing the significance of digital literacy for future educators.
- Proficiency in implementing cloud-based educational tools and fostering interactive learning environments.
- Capability to operate within personal networks and cloud-based learning platforms.
- Adapting and self-regulating knowledge in response to ICT advancements in education.
- Educator's function as facilitator, intermediary, and co-learner in the educational process, fostering reciprocal relationships with students.

3. Methodology

A questionnaire was distributed to 354 university instructors to assess their Information and Communication Technology (ICT) training. The "University Professor Training in ICT" dimension comprises 25 variables, as previously mentioned. The respondents possessed various academic qualifications, including Professional, Specialist, Master's, and doctoral degrees, with ages ranging from 20 to over 70 years. Based on their expertise and/or proficiency in managing each variable within this dimension, the participants were assigned scores ranging from 1 to 4, interpreted as follows: 1= null, 2= low, 3= high, and 4=Very High. To examine the correlation between instructors' age and educational background and their scores across the 25 variables in the "University Teacher Training in ICT" dimension, a cluster analysis was conducted. This analysis employed the K-nearest neighbor (KNN) method, utilizing Metric Distance or Euclidean Distance as a dissimilarity measure. The analysis was performed using SPSS Version 21 software.

4. Results and analysis

The distribution of educators across clusters categorized by their highest educational attainment is presented in Table 1.

Table 1. Distribution of Teachers in Clusters by Academic Level

Conglomerate account	Column labels					
Row labels	1	2	3	4	5	Grand total
Doctorate	9	6	10	13	6	44
Especialization	28	11	14	15	11	79
Master	59	28	30	45	27	189
Post-doctorate	6			1		7
Professional	11	4	1	10	9	35
Total	113	49	55	84	53	354

Table 1 illustrates the distribution of educational qualifications among the teachers across the five clusters. Cluster 1 comprises 9 teachers with doctoral degrees, 28 with specializations, 59 with master's degrees, 6 with postdoctoral degrees, and 11 professionals. Cluster 2 consisted of six teachers with doctoral degrees, 11 with specializations, 28 with master's degrees, no postdoctoral degree holders, and four professionals. Cluster 3 included 10 teachers with doctoral degrees, 14 with specializations, 30 with master's degrees, no postdoctoral degree holders, and one professional. Cluster 4 contained 13 teachers with doctoral degrees, 15 with specializations, 45 with master's degrees, 1 with a postdoctoral degree, and 10 professionals. Lastly, Cluster 5 had six teachers with doctoral degrees, 11 with specializations, 27 with master's degrees, no postdoctoral degree holders, and nine professionals.

The subsequent figures depict the scores attained in each cluster and provide a breakdown of the number of teachers holding doctoral degrees, specializations, master's degrees, postdoctoral degrees, and professional qualifications in each cluster.

