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POST-GRADUATION RESEARCH SKILLS AT THE UNIVERSITY OF SAN CARLOS OF GUATEMALA

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Abstract: The objective of this research was to establish the level of mastery of the components that make up the research competencies in post-graduation students, as well as to establish the strategies that are applied in the training process to reach that level of competency, which is a reference for the development of a research culture. It was a study epistemologically based on interpretive hermeneutics, it had a mixed approach, with intentional non-probabilistic sampling. Likewise, a self-designed questionnaire validated through expert methodology was applied to teachers and students, which included a Likert scale that allowed establishing the level of mastery of the components of the research competencies in students. Among the main results, it is worth highlighting that the research competencies in post-graduation students reflect a level of basic mastery, which indicates that they have the capabilities to carry out research. For the development of investigative skills, both teachers and students agreed that strategies based on collaborative work are used, which link theory with practice, master classes, among others. Significant experiences are manifested in the application of research in the classroom during student training. It is concluded that the research competencies in the students reflect a basic level, which is encouraged from the classroom, applying teaching and learning strategies that the teachers apply, despite the effort made, the research culture must be strengthened.

Keywords: investigative skills, strategies, culture

INTRODUCTION

Currently, research has become the cornerstone for producing new knowledge, which implies that the gap of being only consumers of knowledge must be overcome, given that it must also be produced. In this sense, universities are called to develop research, so it is necessary to develop research skills in students, something imminent to carry out the research task addressing emerging problems in the context, this implies that post-graduation students must help promote the culture of research, research must not be carried out just to graduate from the program that students take.

The above being a problem that has been observed, post-graduation students as part of their training receive courses in the research area, it is presumed that in these courses they develop the skills to carry out the research task, however in some cases they carry out investigation to meet the requirement to graduate, but then they do not carry out the investigation again. In other cases, students are left with the closure of their curriculum and are unable to complete the thesis. That is why this study was aimed at establishing the level of mastery of the components that make up the research competencies in post-graduation students, as well as establishing the strategies that are applied in the training process for their development in order to verify, where the problem lies, in the lack of capabilities, in the training process or on the other hand, research culture is not achieved.

In this sense, Reinoso (2010) indicates that the responsibility of research is not limited only to the training process, it must be promoted in a comprehensive manner. The aforementioned author establishes that there is a relationship between teaching and research, where the teaching and learning process becomes an academic space for the production of knowledge. What was presented

above, it denotes the importance of research, and the performance of the professor and university students in such activity.

In that same sense, Mas (2014) states that for university teachers and their daily performance, research becomes essential as a means to generate innovative theoretical-practical approaches, as a renewing source for their theoretical base, and as a mechanism to maintain connected to contextual reality. Furthermore, research is perceived as a crucial factor for career advancement. To achieve this, it is imperative to receive training and acquire knowledge and strategies that allow the practical application of research processes and results in daily activities.

In relation to the above, this study addressed the components of research competence in post-graduation degrees, which was of substantive importance, given that, at that educational level, research is a fundamental tool for the production of knowledge and is one of training objectives at the university. The challenge has been, not only to train professionals for a specific field, but also to be academics, who through research propose viable solutions to the problems that are experienced.

In this order of ideas, addressing the components of research competence in post-graduation studies was essential; the level of the components that make up the competence in the students and the strategies that have been used to achieve the competence were determined.

There are various concepts about competencies, among them the following can be mentioned: It is the mental ability to apply knowledge, techniques and reflections to practice. This capacity allows the development of frames of reference or models of knowledge and action that facilitate the diagnosis and solution of problems (Catalano et. al 2004 p. 226).

De la Mano and Moro (2009) indicate that it is the competence that is demonstrated to address problems. (p. 4)

The development of updated knowledge and multidisciplinary skills to design and undertake research projects that solve problems of social relevance in various contexts. (Guaman et. al 2020)

Jaik (2013) establishes that competence is a characteristic that is related to the success that professionals have in the workplace, and defines it as socio-affective, cognitive and motor attributes to fulfill an assigned activity, it must incorporate ethics and values to achieve effective performance (p.18)

Tobón (2013) defines competencies as comprehensive actions to identify, interpret and argue contextual problems, developing and applying different knowledge in a coordinated manner (knowing how to be, knowing how to live together, knowing how to do and knowing how to know) with competence, continuous improvement and ethics. (p. 93)

In the previous conceptions, meeting points can be identified. They all agree on establishing them as comprehensive actions, a set of knowledge, skills and abilities that are mobilized to respond to situations that may arise in reality. In this sense, it is also noted that competence is made up of cognitive, procedural and attitudinal abilities.

