



Doctorate in Scientific Research with a mention in Health Sciences, period 2021-2025: Achievements and Advances.

Ph.D. Manuel Enrique Pedroza

Full Professor. National Autonomous University of Nicaragua, Managua, Nicaragua.

<https://orcid.org/0000-0002-9108-5016>

hppedroza@gmail.com

Submitted on August 31th, 2022 / Accepted on January 11th, 2023

<https://doi.org/10.5377/rtu.v12i33.15882>

Keywords: Achievements and progress, Doctorate in Scientific Research.

ABSTRACT

This article is presented to disseminate the achievements and progress of the *Doctoral Program in Scientific Research with a mention in Health Sciences*, (PRODIC_S), I Cohort of the Faculty of Medical Sciences (FCCMédicas) of UNAN-Managua, to present this article. The following are highlighted as relevant findings: (1) Defended the research project of each doctoral student. (2) Fulfillment of the academic plan for the year 2021. (3) Scientific tutor defined for each of the doctoral students. (4) As of June 30, 2022, 80% of the doctoral students have a scholarship from UNAN-Managua. (5) High satisfaction was obtained from the doctoral students about their progress in the program, 90% were *very satisfied* and 10% were *highly satisfied*. (6) Access and availability of academic material through the doctoral Moodle platform. (7) Completion of the first scientific essay. (8) Institutional management of the program based on the R&D+i model. (9) Completion of the doctoral research project. (10) Development of a new curriculum design in six modules. (11) Availability of the team of founding professors of this program.

1. INTRODUCTION

The current dynamics of the modern world, marked as the “*era of information, knowledge, and learning*”, demands that university professionals be more competitive, more capable of interacting and seeking solutions to increasingly complex phenomena, many of them of a multicausal nature and multidimensional effects that demand solutions based on new knowledge of science, technology, and innovation (Pedroza, 2014).

In today’s world, there is a context of continuous and accelerated changes typical of the “*Knowledge Society, Informatization and Learning*”, focused on seven megatrends: *Biotechnology, Biomedicine, Biostatistics, Bioinformatics, Biorobotics and GIS, Climate Change and Paradigm Shift*, which define a new institutional context of paradigm rupture, of new and dynamic learning at global, regional, national and local levels (Pedroza, 2015).

In the global context, a set of processes of educational, technological, socio-economic, etc. transformations occur, all of them oriented to the continuous improvement of the quality of university education in Nicaragua. In the scientific research management model, Research, Development and Innovation Model of UNAN-Managua (R&D+i Model), the new transformations in the field of scientific research have been carried out in UNAN-Managua, in the period 2011-2016, are based (Pedroza, 2018).

Currently, UNAN-Managua faces the challenge of promoting, building, and developing through research, new internal and external competencies, strengthening the strategic alliance with the health, education, agricultural, and livestock sectors, identifying new knowledge and technologies that promote the creation of new possibilities for transformation that facilitate scientific-technological development in the Health, Education, Agricultural and Livestock sectors (Pedroza, 2021).

Strengthening the quality of graduate education and research is imperative in Nicaragua. This leads the university to implement a greater commitment to improving the quality of university education, innovating in *undergraduate and graduate education*, and innovating in *scientific research* strengthened by *holistic, systemic, and anthropocentric approaches to research methods*, which involve real and effective integration with the processes of innovation, entrepreneurship and university extension (Pedroza, 2021).

Since 2013, the Research Directorate of UNAN-Managua organized *efforts aimed at the continuous improvement of graduate education and scientific research, for the institutional strengthening of UNAN-Managua*. In this strengthened context of institutional, academic, and scientific transformations, the following stand out among others: the Master’s Program in Scientific Research Methods (MEDINV), cited by Pedroza (2014), the Doctoral Program

in Management and Quality of Scientific Research (DOGCINV), cited by Pedroza (2016), the Master's Program in Biomedical Research (PROMIB), cited by Pedroza (2020) and the Doctoral Program in Biomedical Research (PRODIB), cited by (Corriols Molina, 2017).

Currently, the Faculty of Medical Sciences (FCCM) of the UNAN-Managua, is carrying out a series of positive transformations to strengthen and improve the quality of graduate education and research. In this context, the *Doctoral Program in Scientific Research with a mention in Health Sciences, PRODIC_S I Cohort of the Faculty of Medical Sciences of UNAN-Managua was implemented*. This program involves a collaborative effort of teacher-researchers from different faculties of UNAN-Managua and outstanding national and international experts, who contribute with their work to strengthen the quality and relevance of this program (Pedroza, 2021).