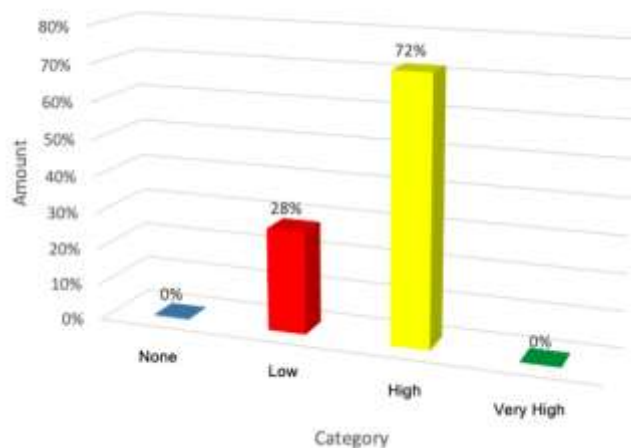


Figure 1. Bar chart of the scores achieved in the cluster

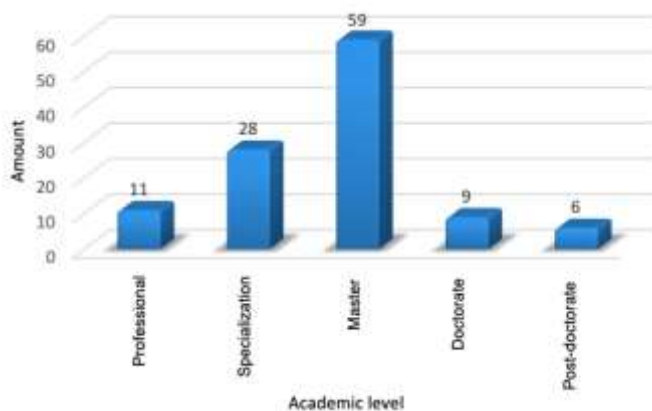


Figure 2. Bar chart of teacher training level in cluster 1

In the first cluster, 72% of the assessed variables had a mean score of 3, indicating an overall high rating. Conversely, the remaining 28% had a score of two, denoting a low rating. It is worth noting that this cluster comprises 9 educators with doctoral degrees, 28 with

specializations, 59 holding master's degrees, 6 with postdoctoral qualifications, and 11 professionals.

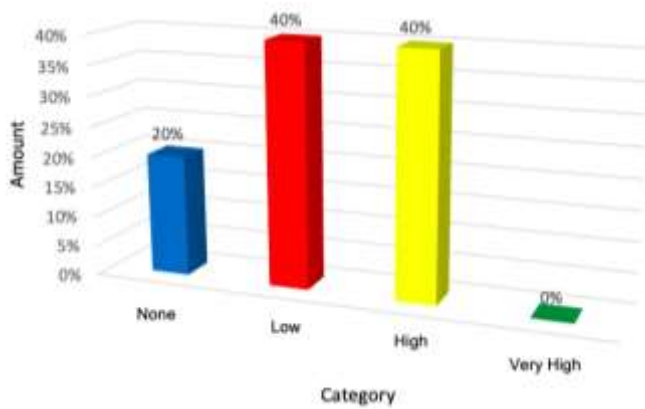


Figure 3. Bar chart of the scores achieved in cluster 2

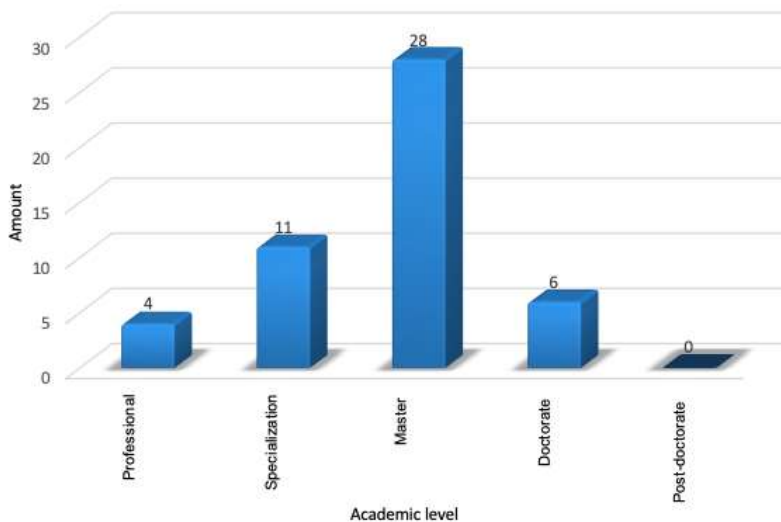


Figure 4. Bar chart of teacher training level in cluster 2

The analysis of cluster two revealed that 20% of the examined variables had a mean score of 1, indicating no assessment. Additionally, 40% of the variables scored 2, indicating low evaluation. The remaining 40% received a score of 3, indicating a high evaluation. Notably, this cluster comprises six educators with doctoral degrees, 11 with specializations, 28 with master's degrees, and four professionals.

