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**ORIGINAL ARTICLE**

# Knowledge management in the Faculty of Health Technology

## Gestión del conocimiento en la Facultad de Tecnología de la Salud

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## ABSTRACT

*Introduction*: nowadays, teachers in higher education must interact with digital platforms. In addition, managing knowledge is synonymous with quality. *Objective*: to characterize the current state of knowledge management in the Information and Communication Technologies of the professors of the Faculty of Health Technology. *Methods*: a cross-sectional descriptive research was conducted between 2016 and 2019. The population consisted of 70 professors with teaching category. Observation, survey, interview and knowledge test instruments were used to collect information and the virtual classroom, a network learning tool. Insufficiencies and potentialities were identified through methodological triangulation. The information was summarized in relative frequency and visualized in tables and graphs. *Results*: between 46% and 65% of the participants in the study evaluated the level of knowledge of information location pathways as low. Between 43% and 57% of the analysis units evidenced a low level to assume roles in non-face-to-face modalities, which makes the use of the virtual classroom, a non-face-to-face tool, insufficient. *Conclusions*: the current state of knowledge management of Information and Communication Technologies of the professors of the Faculty of Health Technology was characterized with insufficiencies in the preparation of teachers in the use of digital platforms to manage knowledge.

***Key words:*** *Knowledge management, Information and Communication Technologies, Networked learning.*

## RESUMEN

*Introducción*: en la actualidad los profesores de la educación superior deben interactuar con las plataformas digitales. Además, gestionar el conocimiento es sinónimo de calidad. *Objetivo*: caracterizar el estado actual en la gestión del conocimiento de las Tecnologías de la

Información y las Comunicaciones de los profesores de la Facultad de Tecnología la Salud. *Métodos*: se realizó una investigación descriptiva trasversal entre los años 2016 al 2019. La población se integró por 70 profesores con categoría docente. Se utilizaron los instrumentos observación, encuesta, entrevista y test de conocimiento para la recolección de la información y el aula virtual, herramienta de aprendizaje en red. Se identificaron las insuficiencias y potencialidades a través de la triangulación metodológica. La información se resumió en frecuencia relativa, se visualizó en tablas y gráficos. *Resultados:* entre el 46% y 65% de los participantes en el estudio, evaluó bajo el nivel de conocimientos sobre vías de localización de información. Entre el 43% el 57% de las unidades de análisis evidenció bajo el nivel para asumir roles en modalidades no presenciales, lo cual hace insuficiente el uso del aula virtual, herramienta no presencial. *Conclusiones*: se caracterizó el estado actual en la gestión del conocimiento de las Tecnologías de la Información y las Comunicaciones de los profesores de la Facultad de Tecnología la Salud con insuficiencias en la preparación de los docentes en el uso de las plataformas digitales, para gestionar el conocimiento.

***Palabras clave:*** *Gestión del conocimiento, Tecnologías de la Información y las comunicaciones, Aprendizaje en red*

## INTRODUCTION

Currently, the world's educational systems are diligently working to elevate the quality of education, as they have gained a clear awareness of its paramount importance for a nation's development. This places a greater emphasis on students, achieved through the ongoing preparation of educators.

In Cuba, an action program has been developed that captures the real state of progress, the required transformations, necessary measures, objectives, and goals to achieve an effective renewal of the educational system. The preparation and continuous development of educators to address the ever-evolving diversity are subjects of profound reflection and decision-making.

As a result of a thorough examination of the current reality and its challenges, tireless efforts are being made in various directions to continuously and consistently enhance the quality of education. This is currently a pressing need in the academic world.

Nevertheless, it remains susceptible to transformations, aiming to fully or partially ensure that graduates possess an initial preparation enabling them to confront the new challenges posed by the knowledge society—a potential for continuous and systematic learning throughout life.

One of these transformations involves the utilization of digital platforms for knowledge management. Higher education has integrated digital platforms, virtual classrooms, into the teaching and learning processes, demonstrating their utility during the COVID-19 pandemic when academic and research activities were conducted through them.