The *PRODIC_S* is an organizational innovation of the Faculty of Medical Sciences of UNAN-Managua to contribute to improving the quality of university education, developing the continuous improvement of Postgraduate Teaching and Research, *through an integrated doctoral program, master's degree and a doctorate in scientific research* (Pedroza, 2021).

In the *PRODIC_S*, the "Holistic, Systemic and Anthropocentric approaches to Research Methods" are promoted as its fundamental principles. It applies the principles of the R&D&I model, as a system in itself that represents a continuous and interactive process of research, innovation, and entrepreneurship, in which research is fed back by the relevant findings that emerge from the innovation and entrepreneurship processes (Pedroza, 2015).

The *PRODIC_S* is an innovative program that allows expanding the institutional competencies of UNAN Managua, opening new development opportunities for young people who want to study scientific research, expands the postgraduate academic offer, offering new students with a Master's or Bachelor's degree, *the opportunity to study an integrated doctoral program, Master's and Ph.D.* (Pedroza, 2021).

This article is developed with the general objective of disseminating the achievements and progress of *PRODIC_S I Cohort 2021-2025*, of the Faculty of Medical Sciences of the UNAN-Managua, occurring in the year 2021.

2. METHODOLOGY

According to the research method, the present study is observational and according to the initial level of depth of knowledge, it is descriptive. According to the period and sequence of the study, it is transversal. In the field of educational research, the present research is a case study, which is based on the application of the mixed approach, promotes full integration, is explanatory in nature, and is oriented by an analytical or naturalistic generalization to build and test theories (Hernández, Fernández, & Baptista, 2014).

3. RESULTS

3.1. Institutional Context of Research in the Faculty of Medical Sciences

In the current context of dynamic changes and the search to improve every day its own conceptual, philosophical, methodological, and technological references, UNAN-Managua has been continuously evolving, to achieve better levels of quality and relevance in university education, according to its five functions: Education, Research, Extension, Internalization, and Management and Administration (Pedroza, 2018).

Due to their importance, some institutional changes of UNAN-Managua stand out, which have been occurring since 2011, in a set of rigorous, very reflective, detailed, and deep, methodological and scientific academic processes, processes that have modernized the university, demonstrating that UNAN-Managua is capable of reinventing and transforming itself, to contribute to the social and technological transformation of Nicaraguan society. Some very positive institutional changes are highlighted below, based on interviews conducted with Dr. Freddy Meynard Mejía, Dean of the Faculty of Medical Sciences UNAN-Managua and MSc. Isaías Hernández, Director Directorate of Institutional Management and Quality. UNAN-Managua:

1. Creation of the Directorate of Planning, in 2011.
2. Creation of the Vice Rector's Office for Student Affairs, in 2014.
3. Creation of the Directorate of Institutional Management and Quality, in 2019.
4. Creation of the Curriculum Design by Competencies, in 2019.
5. Creation of the Center for Open Innovation, in 2020.
6. Creation of the *Vice Rectory of Knowledge Management and Social Linkage*, created on October 1, 2021, according to the Minutes of the Ordinary Session No. 19-2021, of the University Council of UNAN-Managua.
7. Creation of the Biotechnology Research Center, created in 2021.

In this same period between 2011-2016, the Research Directorate of UNAN-Managua promoted the necessary transformations that mark a **before and after** in the "*Biomedical Research of the Faculty of Medical Sciences of UNAN-Managua*". Currently, the transversal axis of scientific research has been strengthened at the postgraduate level and is fully operational in the Faculty of Medical Sciences of UNAN-Managua: Postgraduate Courses, Masters and Doctorate in "Biomedical Research".

In the Faculty of Medical Sciences, in the period 2017-2022, despite the difficult years of 2018, 2019, and 2020, the following stand out as relevant findings: 1) Successful implementation of the transversal axis of scientific research at the postgraduate level of the Faculty of Medical Sciences, which is expressed in the fulfillment of the diploma, master's and doctoral programs in biomedical research, aimed at MINSA and non-MINSA specialist physicians; 2) Strengthened the institutional Agreement Faculty of Medical Sciences of UNAN-Managua-MINSA, with the fulfillment for five years, of the *Postgraduate Courses of Online Research*, aimed at all resident physicians of the different medical specialties, located in MINSA hospitals (Pedroza, 2020).

With the experiences achieved by the Faculty of Medical Sciences of the UNAN-Managua, in the formation of new competencies at the postgraduate level, new transformations are initiated in 2021 in this faculty, to make quality leaps in closing the existing information, knowledge, and technology gaps, through the adoption and dissemination of new models of training in education and research at the postgraduate level.