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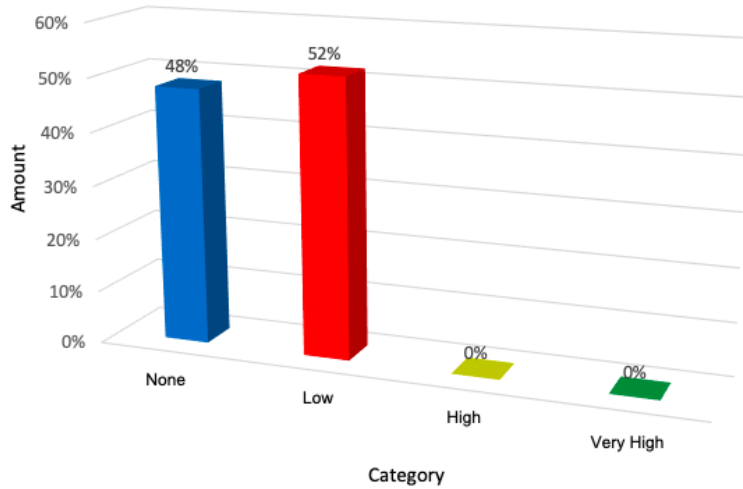


Figure 5. Bar chart of the scores achieved in cluster 3

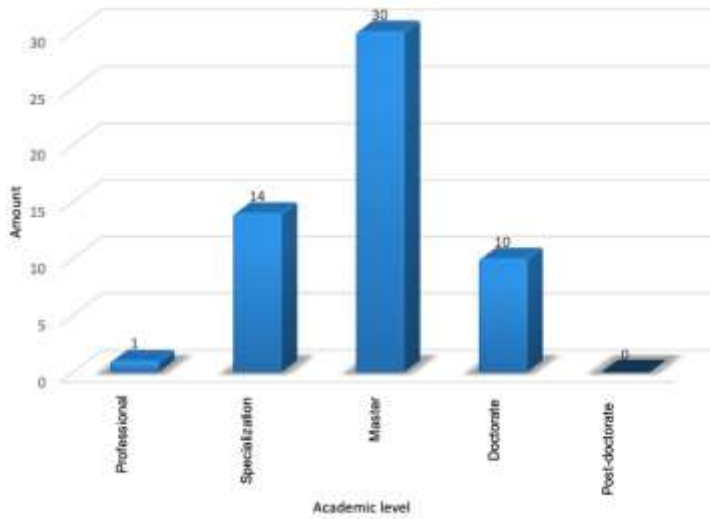


Figure 6. Bar chart of teacher training level in cluster 3

The third cluster exhibited a score of 1 for 48% of the examined variables, indicating no assessment. The remaining 52% of the variables received a score of 2, suggesting a low assessment. This cluster comprises 55 educators with varying levels of education: 10 hold doctoral degrees, 14 have specializations, 30 possess master's degrees, one has a professional degree, and none have completed postdoctoral studies.