The Faculty of Health Technology, a national leading center in Cuba, is deeply immersed in the use of virtual classrooms in its substantive undergraduate and postgraduate processes. The most significant aspect to note is the proficiency in Information and Communication Technologies (ICT) facilitated by the virtual classroom.[1,2]

Therefore, it becomes imperative for teachers to engage with the virtual classroom and the benefits offered by ICT from their workplace, ensuring the sustainability and viability of knowledge management. This article commits to characterizing the current state of knowledge management in Information and Communication Technologies among the faculty members of the Faculty of Health Technology.

## METHOD

The cross-sectional descriptive research was conducted at FATESA between the years 2016 and 2019. The study population consisted of 70 professors holding the academic titles of assistant, associate, or full professor, all of whom were involved in the Assisted Tutelary Doctorate program and enrolled in virtual postgraduate courses (both as instructors and students).

A single study variable was identified: Knowledge Management at the Faculty of Health Technology (ICTKM). This variable was derived through a parametrization process, resulting in three dimensions: technological, organizational, and pedagogical, with 18 indicators that facilitated the construction of instruments to assess the current state.

Four instruments were developed and applied, following their validation, to gather information. These instruments included direct observation, surveys, interviews, and a knowledge test. Methodological data triangulation was employed to analyze the data collected, culminating in the identification of issues and strengths within FATESA.

The virtual classroom, a web-based learning tool, was used due to its accessibility at any given time. Participants engaged in discussions led by a moderator, responding to a guide prepared with flexible questions. Responses to proposed questions were scheduled on a weekly or bi-weekly basis to make the most of available participation time in each session. The study also explored other forms of intervention to enhance participant motivation for subsequent sessions based on available free time.

Each thematic discussion consisted of three phases: motivation (including an introduction and presentation), in-depth discussion, and closure. Two professors from the doctoral training group, although not part of the study population, acted as backup moderators, providing additional insights or reminders related to the group's sentiments about the discussion topics.

Participation in the study required informed consent for the collection of interventions, ensuring that participants were willing to have their contributions recorded and used in the research process. Processed information was presented in tables, summary measures, and relative frequencies.

## RESULTS

The participant observation conducted during teaching activities and knowledge management preparation within the 70 analyzed units revealed that 46% of those observed had a low level of knowledge regarding information retrieval methods, and 57% exhibited a low level of readiness to assume roles in non-presential modalities. Proficiency in basic document digitization tools was found to be somewhat inadequate in 29% of cases and completely inadequate in 17%. See Table 1 for details.

In the results of the survey applied to the entire population, it was found that between 42% and 60% of the respondents exhibited a high level of mastery in understanding ICTKM and possessing knowledge and skills for planning and utilization of it. These indicators are derived from the Pedagogical dimension, as shown in Table 2.

Regarding the technological dimension, 53% of the units under analysis indicated that there is no educational portal or website at FATESA equipped with technological resources for education. Additionally, 43% reported a moderate level of resource utilization for group communication, whether synchronous or asynchronous, in educational activities.

**Table 1.** Knowledge Management Results based on Observation. FATESA. 2016-2019.

| Pedagogical Dimension | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **No** | **Indicator** | **High** | | **Medium** | | **Low** | | | | |
| 1.3 | Level of knowledge of information retrieval methods | 31% | | 23% | | 46% | | | | |
| 1.4 | Proficiency in basic document digitization tools | **VA** | **Ad** | **MdA** | | **SA** | | **I** | | |
| | | 14% | 29% | 11% | | 29% | | 17% | | |
| 1.6 | Readiness to assume roles in non-presential modalities | **High** | | **Medium** | | **Low** | | | | |
| | | 14% | | 29% | | 57% | | | | |

**Legend**

VA: Very Adequate, Ad: Adequate, MdA: Moderately Adequate, SA: Slightly Adequate, I: Inadequate

In terms of planning and control of activities carried out by both teachers and students, 58% of the survey respondents classified it as a moderate level. However, 57% indicated that the state of planning, organization, and control of ICT-based education is low. Furthermore, 100% of the participants mentioned that teachers do not have allocated time funds for designing educational resources.

