

## Knowledge on the Science, Technology and Society perspective of the teaching and administrative personnel applicable to the process management in universities

Conocimientos sobre la perspectiva Ciencia, Tecnología y Sociedad del personal administrativo docente para la gestión de procesos universitarios

Conhecimento sobre a perspectiva de Ciência, Tecnologia e Sociedade do corpo docente administrativo para a gestão dos processos universitários

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### ABSTRACT

**Introduction:** administrative personnel with a vision on Science, Technology and Society can influence universities functions through a social approach, the training, research and, extension process. **Objective:** to diagnose the level of knowledge on the Science, Technology and Society perspective of the administrative teaching personnel of the Universidad de Ciencias Médicas de Ciego de Ávila, Cuba. **Method:** a descriptive observational study was carried out in 2022 at the aforementioned university, where the population study consisted of 52 administrative personnel in teaching functions (N=52). A sample of 34 was selected by simple random sampling (n=34). A validated questionnaire was applied as an empirical method for data collection. Measurement scales were established for quantitative variables. **Results:** the diagnosis revealed a low level of knowledge on Science, Technology and Innovation definitions (85%, 69% and 44%, respectively). Most of the

teaching and administrative personnel (53%) did not recognize the models that revealed the relationships between Science, Technology and Society and have in consideration that the University of Medicine is not positioned as a relevant actor in the local development. Forty-one percent reported that the Science, Technology and Society perspective almost always appears in the normative documents of the Ministerios de Educación Superior y de Salud Pública. **Conclusions:** there is evidence of insufficient knowledge on Science, Technology and Society and its use in the process management at universities. It is recommended to design related improvement actions on the subject.

**Keywords:** Science, Technology and Society; National Science, Technology and Innovation Policy; administrative personnel; university processes

**RESUMEN**

**Introducción:** el personal administrativo con una visión de Ciencia, Tecnología y Sociedad puede influir en las funciones universitarias con un enfoque social de la formación, investigación y extensión. **Objetivo:** diagnosticar el nivel de conocimientos sobre la perspectiva Ciencia, Tecnología y Sociedad del personal administrativo docente de la Universidad de Ciencias Médicas de Ciego de Ávila, Cuba. **Método:** se realizó un estudio observacional descriptivo durante el año 2022 en dicha universidad donde la población estuvo conformada por 52 administrativos en funciones docentes (N=52). Se seleccionó una muestra de 34 por muestreo simple aleatorio (n=34). Se aplicó un cuestionario validado como método empírico para la recolección de la información. Se establecieron escalas de medición para variables cuantitativas. **Resultados:** el diagnóstico reveló un bajo nivel de conocimientos sobre las definiciones de Ciencia, Tecnología e Innovación (85 %, 69 % y 44 %, respectivamente). La mayoría del personal administrativo docente no reconoció los modelos que designan las relaciones Ciencia, Tecnología y Sociedad y consideró que no se posiciona la universidad médica como actor relevante para el desarrollo local (53 %). El 41 % refirió que casi siempre aparece la perspectiva Ciencia, Tecnología y Sociedad en los documentos normativos de los ministerios de Educación Superior y Salud Pública. **Conclusiones:** se aportan evidencias sobre insuficiencias en los conocimientos por el personal administrativo docente sobre Ciencia, Tecnología y Sociedad y su uso en la gestión de los procesos universitarios. Se recomienda diseñar acciones de superación sobre la temática.

**Palabras clave:** Ciencia, Tecnología y Sociedad; Política Nacional de Ciencia, Tecnología e Innovación; personal administrativo; procesos universitarios