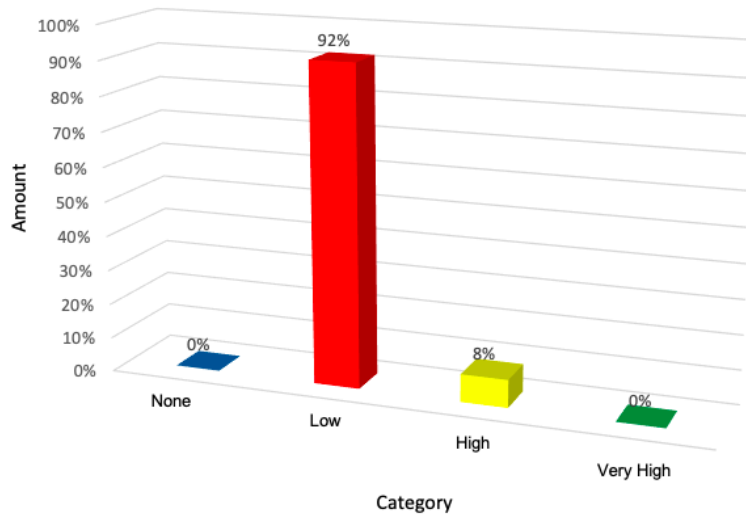


Figure 7. Bar chart of the scores achieved in cluster 4

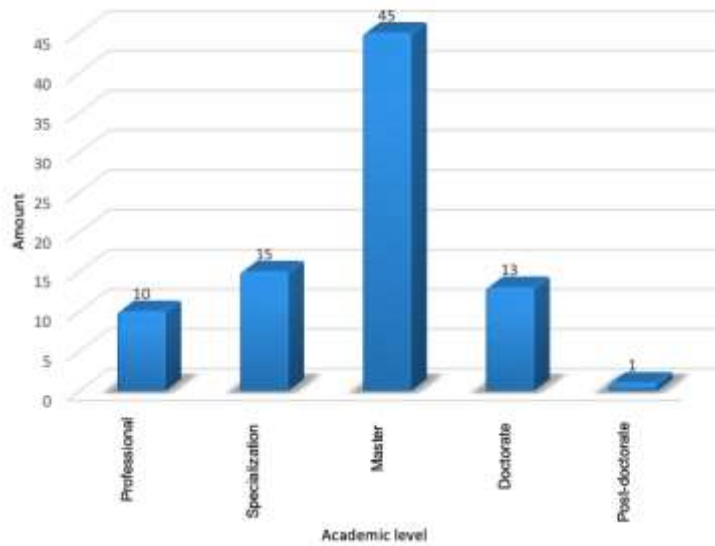


Figure 8. Bar chart of teacher training level in cluster 4

The fourth cluster exhibited a low rating, with 92% of the variables showing an average score of 2, while the remaining 8% demonstrated a high rating with an average score of 3. Notably, this cluster comprises 13 educators holding doctoral degrees, 15 with specializations, 45 possessing master's degrees, 1 with a postdoctorate, and 10 professionals.

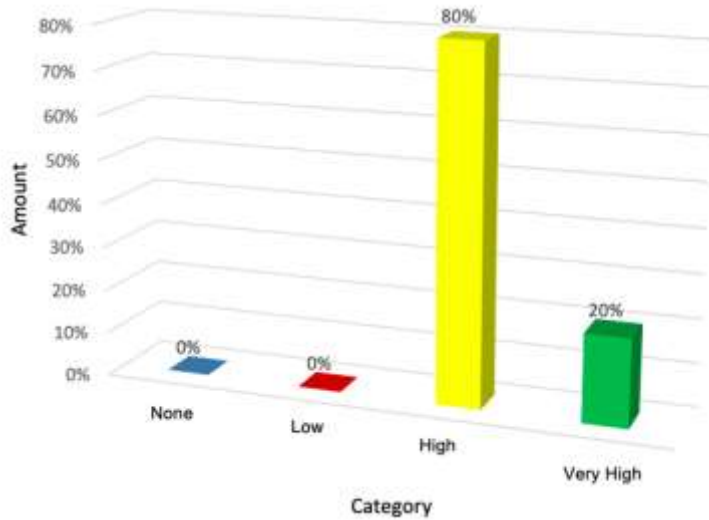


Figure 9. Bar chart of the scores achieved in cluster 5.