**Table 2.** Knowledge Management Results based on Survey. FATESA. 2016-2019.

| Pedagogical Dimension | | | | |
|---|---|---|---|---|
| **No** | **Indicators** | **High** | **Medium** | **Low** |
| 1.1 | Level of Mastery in Understanding ICTKM | 42 % | 21% | 37% |
| 1.2 | Level of Knowledge and Skills for Planning and Utilization of ICTKM | 60 % | 22% | 18% |
| **Technological Dimension** | | | | |
| **No** | **Indicators** | **Exist** | **Does Not Exist** | |
| 2.2 | Existence of an Educational Portal or Website at FATESA with Available Technological Resources for Education | 47 % | 53% | |
| 2.2.1 | Level of Resource Utilization for Group Communication, Synchronous or Asynchronous, in Educational Activities | **High** | **Medium** | **Low** |
| | | 21% | 43% | 36% |
| **Organizational Dimension** | | **High** | **Medium** | **Low** |
| 3.2 | Planning and Control of Activities Conducted by Teachers and Students | 10 % | 58 % | 32 % |
| 3.5 | State of Planning, Organization, and Control of Education in the Use of ICT | 14 % | 29 % | 57 % |
| 3.7 | Allocation of Time Funds for Teachers' Educational Resource Design | **Allocated** | **Not Allocated** | |
| | | 0% | 100% | |

Interviews were used to collect data about the variable in question. It was found that 49% of the interviewees in the pedagogical dimension possess a high level of mastery in understanding ICTKM. Furthermore, 43% reported a low level of utilization of simple digital resources for teaching and/or publishing research results, as shown in Table 3.

In the technological dimension, 57% of the interviewees indicated the existence of an educational portal or website at FATESA equipped with technological resources for education. However, the most affected indicators are network management and security, especially from the end-user perspective. A total of 63% referred to it as inadequate, as presented in Table 3.

Regarding the organizational dimension, between 61% and 88% stated that the planning and control of activities carried out by both teachers and students are low. This applies to the organization of multidisciplinary teams for virtualization, planning, organization, and control of

education in the use of ICT, and the state of planning, organization, and control of education in the use of ICT, as indicated in Table 3.

Fifty-seven percent of the interviewees mentioned having access to resources for developing educational modalities. However, 100% agreed that teachers are not allocated time funds for designing educational resources, as detailed in Table 3.

**Table 3.** Knowledge Management Results based on Interview. FATESA. 2016-2019.

| **Pedagogical Dimension** | | | | |
|---|---|---|---|---|
| **No** | **Indicators** | **High** | **Medium** | **Low** |
| 1.1 | Level of Mastery in Understanding ICTKM | 49% | 22% | 29% |
| 1.2 | Level of Utilization of Basic Digital Resources for Teaching and/or Publishing Research Results. | 34% | 23% | 43% |
| **Technological Dimension** | | | | |
| **No** | **Indicators** | **Exist** | **Does Not Exist** | |
| 2.2 | Existence of an Educational Portal or Website at FATESA with Available Technological Resources for Education. | 57% | 43% | |
| 2.2.1 | Level of Utilization of Resources for Group Communication, Synchronous or Asynchronous, in Educational Activities. | **High** | **Medium** | **Low** |
| | | 29% | 40% | 31% |
| 2.2.3 | Number of Digital Educational Resources Provided by the Instructor for the Development of Educational Activities. | **Good** | **Fair** | **Poor** |
| | | 17% | 54% | 29% |
| 2.3 | State of network management and security, particularly from the end-user perspective | **Adequate** | **Slighly adequate** | **Inadequate** |
| | | 0% | 37% | 63% |
| 2.4 | Utilization of instruments for the assessment of the quality and impact of digitization | **Are used** | **Are not used** | **Are not used in part** |
| | | 35% | 15% | 50% |
| **Organizational Dimension** | | **Are used** | **Are not used** | **Are not used in part** |
| 3.1 | Administrative standards for the implementation of the ICTKM model at FATESA | 20 % | 45 % | 35 % |
| 3.2 | Planning and control of activities conducted by both teachers and students | **Alto** | **Medio** | **Bajo** |
| | | 9 % | 30 % | 61 % |
| 3.3 | State of organization of multidisciplinary teams for virtualization | 5 % | 7 % | 88 % |
| 3.4 | Planning, organization, and control of education in the use of ICT | 23 % | 11 % | 66 % |
| 3.5 | State of planning, organization, and control of education in the use of ICT | 7 % | 10% | 83 % |
| 3.6 | Availability of resources for developing educational modalities | **Available** | **Unavailable** | |
| | | 57% | 43% | |
| 3.7 | Allocation of time funds for teachers for the design of educational resources | **Allocated** | **Not Allocated** | |
| | | 0% | 100% | |
| 3.8 | Economic management of the informatization process | **High** | **Medium** | **Low** |
| | | 0% | 80 % | 20 % |