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**RESUMO**

**Introdução:** o pessoal administrativo com visão de Ciência, Tecnologia e Sociedade pode influenciar as funções universitárias com enfoque social na formação, pesquisa e extensão. **Objetivo:** diagnosticar o nível de conhecimento sobre a perspectiva de Ciência, Tecnologia e Sociedade do pessoal docente administrativo da Universidade de Ciências Médicas de Ciego de Ávila, Cuba. **Método:** estudo observacional descritivo realizado durante o ano de 2022 na referida universidade onde a população foi constituída por 52 funcionários administrativos em funções docentes (N=52). Uma amostra de 34 foi selecionada por amostragem aleatória simples (n=34). Um questionário validado foi aplicado como método empírico para a coleta de informações. Escalas de medida foram estabelecidas para variáveis quantitativas. **Resultados:** o diagnóstico revelou baixo nível de conhecimento sobre as definições de Ciência, Tecnologia e Inovação (85%, 69% e 44%, respectivamente). A maioria dos docentes administrativos não reconheceu os modelos que designam as relações Ciência, Tecnologia e Sociedade e considerou que a universidade médica não se posiciona como ator relevante para o desenvolvimento local (53%). 41% relataram que a perspectiva de Ciência, Tecnologia e Sociedade quase sempre aparece nos documentos normativos dos Ministérios da Educação Superior e da Saúde Pública. **Conclusões:** evidenciam-se as insuficiências de conhecimento do pessoal administrativo docente sobre Ciência, Tecnologia e Sociedade e a sua utilização na gestão dos processos universitários. Recomenda-se projetar ações de melhoria sobre o assunto.

**Palavras-chave:** Ciência, Tecnologia e Sociedade; Política Nacional de Ciência, Tecnologia e Inovação; pessoal administrativo; processos universitários



## INTRODUCTION

The relevance of universities is increasingly related to the link they are able to maintain with society, its problems and needs. In order to achieve this bidirectional exchange, the professional development of the administrative personnel of medical universities is necessary in correspondence with the demands of society and their involvement in the different tasks assigned to them for the successful achievement of the management process.<sup>(1)</sup>

In this sense, Science, Technology and Society (STS) studies can contribute to the management of university processes through a social vision of the functions of universities. Taking into account that STS studies are understood as a field of study and research, a field of work focused on the reciprocal interactions between science, technology and society, a theoretical perspective or academic field, a scientific discipline, among others; in all cases, the objective is to promote an approach that shows science and technology as social processes, as social constructions whose development is not explained solely by the values of truth, efficacy, and efficiency.<sup>(2)</sup>

It is proposed that university administrative personnel should know aspects of the STS approach and assume positions of interpretation of these studies as a necessary response to the challenges of an innovative university for sustainable human development. This means incorporating aspects that favor a social vision of science, technology and innovation as a way of appropriating a new paradigm on the process of knowledge construction in management practice.<sup>(3)</sup>

In addition, it allows understanding a social vision of the role of universities, as well as of the linked models and key concepts that designate the complex relationships between science, technology and society, their repercussions and impacts on training, research and public policy processes.

The concepts or definitions of science, technology and innovation have an evident relevance to understand the necessary changes, which with marked intentionality, should be generated in the vision of the administrative personnel of medical universities on science, technology and innovation in their effective incorporation to the management of university processes in favor of a model of innovative university for development.<sup>(4,5,6,7)</sup>

However, this perspective is not incorporated into the components that support the preparation of administrative personnel. Although at the country level there is political will for the management of science, technology and innovation in order to enhance the social and human development of the nation.<sup>(6)</sup>

At the Universidad de Ciencias Médicas de Ciego de Ávila, key university processes are developed, with a faculty that works to improve the quality of its management. For the directors, the improvement of its administrative teaching staff is an important aspect to guarantee the educational quality, however, insufficiencies are observed in the adequate management of the processes developed in the institution.



In view of the above, the need to know the current state of knowledge on the STS perspective of the administrative staff of the Universidad de Ciencias Médicas de Ciego de Ávila is declared as a scientific problem.

A diagnosis of the knowledge of the STS perspective of the administrative staff of the Universidad de Ciencias Médicas de Ciego de Ávila makes it possible to determine the learning needs related to the subject, in order to design training actions that incorporate aspects of this perspective into the management of university processes.

The objective of the research is to carry out a diagnosis of the current state of knowledge about the STS perspective of administrative personnel for the management of university processes.

## METHOD

A cross-sectional descriptive observational study was carried out in the administrative staff performing teaching functions at the Universidad de Ciencias Médicas de Ciego de Ávila, Cuba, during the year 2022.