It is important to highlight that competencies are first developed from the experiences, knowledge and beliefs of the human being, that is, the social and cultural experience of the person is elementary and educational processes achieve the specialization of knowledge: cognitive, procedural and attitudinal. In the field of higher education and specifically at the post-graduation level in science category master's programs and doctorates, research skills are developed by researching.

In this order of ideas, according to Nuñez (2019), it establishes that based on studies that have been carried out in Latin America, among them the Tuning Project (2004) stands out, where research was investigated in relation to investigative competence, the location was obtained as a result. Of the same among the ten most elementary, they must be developed in higher education, establishing its components in: cognitive, metacognitive, motivational, research activity, influence of professional activity, teamwork and interdisciplinarity.

For the purposes of this study, investigative competence is defined as the set of knowledge that is mobilized to address a problem or topic related to a specific disciplinary context and field, applying the scientific research process with a qualitative, quantitative or mixed approach, tools technological technologies and means to produce new knowledge and transfer it as a contribution to science and academic society. From the previous definition, investigative competencies have components detailed in Figure 1, which constituted what was investigated in this study.

In the previous sense, the components of the research competence are conceptualized with Benavides (2002) as a reference in the following way:

- Cognitive: defined as the set of intellectual skills that allow the researcher to develop complex tasks by interacting with contextual phenomena. It includes the capacity for observation, analysis, synthesis and critical thinking.

- Methodological: includes the ability to apply methods in the research process, which implies stating the problem, establishing the approach, scope, research design, establishing sampling, designing, validating and applying instruments.

- Technological: includes the capacity that facilitates the management of information, the management of databases and the management of programs for data analysis.

- Communicational: includes the ability to present results and publish them.

- Interpersonal: includes the skills that come with the motivation expressed in the research process.

- Ethics: includes honesty in conducting research and producing knowledge with a genuine nature.

With what was stated in the previous pages, this study became a necessity to establish the level of development achieved by graduate students in each of the components that make up research competence. Thus, it was also possible to determine the strategies that teachers apply to awaken their research interest, which influences the development of a research culture so that the university permanently produces knowledge in the face of the problems, challenges and trends of the 21st century. The objective of this research was to establish the level of mastery of the components that make up research competence in post-graduation students at the University of San Carlos of Guatemala as a reference for the development of a research culture.