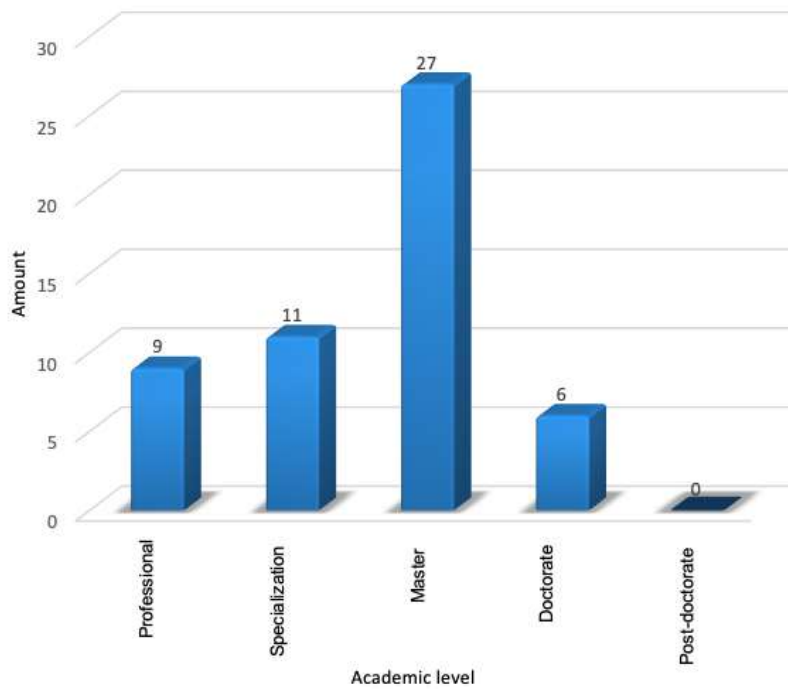


Figure 10. Bar chart of teacher training level in cluster 5

Cluster 5 distinguished itself by exhibiting the most impressive ratings among the assessed variables, with scores of 4 and 5 denoting high and very high evaluations, respectively, accounting for 80% and 20% of the total variables. This cluster comprises six educators holding doctoral degrees, 11 with specializations, 27 possessing master's degrees, nine with professional qualifications, and zero individuals with postdoctoral credentials.

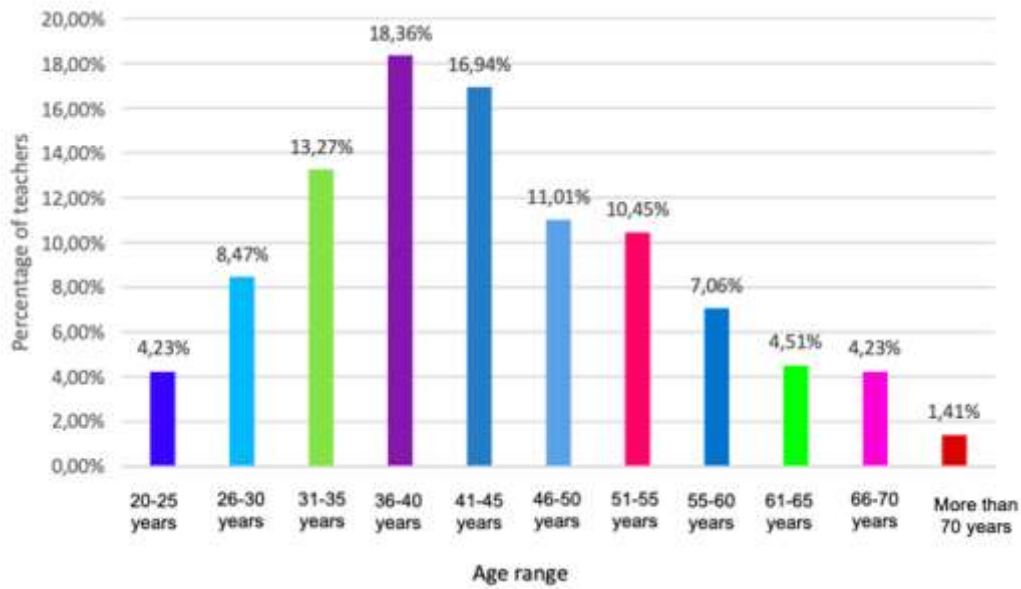


Figure 11. Bar chart of the age of university professors

The age distribution of participants in the 2020 survey at the University of Sucre is shown in Figure 11. The respondents' ages ranged from 20 to 70 years. The data showed that among the surveyed educators, 13% were aged 20-30, 32% fell into the 31-40 category, 28% were between 41 and 50, 17% belonged to the 51-60 group, 9% were in the 61-70 range, and the remaining 1% exceeded 70 years of age. This study seeks to examine the correlation between age and educational qualifications among teachers. The following graphs show the age ranges associated with each academic qualification level.