The population consisted of 52 administrative teachers (N=52) and the sample under study consisted of 34 administrative teachers selected by simple random sampling (n=34), which represented 65% of the population.

A survey was applied as an empirical method for the collection of information, validated by the Centro de Estudios Educativos de la Universidad de Ciego de Ávila "Máximo Gómez Báez" (Complementary file).

The study variables were: level of origin, years of teaching experience, management structure, occupational category, knowledge about definition of Science, Technology and Innovation, knowledge about concepts and models that designate the changes in the interrelationships Science, Technology and Society in contemporary society, STS perspective in the normative documents issued by the Ministry of Higher Education and the Ministry of Public Health, positioning of the Universidad de Ciencias Médicas de Ciego de Ávila as a relevant actor in the processes of production, dissemination and use of knowledge demanded by local development, difficulties in assuming the STS approach, and suggestions to make the STS perspective a reality in the university context.

Descriptive statistics were used for quantitative variables, which were presented in tables and frequency distribution graphs for better understanding.

The variable knowledge about the definition of Science, Technology and Innovation had as a measurement scale: High: if the subject identifies at least three characteristic features of science, technology and innovation from the STS perspective; Medium: if the subject identifies two features; Low: if the subject identifies one or none.



The variable concepts and models that designate the changes in the interrelations between Science, Technology and Society in contemporary society were measured on the following scale: Knows: if the table recognizes the concept or model; Does not know: if the table does not recognize it.

The STS perspective variable in the normative documents issued by the Ministry of Higher Education and the Ministry of Public Health was measured on the following scale: Always: if the STS perspective is present in all the documents; Almost always: if it appears regularly in the normative documents; Sometimes: if the STS perspective appears on some occasions in the normative documents; Never: if the STS perspective is not found in the normative documents; Don't know: if not able to answer the question.

The variable positioning of the Universidad de Ciencias Médicas de Ciego de Ávila as a relevant actor in the processes of production, dissemination and use of knowledge demanded by local development was measured on the following scale: Positioned: if the administrative teaching staff considers that the university, through its substantive processes, contributes to local development; Not positioned: if the administrative teaching staff considers that it does not contribute.

The variables that constitute open questions in the survey of administrative personnel were collected as qualitative information. They were: difficulties in assuming the STS approach and suggestions for making the STS perspective a reality in the university context.

The ethical principles of the Declaration of Helsinki<sup>(8)</sup> such as confidentiality and privacy of data were taken into account in the research. The research is part of the result of the project Improvement in Science, Technology, and Society of the administrative teaching staff of medical universities for the management of university processes and of the STS Education Project in the university context of the Universidad de Ciego de Ávila, which is part of the Doctorate Program in Educational Sciences in the aforementioned institution.

## RESULTS

It was found that the level of origin of the teaching administrative personnel was as follows: 15 (44 %) belonged to the Faculty of Medical Sciences "Dr. José Assef Yara" of Ciego de Ávila, 14 (41 %) to the Facultad de Ciencias Médicas de Morón and, 5 (15 %), to the Universidad de Ciencias Médicas Ciego de Ávila.

Of these, 50% (17) had less than 10 years of teaching experience; the majority (27, representing 79%) performed management functions at the department level as a management structure; the occupational category of 13 of them (38%) belonged to non-biomedical higher education graduates, followed by 10 (29%) physicians.

The predominance of the Low level of knowledge was observed on the definition of Science (29), Technology (23) and Innovation (15), which accounted for 85%, 69% and 44%, respectively (Table 1).



**Table 1.** Knowledge about the definition of Science, Technology and Innovation in the administrative staff.

Knowledge (n=34)	Evaluation					
	High		Medium		Low	
	No.	%	No.	%	No.	%
Science	2	6	3	9	29	85
Technology	6	17	5	15	23	68
Innovation	9	27	10	29	15	44

Source: survey.

There was also a low level of knowledge about the models that designate STS relations, where the university occupies a relevant place (Table 2).

**Table 2.** Knowledge according to concepts and models that designate changes in the Science, Technology and Society interrelationships in contemporary society.