METHOD AND MATERIALS

The research was based on postpositivism, according to Byman (2016) reality is complex, which is why the implementation of mixed methods is necessary, which allows the researcher to address that reality in order to obtain a more complete vision of the phenomena of the social area. The approach was mixed, "…they represent a set of systematic, empirical and critical research processes and involve the collection and analysis of quantitative and qualitative data, as well as their integration and joint discussion, and achieving a greater understanding of
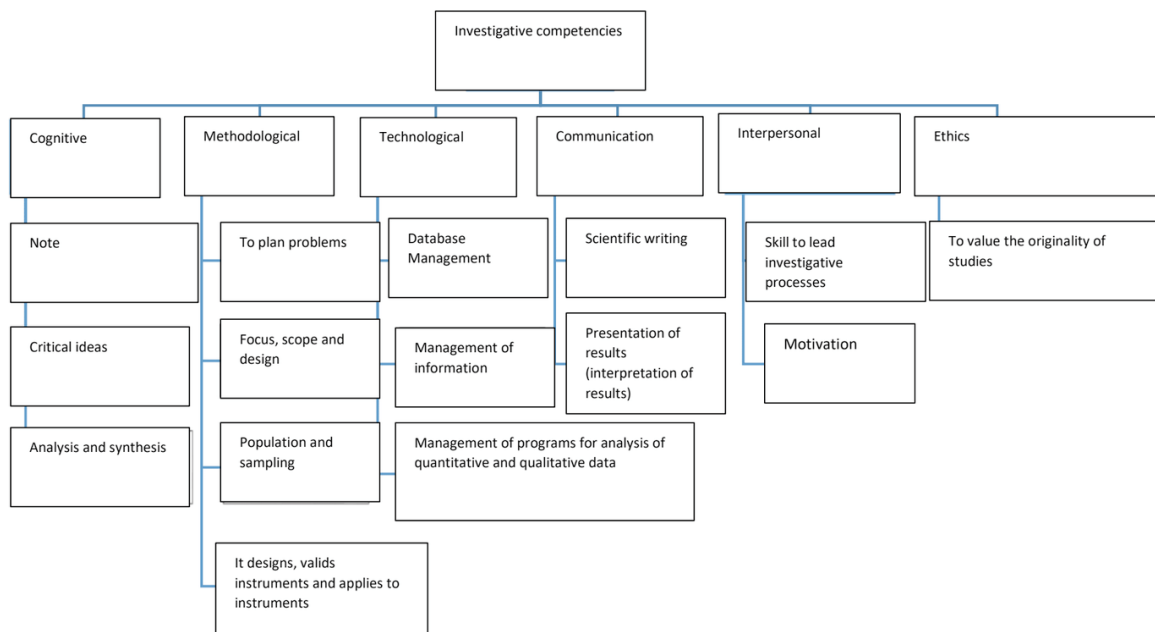
Figure 1 Components of the research competence for this study

the phenomenon under study" (Hernández Sampieri & Mendoza Torres 2018. P. 612). The scope was descriptive, not experimental, since the variables were not manipulated.

The population was made up of the academic units of the University of San Carlos of Guatemala, the sampling was non-probabilistic and intentional, given that the participants had to meet the inclusion criteria established for this purpose, as shown in Table 1.

Units of analysis	N (population)	n (sampling)	Percentage	Selection procedure
Universities*	10	4	40%	Purposive sampling
Non-optional schools	7	2	28.57%	Purposive sampling
University centers ***	15	3	20%	Purposive sampling

Inclusion criteria
  • Professors who teach in the research area of the science and doctorate category master's programs
  • Students of the third, fourth and fifth cycle/semester of the science and doctorate category master's degrees.

Table 1. *Sampling frame*

The instrument was a questionnaire designed for this purpose, it included a Likert scale 1 very low, 2 low, 3 moderate, 4 high, 5 very high. A group of three experts in the field reviewed and rated each questionnaire item in terms of its relevance and clarity. Using a scale from 1 to 4, where 1 indicates "not relevant" and 4 "very relevant", the content validity index (CVI) was calculated for each item and for the questionnaire as a whole. The results revealed the items obtained an CVI equal to or greater than 0.78, with a total CVI of 0.92. This demonstrated that the questionnaire has content validity that guaranteed that the items were consistent with the topic of study.

An interview guide was also applied, which was subjected to expert judgment; the content validity of each item was evaluated using a relevance scale. Five experts reviewed and rated the relevance of the items. The content validity index (CVI) was calculated for each item and for the guide in general. The results showed that most items reached an CVI equal to or greater than 0.76, with a total CVI of 0.96. This indicates that the interview guide has high content validity, which ensures that the items are relevant and representative of the topic of study. Wording adjustments were made to the items with CVI of 0.78.

RESULTS

The results presented below reflect the levels of mastery that students have in each of the components of research competence in post-graduation studies.

1. Level of investigative skills

The average of the investigative competence component is positioned at level 3, which is considered a basic level according to the scale applied. Cognitively, the student has the knowledge to carry out research. Regarding the methodological component, she knows how to pose a problem and masters the research approaches, scope, research design and identifies the population and can choose and apply a type of sampling. In the technological component, she has the skills to manage software for data analysis, information management, among other aspects. In the communication component, they denote skill at a level 3. It is important to highlight that the ability to publish has as a background the writing of scientific manuscripts, which is at a level of 2.21, which indicates that it must improve, which explains the low scientific publication that Some of it is reflected in the positioning of the university in the international framework.