The implementation of *PRODIC_S* is a clear example of the necessary transformations *focused on the person and the new competencies to be developed, the new learning through digital and online technologies, as well as a new pedagogy to achieve the application of new paradigms, approaches, methods and research techniques*, which will contribute to improving the quality and relevance in the training of new professionals, in the different areas of knowledge (Pedroza, 2022).

3.2. Rationale for the realization of the Ph.D. Program in Scientific Research with a mention in Health Sciences I Cohort FCCMédicas

The *PRODIC_S I Cohort* takes up the experience of the Doctoral Program in *Management and Quality of Scientific Research*, *DOGGINV I Cohort* 2016-2020, a successful program created by the Research Directorate of UNAN-Managua, Pedroza (2016), approved by the University Council on January 19, 2016, which worked very well graduating 94.12 % of its doctoral students in four years, a period during which this program was conducted at the Multidisciplinary Regional Faculty (FAREM Estelí).

The *PRODIC_S I Cohort* is aimed at professionals from different careers and specialties, who work at UNAN-Managua or other universities of the Nicaraguan Council of Universities (CNU) and Nicaraguan government institutions.

The rationale for this program is based on the following macro-factors:

1. The context of institutional change that is being developed in our University UNAN Managua, marked by the *Change of Epoch, Institutional Change, and Change of Paradigms* of the modern world.

2. In its current development, the UNAN-Managua is implementing Integrated Master's and Doctoral Programs with a continuous degree, being a career based on a Bachelor's degree, it is integrated with Master's and Doctoral programs, that is to say, candidates enter with a professional degree, Engineer or other similar (FAREM Chontales, 2022).
3. The urgent need to update the Postgraduate Programs of the Faculty of Medical Sciences.
4. The *PRODIC_S I Cohort* has *seven elements of modernization*, which allow it to develop the competencies required by the program itself, in less time than the traditional pre-established schemes. These modernization elements are the following:
 1. Developed all its courses online, within the Moodle Platform of UNAN-Managua.
 2. Developed its Communication Platform through GoToMeeting, meet, or zoom, so it can hold teleconferences with national and international experts.
 3. Developed its quarterly monitoring and evaluation system, to ensure better quality and relevance in the fulfillment of the responsibilities of its doctoral students.
 4. Developed a new curriculum design in six modules, which allows it to *guarantee the fulfillment of its Objectives and Expected Learning Outcomes*, according to the quality standards established in the *Qualifications Framework for Central American Higher Education* of the Central American Higher University Council (CSUCA, 2013).
 5. Developed a new institutional research management model, based on the R&D+i Model of UNAN-Managua (Pedroza, 2015).
 6. Availability of the team of founding professors of this program.
 7. Availability of the Team of Scientific Tutors that guarantee personalized attention to the doctoral students of this program.

The philosophical foundation of PRODIC_S I Cohort is based on the institutional management of research of the different research processes, Basic, Strategic, Adaptive, and Applied, with multi-inter and transdisciplinary approaches, which is essential to apply in different contexts, to find solutions to complex problems, based on the reality of the health sectors of Nicaragua, thus allowing to improve the standard of living of the Nicaraguan society, thus increasing the availability and access to new knowledge and technologies (Pedroza, 2022).

The *PRODIC_S I Cohort* is developed according to the areas of knowledge of UNAN-Managua: focused on Health Sciences (UNAN-Managua, 2021. Pp 14 - 29).

The scientific-technical foundation of PRODIC_S I Cohort is based on the *R+D+i Model*, which promotes the institutional integration of the actors, factors, and processes of research, innovation, and entrepreneurship, typical of university work and the university-state-business-society alliance in Nicaragua Pedroza (2015). In the *PRODIC_S I Cohort*, the “*Systemic and Mixed Approaches to Scientific Research*” are promoted, which integrates as a whole the application of quantitative and qualitative research methods, in the search for solutions to real problems, relevant to society as a whole (Pedroza, 2021).