Knowledge (n=34)	Evaluation			
	Known		Not known	
	No.	%	No.	%
Techno-science	4	12	30	88
National Innovation Systems	7	21	27	79
Triple Helix Model	1	3	33	97
New Mode of Knowledge Production	5	15	29	85
Research University	8	24	26	76
Entrepreneurial University	11	32	23	68
The university for development	11	32	23	68

Source: survey.

It was observed that 41% of the respondents (14) reported that the STS perspective almost always appears in the normative documents of their management activity (Table 3).

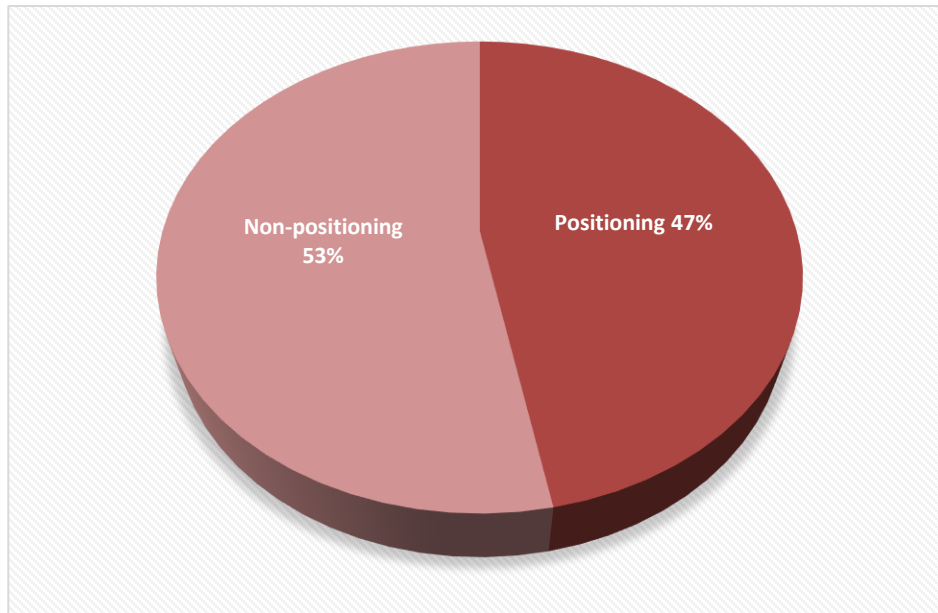
**Table 3.** Recognition of regulatory documents issued by the Ministry of Higher Education and Ministry of Public Health in the management activities performed

STS Approach in Regulatory Documents	No.	%
Always	9	26
Almost Always	14	41
Sometimes	10	29
Never	-	-
Don't Know	1	3
<b>Total</b>	<b>34</b>	<b>100</b>

Source: survey.



Fifty-three percent (18) considered non-positioning (Graph 1), closely followed by positioning with 47% (16), on considerations, worth the redundancy, of the performance of the Universidad de Ciencias Médicas of Ciego de Ávila as a relevant actor in the processes of production, spreading and use of the knowledge that local development demands from this field.



**Graph 1.** Considerations of the teaching administrative staff according to the positioning of the Universidad de Ciencias Médicas of Ciego de Avila, as a relevant actor in the processes of production, spreading and use of the knowledge that local development demands from this sector.

### Results of the open-ended questions survey on administrative teaching staff

The difficulties in assuming the STS approach in their management and professional activity in general expressed by the respondents were related to: insufficient knowledge for the application of the approach; it is not studied at the undergraduate level; the contents received are only addressed in the courses for change of teaching ranks; it is not incorporated into the preparation process of administrative teaching personnel; insufficient knowledge on the subject; insufficient skills for its application; recognizing that the course on Social Problems of Science and Technology is not sufficient.

When answering the question about three suggestions to make the STS perspective a reality in the university context where the respondents could argument on their answers, they referred to the need to receive training activities related to the subject, which will allow them to assume the STS approach in their management activity from the cognitive and attitudinal point of view, to incorporate it as a content of the preparations of the administrative teaching staff, to spread experiences related to the approach in the management activity and to incorporate the STS perspective into the teaching-educational process.