The interpersonal component includes the skills to lead research processes, it is at level 3, while the motivational component has a level 4, which positions students at an intermediate level, which can be used to encourage research in the student. as a constant practice beyond being a requirement to graduate. Finally, the ethical component is positioned for students at a basic level, which includes scientific production free of plagiarism.

The levels of mastery achieved in the components of the competence according to Figure 2, led to identifying the strategies that teachers apply in the training process. In this sense, Pérez (2012) establishes that the development of investigative skills requires pedagogical and didactic strategies that lead to the construction of meaningful learning. For this study, the contributions of the aforementioned author were taken up, which defines strategies as actions that are oriented towards the development of cognitive operations, skills and attitudes to achieve meaningful learning in the student.

2. Strategies that are applied to develop investigative skills

Through this study, it was possible to identify seven strategies that teachers apply to develop the components of investigative competence. These strategies are aimed at promoting student actions, in such a way that it is not passive learning, with the main objective being that the student puts into practice what he learns theoretically, which allows learning that can be taken advantage of. the best way, providing elements to solve the challenges posed at different professional levels.

DISCUSSION

It is important to highlight that there are similar studies, which served as a reference to continue contributing to the knowledge of the topic in question.

First knowing the level of research competencies of the students was necessary to know what knowledge, skills and abilities they have developed for research, and from this establish that after graduating from the programs, they can carry out more advanced research, as indicated by Villar et al. (2011) establish that research competence allows university students to generate specialized practical learning aimed at designing and executing research projects; therefore, the development of these competences in the training process is necessary, with which they agree, given that having the competencies at a basic level empowers graduates to do
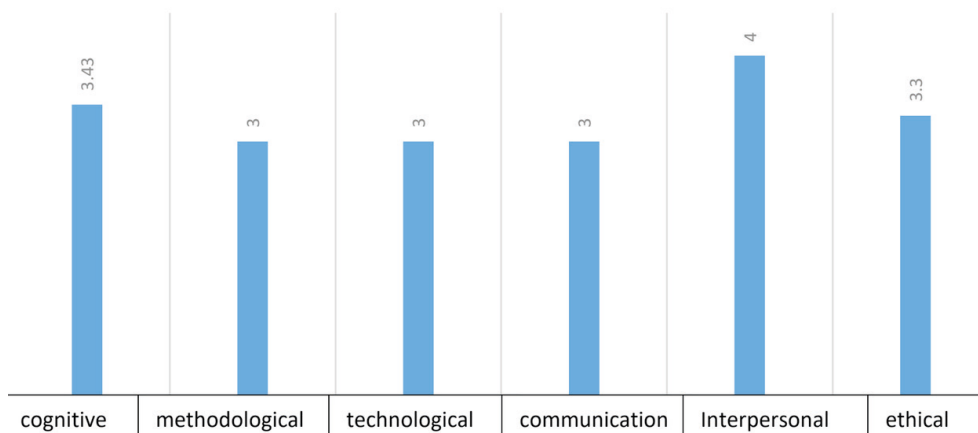
Figure 2 *Average levels of mastery of the components of investigative competence*

		Informants					
Citizens	**Quantity**	**Gender**		**Program to which it belongs**	**Working Information**	**Participation in research projects**	**Applied instrument**
		Men	**Women**				
Teachers	23	57%	43.%	91.3% MCC*	100% teacher	56.5%	Quizz
				17:4% Doctorate	17.4% P. Coordinator**		
Students	113	39.8%	57.5%	85.8% MCC	38.1% Teacher	31%	Interview guide
					4.4.% investigator		
					18.6% administrator		
				14.2% Doctorate	7.6% coordinator		
					33% others		