The application of the knowledge test regarding the use of basic tools for document digitization and the utilization of simple digital resources for teaching and/or publishing research results yielded a low level of proficiency, ranging from 40% to 65% of participants. This is in contrast to the domain of ICTKM existence, knowledge of information retrieval methods, and readiness to assume roles in non-presential modalities, as shown in Table 4.

When exploring knowledge about the use of basic tools for document digitization, it was found that 31% possessed very adequate knowledge, followed by 29% with adequate knowledge. Additionally, 51% of participants in the knowledge test reported a high level of proficiency in using simple digital resources for teaching and/or publishing research results, as depicted in Table 4.

**Table 4.** Knowledge Management Results based on Knowledge Test. FATESA. 2016-2019.

| **Pedagogical Dimension** | | | | | | |
|---|---|---|---|---|---|---|
| **No** | **Indicator** | **High** | | **Medium** | | **Low** |
| 1.1 | Level of mastery in understanding ICTKM | 29 % | | 31 % | | 40 % |
| 1.3 | Level of knowledge of information retrieval methods | 23 % | | 12 % | | 65 % |
| 1.4 | Proficiency in using basic tools for document digitization | **VA** | **Ad** | **MdA** | **SA** | **I** |
| | | 31% | 29% | 17% | 17% | 6 % |
| 1.5 | Level of utilization of simple digital resources for teaching and/or publishing research results | **High** | | **Medium** | | **Low** |
| | | 51% | | 32% | | 17% |
| 1.6 | Readiness to assume roles in non-presential modalities | 23% | | 34% | | 43% |

**Legend**

VA: Very Adequate, Ad: Adequate, MdA: Moderately Adequate, SA: Slightly Adequate, I: Inadequate

The data collection instruments were analyzed using a methodological triangulation process, allowing the integration and comparison of available information to construct a comprehensive and detailed view of each particular experience. Qualitative data from the knowledge test results and observations related to the indicator were combined.

This highlights deficiencies in the performance of ICTKM, with 43% of those observed and 57% of those who participated in the knowledge test demonstrating a low level of readiness to assume roles in non-presential modalities. This implies that the use of the virtual classroom, a non-presential learning tool, is insufficient. (Fig. 1)