## DISCUSSION

The diagnosis about the knowledge on the definition of Science, Technology and Innovation by the teaching administrative staff of the Universidad de Ciencias Médicas de Ciego de Ávila revealed its predominance in the Low and Medium levels. It is related to the fact that they considered the concept of science as a body of knowledge, principles, laws and theories that explain the world; others conceive it as a systematic research process and the knowledge resulting from it. These answers characterize some aspects of science as a complex social phenomenon, however, there are other elements that are not taken into account in the definition, which reflect the distinctive features of this phenomenon, as: social activity aimed at the production, distribution and application of knowledge about the objective laws of nature and society, as a productive force, an important social institution linked to society and culture.<sup>(2)</sup>

It is noteworthy that none of the administrative teaching staff surveyed expressed definitions that reflect the contexts where knowledge is generated and produced, as an element to express the science-society link, an aspect that becomes important to understand the phenomenon from the position of the medicine school and its contribution to provide solutions to social problems, especially those related to human health. This requires the preparation of the administrative teaching staff in the theoretical aspects of the STS perspective.

Regarding technology, there was a predominant conception of understanding it as applied science or relating it to new instruments, tools, applications, computers and practical devices for use. This image of technology appreciated by the teaching staff makes it difficult to understand the social image of technology. Technology must be understood as a social process, in which technical and organizational aspects, skills, experiences and cultural aspects are interrelated: objectives, values and ethical codes, codes of behavior.<sup>(2)</sup>

The criteria accepted by most of the respondents favored the decontextualization of technology, and as a result, the social interests present in its development are not taken into account. In the field of medicine schools, understanding technology apart from social relations and the context in which it is produced prevents a critical analysis of the phenomenon, its applications and human purposes, as aspects that generate evaluative processes on the use and responsibility in the use of technology.

In relation to the concept of innovation, it was noted that the criteria were related to the consideration that it is any change generated in an organization and new products, services or procedures that find a successful application. Only 9 administrative teachers considered it correct to understand innovation as the materialization of advances derived from accumulated knowledge and materialized in the creation, introduction and dissemination of new and improved processes, procedures and products of society. This concept emphasizes that innovation is a social process closely linked to culture and with an established social purpose.<sup>(6,9)</sup> Some administrative teachers did not provide elements for the definition.





The authors of this research consider that STS studies offer contributions for the management of university processes. This is because the mastery of the concepts of science, technology and innovation with a social image makes it possible to understand that these phenomena cannot be understood apart from the social contexts that condition and explain them. Therefore, a social vision modifies traditional conceptions and practices in science teaching, and the approaches more linked to the social commitment of the university; which coincides with different scholars on the subject.<sup>(5,11)</sup>

Regarding the level of knowledge about concepts that designate the changes in the interrelations between Science, Technology and Society, the predominant answers were related to the lack of knowledge of the different concepts.

The term Technoscience is precisely a language resource to denote the intimate connection between science and technology and the blurring of their boundaries.<sup>(2)</sup> This is a term of broad meaning in the medical sciences. National Innovation Systems can be understood as the set of actors and organizations, and the links between them, as well as the related policies, rules, norms, habits and beliefs, which in a nation, sector or territory have major roles in innovation processes.<sup>(6)</sup>

The Triple Helix Model provides greater possibilities to capture the relationships (transitions) and even the transmutations (exchange of roles) that can occur in university-industry-government relationships. It is part of the intellectual process aimed at capturing the evolution of university-society relations.<sup>(3)</sup>

The New Mode of Knowledge Production is a concept that reveals changes in the role of the university, where it is recognized that the production of knowledge takes place in the context of its application, with an interdisciplinary character in correspondence with the complex problems faced by research, with the confluence of various actors with shared responsibility in the definitions, management and control of the quality of the results of scientific and innovative activity.<sup>(3)</sup>

The research university concept refers to the incorporation of research into universities and the entrepreneurial university to a link between universities and the business sector, that results in the capitalization of knowledge.