Table 2. *Description of informants*

Note: *Master's Degree Science Category (MCC). **Coordinating teacher

Strategy type	Information provided by Teachers	Information provided by Students
Personalized advice	A space for knowledge and free expression is offered for personalized advice regarding research topics, in which professionals are offered tools for their academic improvement.	S There is openness on the part of the professors to make inquiries, request tutoring and specialized attention in the academic situations that arise.
Master class	Spaces for dialogue are created, in which personalized support is provided as well as an approach to the academic and work experiences of colleagues in the different areas and specialties.	The aim is to create safe learning spaces in which trust and networks of contacts can be generated, for the subsequent application of knowledge, through debates and situations where dialogue is vital.
Contextualize the learning and development of the programmed	The contextualization of the cases is contemplated to be able to approach the research from a real position that favors professionals in training, preparing them to provide a better product to society with cases from everyday life based on the experience of teachers and other colleagues.	The review of previous research in the same field is vital for the enrichment of the individual, including recommended bibliography, as well as research linked to the different interests of the students.
Creation of unpublished material	Creating something unpublished is the way through which the research culture can be promoted efficiently, assigning tasks, essays, assignments related to the creation of original content, which can be the basis for the student to continue researching and publishing.	The student has the opportunity to publish, create, design, manuscripts within the learning activities of the courses, subsequently they can be improved thanks to feedback and presented to different magazines recognized nationally and internationally.
Collaborative work	By creating collaborative spaces for research, it is possible for more people to participate in the spaces intended for this field within the Post-graduation Studies System.	Collaborative work is oriented towards carrying out activities so that motivation arises from the socialization that occurs among students.

Use of educational technology	Teachers did not indicate the use of these strategies.	Virtual tools are used for the development of the courses, including topics such as gamification and for data analysis.
Binding with graduation	Through what the Post-graduation Studies System establishes as general, applicable to all programs, the support of students is obtained, who opt for scholarships at the national and international level, generating opportunities to prepare for working life.	Own courses have been established to prepare the thesis, providing the specific support of an advisor and multiple professionals trained to investigate.
Other	Some other strategies are contemplated, which include teachers' own methods, but which were not identified with a specific name.	Students perceive other methodologies, which are based on uncommon and unstructured techniques that were not identified with a specific name.

Table 3 *Strategies that are applied to develop investigative skills in the classroom*

research, something important to highlight and very much in agreement with what Jaik (2013) indicates in his study investigative competencies, indicates that in the current context research plays a role relevant and one of its findings precisely is to train citizens with skills to investigate through education, and the study that was carried out confirmed that indeed the post-graduation students of the University of San Carlos of Guatemala form and develop the skills through the training processes.

Another important aspect to be found in this study is that the strategies used by teachers are aligned with this level of competencies found to be effective. In this sense, students require strategies that include practical activities, direct guidance and exercises that strengthen basic research skills, an aspect that has ensured that the pedagogical interventions of post-graduation professors are not only relevant, but also adequate to current needs. of the students.

In the previous sense, Mahecha and Pachón (2011) in their study of training in research skills in higher education show that the training of research skills is derived from the effectiveness and clarity in which each post-graduation program assumes the training in research, which is consistent with the findings of this research, given that teachers manage the teaching and learning process according to what is established in the programs in relation to research.

Reiban (2018), in the study carried out on the research competencies of the university professor, determines that this is positioned in a context that requires a type of knowledge and actions determined by higher education teaching staff and also establishes the quality parameters that must be be achieved in the research that is carried out, concluding that investigative competence must respond to the professional development demanded by today's society. In that sense, it can be said that this is a thematic limitation of the research carried out; it remains to be investigated in relation to the quality parameters with which the research carried out in post-graduation courses is associated.

Espinoza et. al (2015) addresses the development of research skills in university students, taking as a reference the educational process developed by teachers, establishing that it is a requirement of today's society, addresses research skills in relation to the development of a culture for investigation. In addition, Guaman et.al (2020), in their study of research competencies as an imperative for training in today's university, concludes that these contribute to the development of university professionals capable of proposing research projects that address the problems of the contest and provide solutions to them., which compared to this study, it is evident that among the components of research competence with the basic level there is the ability and capacity to propose research

projects and carry them out, which shows that upon graduating from a post-graduation degree in San Carlos has the authority to continue investigating, which is not the case, showing that the investigative culture needs to be strengthened.

It is important to mention that the development of competencies in education at all levels has as a background the actions that the teacher carries out in the training field, in that order of ideas, a second aspect found in this research was the strategies that teachers use for their development and awaken their interest in research.