3.3. Institutional Evolution of the Doctoral Program DOGCINV III Cohort to the Doctoral Program in Scientific Research with Mention in Health Sciences PRODIC_S First Cohort of the FCCMédicas

With the approval of the Faculty Council of the FCCMédicas, **Agreement of the Ordinary Session No. 05-2020 of April 30, 2020**, the Doctoral Program “*Management and Quality of Scientific Research, DOGCINV III Cohort of the FCCMédicas UNAN-Managua*” began. This program was inaugurated on Saturday, March 6, 2021. The inauguration ceremony was preceded by Dr. Freddy Alberto Meynard Mejía, in his capacity as Dean of the FCCMédicas and Cro. MSc. Jaime López Lowery, in his capacity as Technical Secretary of the CNU. *Both leaders of UNAN-Managua gave words of great satisfaction for the start of this doctoral program.*

The opening ceremony included keynote lectures by teleconference, both by Dr. Jorge Antonio Lazareff of UCLA, scientific advisor of this doctoral program, and Dr. Julio Di Rienzo of the University of Cordoba, Argentina, Coordinator, and founder of the INFOSTAT Group. *Both speakers gave words of encouragement and congratulations to the FCCMédicas UNAN-Managua, for the start of this doctoral program.*

On March 18, 2021, a proposal to *update the doctoral program “Management and Quality of Scientific Research” III Cohort of the Faculty of Medical Sciences of the UNAN-Managua, period 2021-2024, was submitted to the Directorate of Postgraduate Studies of UNAN-Managua.*

This initial proposal received three response documents with major changes in substance and form, to the original curricular design, *which resulted a year later in the transformations that resulted in a new updated, improved, and strengthened curricular design, including the change of the name of the Doctoral Program from DOGCINV to PRODIC_S I Cohort.*

This name change was duly authorized by the Faculty Council of the FCCMédicas, with approval of the Agreement of the Ordinary Session No. 06-2022 of April 05, 2022, of the Faculty Council of the FCCMédicas.

Subsequently, with the Final Technical Opinion No. 003/31-05-2022 of the Postgraduate Direction of UNAN-Managua, which was received on June 1, 2022, the Doctoral Program PRODIC_S I Cohort, was approved by the University Council of UNAN-Managua, in the Ordinary Sessions of June 17 and July 8, 2022 (Pedroza, Informe de Gestión del Primer año del PRODIC_S. I Cohort Results and Progress, 2022).

3.4. Syllabus of the Doctoral Program PRODIC_S I Cohort

This program is based at the Faculty of Medical Sciences, Rubén Darío University Campus, UNAN-Managua. *It is a doctoral program offered in the integrated modality of a master's degree and a doctorate in Scientific Research*, aimed at students who have previously obtained a master's degree or a bachelor's degree. The PRODIC_S offers opportunities for doctoral studies in a wide range of basic, strategic, applied, and adaptive research to contribute to the solution of relevant problems based on the reality of the Nicaraguan health sector (Pedroza, PRODIC_S. I Cohort, 2022).

The graduate of the *PRODIC_S I Cohort is a professional who has the competencies to perform original scientific research of a high level*, applying a deep level of knowledge on quantitative and qualitative research methods and techniques, objectively guided by the Holistic, Systemic, and Anthropocentric vision of the Research Management Model, R+D+i.

The curriculum of the PRODIC_S I Cohort is organized into six modules, through which 72 credits will be credited for theoretical hours, including 576 hours of theoretical lectures, to complete 1,080 hours of theoretical hours. Likewise, 54 credits will be assigned through the completion of 1,638 practical hours, completing 2,718 hours in total. The minimum number of credits for the publication of three scientific articles, participation in congresses, including the defense of the master's thesis and the doctoral thesis will be 29, to complete *a total of 155 credits* (Pedroza Pacheco, PRODIC_S. I Cohort, 2022).

3.5. Doctoral Candidates of the Doctoral Program PRODIC_S I Cohort

According to the institutional report referred to in Pedroza (2021 **b**), a brief characterization of the doctoral students of the *DOGCINV III Cohort* is cited.

- ✓ The doctoral students are twenty professionals, teachers-researchers, from different institutions in Nicaragua. Seventy-five percent of them are men and 25% are women. Eighty-five percent of them are young teachers-researchers from UNAN-Managua and 15% are from other Nicaraguan institutions, of which 5% are from the former Polytechnic University (UPOLI), 5% from private companies in the commercial sector and 5% from private companies in the health sector.

- ✓ By the main function performed by the doctoral students, 55% of them are full-time university professors, 20% are heads of areas or technical units in the teaching area, 10% are full-time university professors and 5% are technical assistants or technical units in the administrative area, director of the teaching department of the UNAN Managua University, and director of research at UPOLI, respectively, totaling 15%.
- ✓ Eighty percent (16/20) of the doctoral students have institutional scholarships from UNAN-Managua to study for this doctorate, with funding ranging from 60% to 70%. Regarding the source of their institutional scholarship, 25% of them have a scholarship sponsored by the Faculty of Medical Sciences, 15% of them have a scholarship sponsored by the Faculty of Education and Languages, 10% of them have a scholarship sponsored by the Vice Rector's Office for Student Affairs and 30% of them have a scholarship sponsored by the Faculty of Sciences and Engineering.