Close to the ideal model for developing countries, among them Cuba, is the University for development, which is characterized by the joint practice of teaching, research and extension, among other activities in the environment, which indicates joining efforts with very diverse social actors in favor of sustainable human development.<sup>(3,11)</sup>

This implies, in particular, contributing to the generalization of advanced and continuing education, the original creation of culture and socially valuable knowledge, the solution of collective problems, the prioritization of the most neglected sectors through the collaboration of the university and other actors in interactive processes where everyone learns and performs, not as patients but as agents.<sup>(3)</sup>



The concepts and models addressed express connections between science, technology and innovation and the work of universities, and have their expression in university policies for managing substantive processes. Therefore, for universities to become a key factor for human development, to promote sustainability and social development, the traditional ways of relating to the context must be modified; it is necessary to move from the classic model of supplying knowledge to processes of joint construction of knowledge, and this aspiration is only possible with new conceptual references.<sup>(3,12)</sup>

Regarding the recognition by the teaching administrative staff of the STS perspective in the normative documents issued by the Ministry of Higher Education and the Ministry of Public Health according to the management activity they perform, most of the teaching administrative staff stated that it was present Almost always; which could be determined by the policies issued by the country's top political authorities aimed at promoting the use of science, technology and innovation to provide timely responses to the problems of society, an aspect that is reflected in the documents of these ministries.

However, the arguments expressed in terms of concepts, difficulties in assuming the STS approach in the management activity of the teaching and professional administrative staff in general, and suggestions for making the STS perspective a reality in the university context, evidenced insufficiencies related to the level of knowledge about the STS perspective and its application to the management activity at the Universidad de Ciencias Médicas de Ciego de Ávila.

The question about whether or not the medical university is positioned as a relevant actor in the processes of production, dissemination and use of knowledge for local development showed a greater number of negative answers; however, very little difference was observed in the positive answers. The arguments in favor of positioning were related to the performance of research, the increase in the number of professors with higher ranks and the existence of extension projects. The statement that it is not positioned is supported by the fact that the results do not meet the expectations of society; it does not translate into health indicators and insufficient number of local development projects.

The previous question takes into account the role that corresponds to the medical university in the solution of situations that affect society, among which are those related to health, as a process that demands cooperation with other actors, universities, organizations and institutions to influence the development of the territory; an aspect that was not taken into account in the answers obtained.

In the arguments expressed, it was not reflected by the teaching administrative staff that this is an aspect of strategic importance for the country, where universities have great involvement to promote the social appropriation of knowledge by the population and to assume social commitments in favor of sustainable human development.

On the other hand, in the open questions asked, the answers in relation to the preparation in the STS perspective could be related to the fact that, in higher medical education, STS studies were established only from the academic year 2019-2020 for the fifth year of the Medicine major, and in the following academic year (2020-2021) for the rest of the majors within the national Plan E, according to Resolution 83/2021. In this regard, 24 administrative teachers did not respond to this question.



Others acknowledged that the course on Social Problems of Science and Technology is not sufficient for the adequate understanding of science, technology and innovation as processes linked to the social contexts that condition and explain them, which is due to the fact that in most cases they take it only because it is an indispensable requirement for obtaining the main teaching ranks, without taking into account its importance for the management of university processes. This coincides with results obtained in research carried out by Rodríguez, *et al.*<sup>(7)</sup>

The authors' experience for more than 20 years as professors and members of the course on Social Problems of Science and Technology tribunal for the exercise of teaching ranks at the Universidad de Ciencias Médicas de Ciego de Ávila, allows contributing elements that coincide with the criteria of the authors cited above. In the administrative teaching staff of this medicine school, the classical or traditional vision on science, technology and innovation predominates.

It was considered as a limitation of the research the use of the survey as the only measuring instrument. If the observation technique, the interview and the document analysis of the preparation plan of the university's administrative teaching staff and the subjects of the Diploma in Health Management had been added, could corroborate the results obtained and enrich the diagnosis.

## CONCLUSIONS

The knowledge of the administrative teaching staff of the Universidad de Ciencias Médicas de Ciego de Ávila about Science, Technology and Society, and its use in the management of university processes, is insufficient. It is recommended to design training actions on the subject.

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**Conflict of interest:**

The authors declare that there are no conflicts of interest.



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