In that sense, paraphrasing Espinoza et al. (2016) research training entails the development of competencies, for which participatory, active strategies are needed that link the student with research, they are its nature and search, with its phases and operation, in short it is applying strategies that lead the participant to learn by doing, given that according to the author, research is learned by researching, and according to the findings of the research, the strategies that the professors apply in the post-graduation studies subject to this investigation take the student to that level, to link with research through collaborative exercises from the classroom.

Another study like that of Pacheco (2017) indicates that the teacher is an activator of knowledge, who finds in training the bases to produce science that allows him to represent the reality that he studies. But the basic thing about this is that it has an influence on the professionals it trains, which indicates that the abilities of the teachers are reproduced or transferred to the students, so it must be ensured that this teacher is in permanent training and updating to correspond. to the challenges that arise in today's world in relation to research, for example, the issue of open science, open access, among others.

This study did not delve into teacher training, which remains a limitation and must continue to be investigated in order to determine the research capabilities that teachers have, as well as to investigate how many of them do research permanently. And very much in line with what Pacheco (2017) indicates, the professor in these post-graduation courses has achieved, through the application of strategies such as collaborative work, consultancy, creating material, among others, the development of the components that make up the investigative competence and has managed to bring it at a basic level which is what is expected of a graduate student.

In coherence with the above, other authors such as Mas Torello (2014) establish a relationship between teaching and research, where the teaching and learning process becomes an academic space for the production of knowledge. The above denotes the importance of research, and the performance of the university professor in such activity, which, from this study, the actions of the professor are made visible and it is clear that from the classrooms they are trained for research, however, it is necessary that knowledge is produced, not only as a mere graduation requirement, but that it becomes a culture.

It is important to mention that strategies lead to the development of competencies and this is therefore an element for the development of a research culture, according to Espinoza et al. (2016) it is necessary to strengthen this in future professionals, they must be motivated to achieve a constant investigative exercise and that from this they can contribute to the solution of contextual problems.

Without a doubt and as established by the authors of the studies consulted, for the construction of a research culture it is proposed to promote processes of participation in multidisciplinary research projects in order

to achieve an exchange of knowledge for the production of knowledge with a view, not only to carry out research to graduate from a program, but because it is a custom rooted in professionals who understand that research is implicit in every area, so to make decisions, promote improvements, among others, it must be based on evidence, and research allows it, an aspect that must continue to be investigated to delve into the factors that are interfering so that this does not fully occur at the university.

The results of this research demonstrate that research competencies in post-graduation students have a basic level that is elementary for developing research and how the strategies implemented by teachers in the classroom contribute significantly to the development of these competencies. The findings reveal that students, through the application of active and participatory methodologies in the classroom, not only acquire fundamental knowledge, but also develop critical skills to continue with more advanced research. This study contributes to the field of higher education by establishing that research training at a basic level includes the essential skills to conduct research and thus foster a robust and sustainable research culture in educational institutions.

CONCLUSIONS

In conclusion, it can be said that through this study it was determined that research is encouraged from the classroom, with the methodology courses and research seminars

designed in the curriculum being the main fields of action. Teachers apply strategies aimed at the operationalization of research by students. The learning product obtained through the strategies has been a significant experience for the students, as they indicate that they have learned, but it has also meant challenges.

The strategies that teachers apply to develop skills and awaken the student's interest in research are substantive, for which participatory and active strategies are needed that link the student with research, given that research is learned by doing research. There is no doubt that the post-graduation courses at the University of San Carlos of Guatemala have opted for collaborative work, the application of active strategies, practical application, and support, which is consistent with what was indicated by the aforementioned author.

Finally, it is noted that in the post-graduation courses of the University of San Carlos, research skills are developed, which is fundamental for the construction of a research culture, but it is necessary to promote processes of participation in research projects, and not only from the actions and the isolated efforts that each academic unit and professor makes, in order to ensure that the graduating professional carries out research beyond the purpose of graduating from a program, but because it is a custom ingrained in professionals who understand that research is implicit in everything. scope, to make decisions and promote improvements, which must be done based on evidence, and research allows it.

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