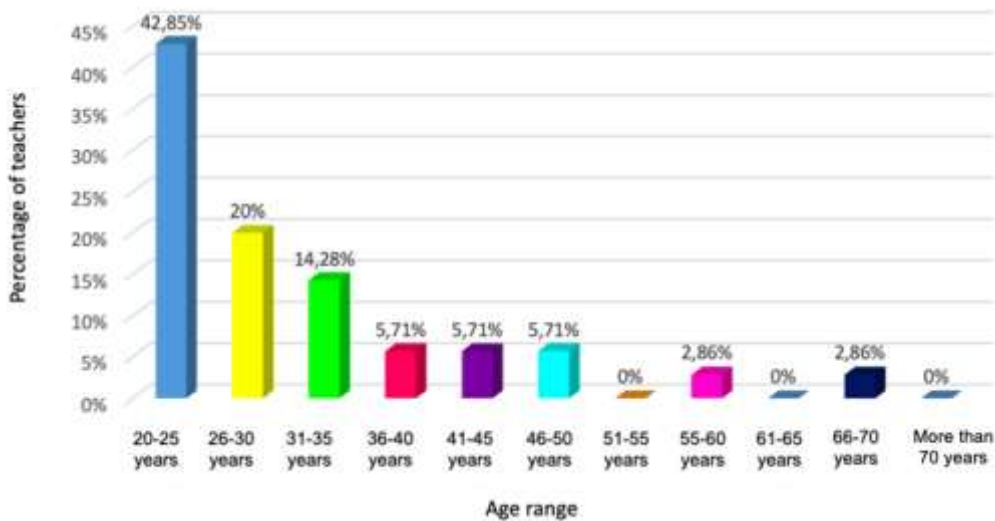


Figure 12. Bar chart of the age of university teachers with a professional level of education

Figure 12 illustrates that a significant proportion of female educators at the professional level are in their early-to mid-career stages. Nearly three-quarters (77%) were aged 20 to 35 years, while only a small fraction (6%) were aged 51 years or above.

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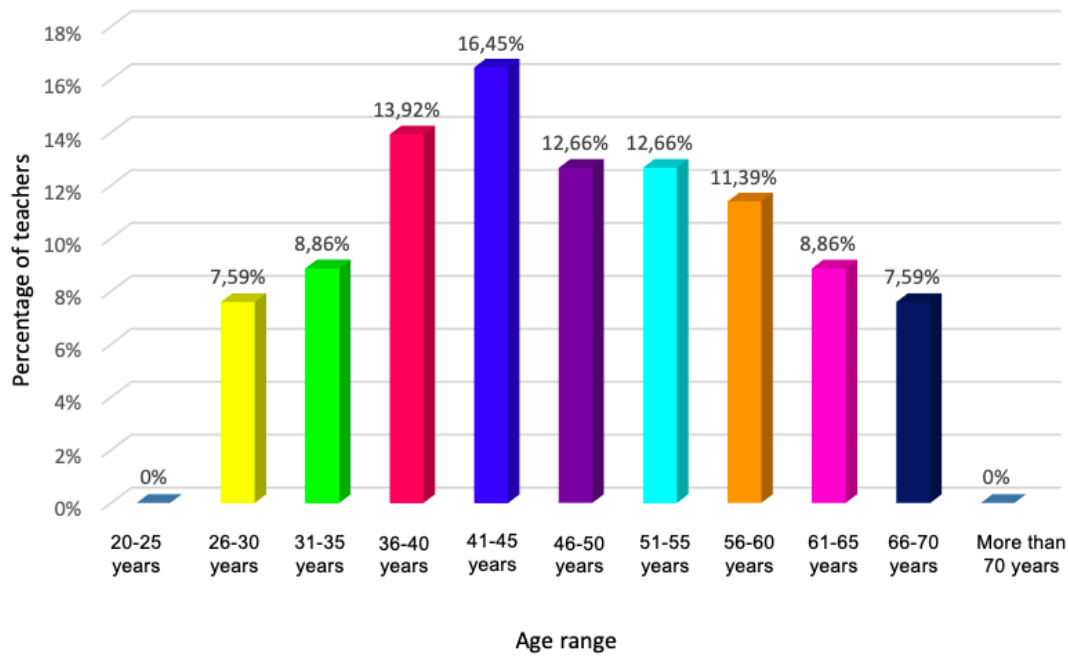