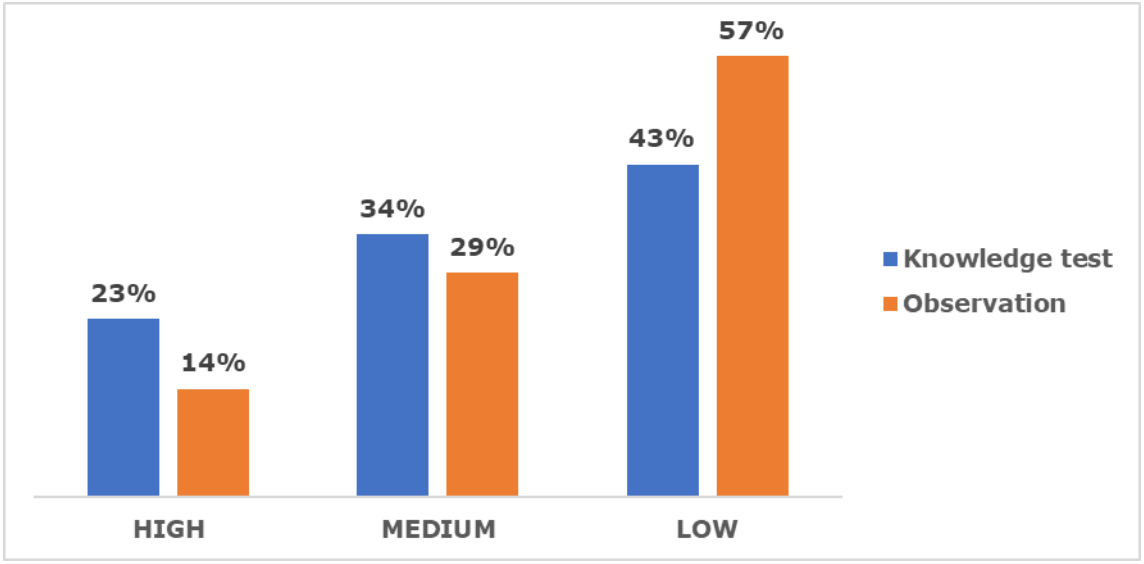


**Figure 1.** Readiness to Assume Roles in Non-Presential Modalities

Regarding the criteria used for triangulating the results of the knowledge test and observation, it was found that in both cases, evaluation covered between 46% and 65% of the study participants. Additionally, a low level of knowledge about information retrieval methods was observed. (Fig. 2)

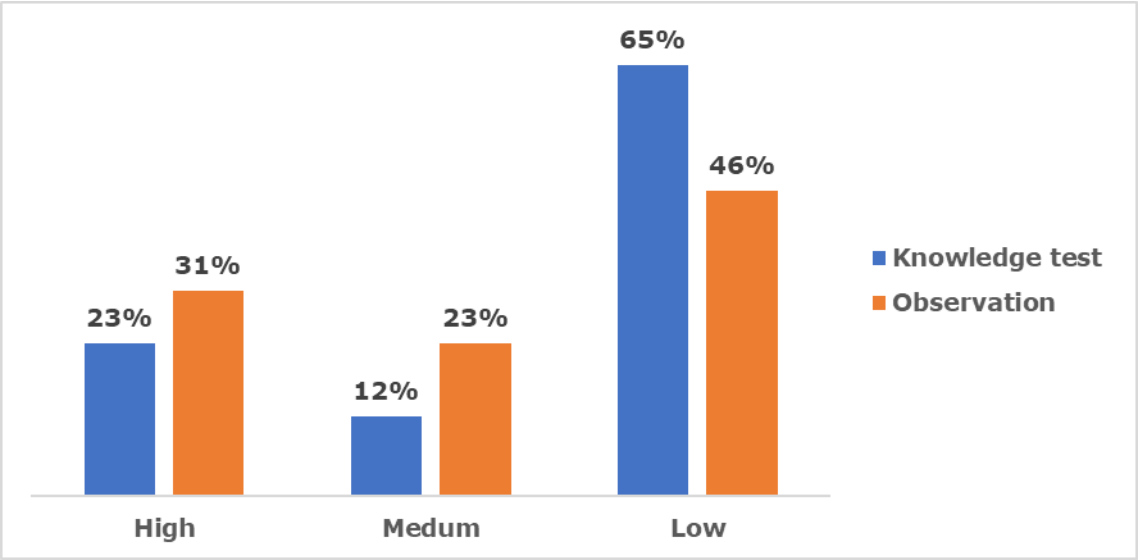


**Figure 2.** Level of knowledge about the ways of localization

The results presented allow us to affirm in the study that ICT is not approached with a pedagogical and didactic perspective, and its importance for instructional support is underestimated. This demonstrates a disconnect from the concept of ICTKM, as it fails to recognize the value that the technological platform brings to collaborative and independent work, meaningful networked learning, information retrieval, and availability, among other aspects. [5-7]

## DISCUSSION

Based on the diagnosis conducted, several problems influencing inadequate ICTKM at FATESA were identified, which also impact graduate preparation. It is essential to determine which problems represent true causes and which are their resulting effects.