A survey conducted at the end of November 2021, *on the satisfaction of the doctoral students*, revealed the degree of satisfaction with the progress they are currently making in this doctoral program: *90% are very highly satisfied and 10% are highly satisfied*. This is largely explained by the *progress and achievements to date*:

- a. The successful completion of the academic plan established for the first year, all courses were already completed. From the *official curricular design, Matrix of the Study Plan of the Doctoral Program in Scientific Research with Mention in Health Sciences pages 39 and 40* (Pedroza Pacheco, PRODIC_S. I Cohort, 2022), 15 courses have already been approved, which represents 83.33% compliance with the total Study Plan.
- b. The access and availability of all academic material, within the program's Moodle Platform, *which facilitated training and more efficient use of time*.
- c. The excellent support of the Faculty of Medical Sciences of UNAN-Managua, for the successful completion of the institutional management of the program.
- d. The excellent institutional support of UNAN-Managua as of June 30, 2022, 80% of the doctoral students have doctoral scholarships in research.
- e. The successful completion of the first scientific trial of the program.
- f. Successful completion of the doctoral research project of the doctoral students.
- g. The implementation of the process of accompaniment of the Doctoral Thesis Tutor.

3.6. Social, Theoretical and Methodological Values of the PRODIC_S I Cohort Program

Social Value: The *PRODIC_S I Cohort* responds to the need to train professionals with a new mentality, with better human skills and attitudes, [*non-elitist, non-reductionist*], which allows them to develop new capacities to learn, relearn, unlearn and *learn to learn*, developing *autonomous and permanent learning*, as an indispensable mechanism to successfully respond to the enormous challenges of the present, as well as to adapt to the changing future (UNAN-Managua, 2011).

In the doctoral students of the *PRODIC_S I Cohort*, the UNAN-Managua values “**Empathy, Solidarity, Responsibility, Vocation of Service, Humanistic, Equity, Perseverance, Ethics, Honesty, Respect, Integrity**” are promoted (UNAN-Managua, 2021, p. 36). This leads to a broader understanding of the human being, from nature, and society to individuals, and promotes creativity, reflection, and critical thinking, for the development of new knowledge, skills, and abilities, for the formation of civic, cultural, ethical, humanistic, spiritual, ecological values and positive attitudes towards life.

Theoretical Value: *PRODIC_S I Cohort*, implements a multidimensional vision of scientific research, through a new conception of education in the field of science, technology, and innovation, understood as an “investment for development”, which facilitates the generation of new knowledge and technologies (Pedroza, Modelo I+D+i, 2015).

A fundamental part of the theoretical value promoted by this program, is the R&D+i Research Management Model, to generate concrete institutional actions, technological spillover effects (“spillover effects”), and economic externalities, which will contribute to the University and society as a whole, in making visible the impact of the results of scientific research and contribute to the sustainable human development of the Nicaraguan society (Pedroza, 2018).

Methodological Value: A fundamental part of the *methodological value* of this doctoral program is its object of study: *the quantitative and qualitative methods of research and their interactions with the Mixed Research Approach, since they constitute the fundamental means of learning as a transversal axis for the generation of new knowledge*, this contributing to the development of new technologies in the different specialties, according to the areas of knowledge of UNAN-Managua (Pedroza, PRODIC_S. I Cohort, 2022).

4. CONCLUSIONS

1. The Doctoral Program *PRODIC_S I Cohort*, is an innovative proposal that contributes to improving the institutional competencies in postgraduate research at UNAN Managua, opening new development opportunities for young people who

want to study scientific research, expanding the university's postgraduate academic offerings, offering new students with a Master's or Bachelor's degree, *the opportunity to study an integrated Master's and Doctoral program.*

2. *There is 90% very high satisfaction and 10% high satisfaction among the doctoral students of PRODIC_S I Cohort, which is explained by the achievements and progress to date: a) successful fulfillment of the academic plan year 2021-2022, b) Access and availability to all academic material, within the Moodle Platform of UNAN-Managua, c) Successful institutional management based on the R+D+i Model, thanks to the support of the FCCMédicas, d) Excellent institutional support from UNAN-Managua, as of June 30, 2022, 80% of the doctoral students have scholarships for the PRODIC_S, e) Completion of the first scientific essay, f) Completion of the doctoral research project, g) The process of accompanying the doctoral thesis, h) Development of a new curricular design in six modules, i) Availability of the team of founding professors of this program, j) Definition of the scientific tutor for each of the doctoral students.*

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