Figure 13. Bar chart showing the age of university professors with specialized studies Regarding specialized studies, the survey reveals that educators aged 20-25 and those above 70 lack such qualifications. As a result, all teachers who completed specialization programs fell within the 26-70 age range.

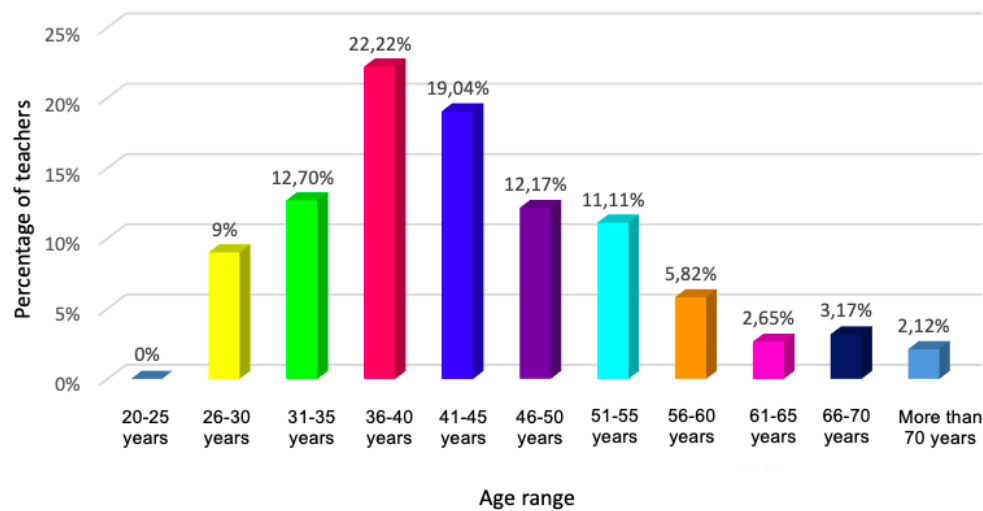


Figure 14. Bar chart showing the age of university professors with master's degrees

For those pursuing master's degrees, the age distribution of the surveyed teachers revealed that approximately 22% fell within the 26-35 age bracket, 41% were between 36 and 45 years old, and the remaining 37% were aged 46 to 70.

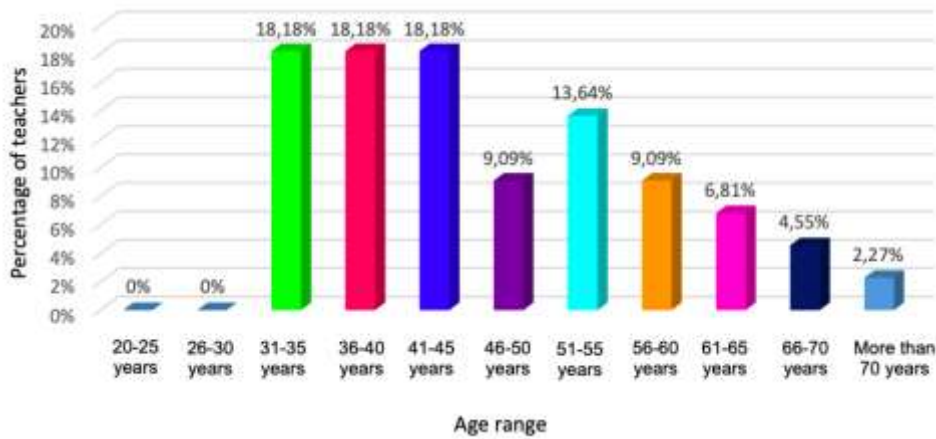


Figure 15. Bar chart of the age of university professors with doctoral studies
 An analysis of doctoral-level professors reveals that none are in the 20-30 age range, while about 55% fall between 31 and 45 years. Notably, only approximately 7% of this group was aged 65 years or older.