These results revealed the inadequate proficiency of teachers in fundamental computer tools for work, as well as in information retrieval from the internet for knowledge updates. This includes a lack of familiarity with web 2.0-based learning tools, standards, and policies for non-presential teaching, and collaborative work within ICTKM. [6-10]

In the case of managerial preparation, even though they are recognized as having advanced knowledge in technology use, the available personnel are not effectively utilized. Ensuring training, leadership, and project guidance from both the department and the faculty for ICTKM is not guaranteed. [11]

The absence of a policy for the allocation of physical and logical computing resources (such as personal computers) based on performance and the connectivity of areas is another concern. Those accessing the intranet and the internet due to their job functions and information needs face an inefficient organization of the intranet, resulting in underutilized resources.

Furthermore, the insufficient technological capacity in relation to student enrollment exacerbates the situation. This leads to limited use of ICT (as an effect) and allocations of resources from higher authorities without prior agreement with the faculty's leadership.

The poorly functional design of the old faculty website complicates knowledge source retrieval and leads to inadequate storage of scientific production, information cataloging, absence of

learning object repositories, virtual libraries, or search engines for managing information. This results in unstructured content and a lack of information availability.

Despite these challenges, FATESA possesses objective and subjective conditions for a new learning environment. It has available resources for ICTKM development, including computer labs, departments, mobile devices, desktop computers, tablets, and laptops available to both faculty and students.

The IT specialists are well-versed in the continuous improvement of the intranet and the services it offers. The FATESA intranet includes a dedicated virtual space for education, a repository of digital content, and tools for content creation, virtual libraries, and electronic journals that facilitate result sharing.

Access to social networks and group tools enables interaction among professors, students, and groups within the social context. Specialized databases, training recordkeeping, space for documentation related to various careers, courses, disciplines, subjects, topics, and classes, as well as the development of various synchronous or non-synchronous learning experiences, are all available. [11-12]

Similar research by other authors [13-15] aligns with the findings of this study. Escorcia and Barrios [13], in their research on knowledge management in higher education institutions, analyzed the results of methods, techniques, and instruments applied to identify the problem. They found that research departments lack the infrastructure and adequate human capital for generating new knowledge. The study also highlighted the need for incentives for researchers to increase scientific production and allocate time funds[13], which corresponds with the results of the current work.

Valle and Camejo [14], in their study on knowledge management in primary education programs, conducted methodological triangulation, which revealed a lack of methodology among primary education teachers to effectively guide students in knowledge management. Their research indicated that primary education course programs do not include a methodology for developing knowledge management skills. They observed that students' work lacks proper utilization of knowledge management skills due to insufficient proposed theoretical foundations.

The consulted research studies [13-15] coincide in highlighting issues with knowledge management, including limited resources for knowledge generation, storage, and distribution, inadequate technological infrastructure, and a lack of knowledge transfer culture.

All of these aspects represent significant challenges that need to be addressed to succeed in the implementation of ICTKM. It is essential to develop proposals to address the identified knowledge management issues supported by Information and Communication Technologies.

## CONCLUSIONS

The knowledge management supported by ICT in the Faculty of Health Technology has been characterized. The current state of the teachers indicates that there are deficiencies in their preparation for using digital platforms to manage knowledge.

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## AUTHOR CONTRIBUTION

**Otilio Omar Lombillo Crespo:** Conceptualization, Data Curation, Writing – orginal draft.
**Barbarito Herrera Serrano:** Review
**María Lazo Pérez:** Formal Analysis, Supervision
All authors approve the final version of the manuscript.

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No conflicts of interest are declared.