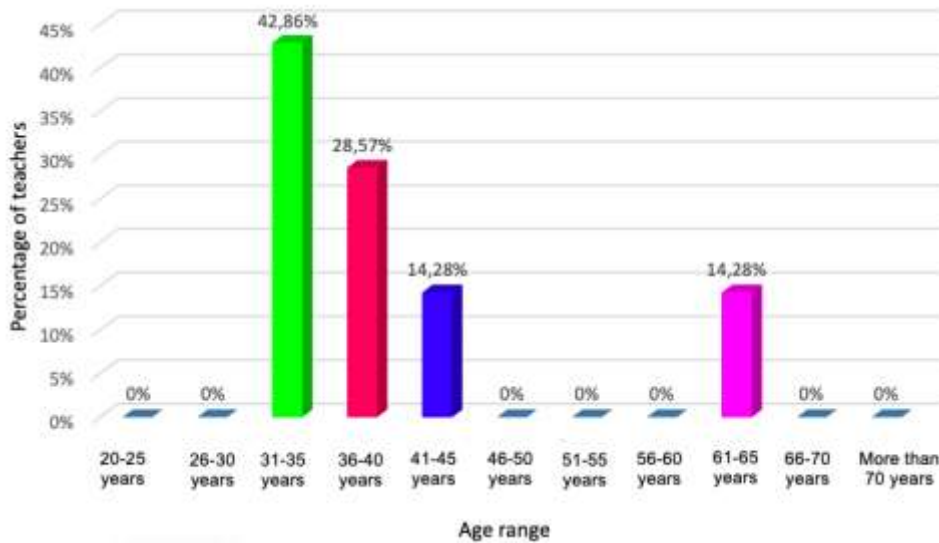


Figure 16. Bar chart of the age of university professors with postdoctoral studies

Figure 16 reveals that an overwhelming majority of individuals lack a postdoctoral degree. The age distribution shows that 86% of this group falls between 31 and 45 years, with the remaining 14% in the 61 to 65 age range.

5. Conclusions

An examination of all clusters revealed that over half of the educators possessed advanced academic qualifications, with 53.3% holding master's degrees, 12.3% having doctorates, and 2% completing postdoctoral studies. Notably, cluster 5 demonstrated the highest performance across the evaluated variables, achieving "high" scores in 80% and "very high" scores in 20% of the cases. In contrast, cluster 3 exhibits the lowest scores, with "null" and "low" ratings in 48% and 52% of the variables, respectively. Additionally, the majority of teachers with master's, doctoral, and post-doctoral degrees fell within the 31-45 age range, indicating that the most highly educated educators were comparatively young. Despite the prevalence of young, highly qualified teachers with advanced degrees, the overall assessment

of the analyzed variables was not as favorable as anticipated. The subpar performance in 60% of the examined variables suggests that educators' age and educational background do not have the expected positive impact on their ICT knowledge and utilization.

6. Recommendations

A comprehensive information and communications technology (ICT) training program is recommended for educators across all levels and age groups. This initiative aims to provide uniform and thorough instruction for the effective utilization of digital tools. By implementing such a program, digital literacy among teachers can be enhanced, fostering innovative teaching methods and ongoing improvements in educational approaches. The provision of inclusive and accessible training will ensure that all educators acquire essential skills to incorporate ICT into their teaching strategies, ultimately leading to enhanced educational quality for students.

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