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Research teachers: Evaluation of research quality from the perspective of efficiency, efficacy and effectiveness

Docentes investigadores: Evaluación de la calidad investigativa desde la eficiencia, eficacia y efectividad

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Abstract

The study examined the re-signification of managerial theory and practice in BANI environments through Transpersonal Conscious Educational Administration (AETC). A qualitative approach, interpretative paradigm, and ethnographic design with ethnographic systematization were adopted, involving one participant per hierarchical level: senior management, leading management, and technical management. Data collection included participant observation, interviews, field diaries, and systematization workshops, processed through coding and thematic categorization. Results showed that conscious educational management strengthened ethical leadership, holistic human development, resilience, and collaboration, integrating transpersonal competencies, neurointelligence, and mindfulness. Managerial praxis transformed into transpersonal, adaptive, and ethical leadership capable of addressing fragility, anxiety, nonlinearity, and incomprehensibility characteristic of BANI environments. In conclusion, Fundaunamor functioned as a practical laboratory for organizational transformation, validating an integrated, conscious, and humanistic educational and managerial model.

Keywords: Theory, Management, Management, Leadership, Integration.

Resumen

Las universidades están para producir ciencia, crear nuevo conocimiento, por lo cual el quehacer del docente universitario comienza cada vez más a diversificarse y la investigación es una actividad, un instrumento de apoyo para el mejor desarrollo de la función pedagógica; pero para algunos la investigación lo ven como algo complejo, costoso y sin implicaciones para la docencia en las aulas. Ante esta realidad el objetivo de esta investigación es evaluar la calidad de los docentes en la investigación desde la eficiencia, eficacia y efectividad, que surge de una de las dimensiones de la tesis doctoral en Gestión de la Calidad de Investigación Científica, UNAN-Managua. La metodología se caracterizó por un paradigma constructivista, enfoque mixto, tipo de estudio explicativo, de acuerdo con el tiempo de ocurrencia de los hechos y registro de la información, el estudio es retrospectivo y según el período y secuencia del estudio es transversal, se utilizaron métodos, técnicas, herramientas e instrumentos para recolectar y procesar datos.

Palabras clave: Teoría, Administración, Gestión, Liderazgo, Integración.

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Introduction

This scientific article, *Research Professors: Evaluation of Research Quality from Efficiency, Efficacy, and Effectiveness*, is linked to Sustainable Development Goal (SDG) 4: Quality Education; the National Education Strategy, in all its modalities "Bendiciones y Victorias" 2024 – 2026, guideline 11: Research; the National Poverty Eradication Plan; and the Institutional Project of UNAN-Managua.The figure of the research professor or teacher-researcher has sparked considerable debate, both in academic circles and in educational practice itself, concerning what it means to be a teacher-researcher, what and how they can investigate, and the purpose of the research they can undertake (Vidal, 1988; Enríquez & Romero, 2000).

This research holds methodological utility by evaluating human resources for research through a system of specific quality indicators, based on the criteria of effectiveness, efficiency, and efficacy.

To achieve the objectives of this research, it is necessary to explore the conceptual terms related to research impact and quality indicators.

Evaluation is "a structured and reflective analytical process that allows for understanding the nature of the object of study and making value judgments about it, providing information to help improve and adjust educational action" (Ruiz, 1996).

Quality indicators are measurement instruments, tangible and quantifiable in nature, that allow for the assessment of the quality of processes, products, and services to ensure customer satisfaction. In other words, they measure the level of compliance with the specifications established for a given activity or business process. That is, a quality indicator is a measure that evaluates the excellence and precision of the work performed by a team or individual on a project. It refers to how well established standards are met, the accuracy of execution, and the satisfaction of customer or project requirements and expectations.

Efficacy is defined as the congruence between what was planned and the achievements obtained. To verify efficacy, the institution must explicitly state its qualitative and quantitative goals at the institutional, academic, and human resource levels across the various functions of teaching and research, as well as goals for teacher development and learning achievements.

Efficiency is the ability to achieve goals by optimizing the use of available resources. In the context of Higher Education institutions, efficiency can be analyzed from administrative and academic perspectives. According to (López de Caballero, 2019), academic efficiency refers to the best use of pedagogical means to achieve planned results. It involves aspects related to the characterization of teachers, as well as curriculum management such as regulations, curriculum structure, course sequences, curriculum flexibility, and obtaining the degree within the timeframes set by the institution. Put more simply, efficiency analyzes the volume of resources expended to achieve goals. It is the achievement of an objective at the lowest possible unit cost.

Effectiveness measures the degree to which results are achieved; that is, the focus is on accomplishment, not on the resources spent to reach that result. In other words, how much of the expected results were attained.

Effectiveness is nothing other than the combination of efficacy and efficiency. This indicator presents the consequences of a product or service. It involves doing the right thing with great accuracy and without any waste of time or money.

The combination of these elements—result, cost, and time—allows for the objective measurement of the degree of effectiveness and efficacy of an organizational area and enables comparisons between areas.

Materials and methods

The study type is ex post facto, meaning it uses available information about events that have already occurred. In terms of scope, it is explanatory. According to the timing of the events and information recording, the study is retrospective, and based on the period and sequence, it is cross-sectional.

As the research has a mixed-methods approach, it employs methods and techniques from both qualitative and quantitative paradigms. These include: documentary research, ethnographic method, data analysis, surveys with closed-ended questions, semi-structured interviews, participant observation, triangulation, and focus groups; all within a socio-constructivist paradigm.

Results and discussion

The central project is titled: "*Quality Indicator System: Evaluation of Research Training, National Autonomous University of Nicaragua, Managua*", which consists of a total of 186 quality indicators to assess effectiveness, efficacy, and efficiency across 5 dimensions. On this occasion, one dimension will be addressed: Human Resources for Research: Research Professors.

A professor's activity is multidimensional, but in this research, only their research activity will be evaluated. The teacher, as a person, citizen, and professional, in their role as researcher and trainer, is competent to guide the real understanding of the context. They have the authority conferred by being a builder and creator of knowledge from their own research, unlike a teacher who merely repeats others' theories.

Adúriz (2007) is emphatic in stating that "research enables learning when it illuminates teaching." We are aware that this process is bidirectional, contributing to the solution of human, social, scientific, and technological problems. Similarly, it generates and enables the implementation of outreach programs aimed at serving the community and establishing effective links with different social sectors—a factor that is, in fact, decisive in improving living conditions in the regions.

The university teacher who conducts, guides, and supports research processes with other teachers and students has the opportunity to be a creator and builder of knowledge through the direct and systematized experience offered by each stage of the research and its results. Furthermore, it is the teacher involved in research processes who can clearly, and above all, with authority, guide the students' learning process, as they are the ones developing their own knowledge, taking into account what other researchers have found. Only they, through the results of their inquiries, allow, over time, the construction and consolidation of science.

How will the efficiency, efficacy, and effectiveness of human resources for research be measured?

Table 1

Ways to measure efficiency, efficacy, and effectiveness

Indicators	Efficiency	Eficacy*	Effectiness**	Quality
Indicator 2: human resources for research.	$\frac{\left(\frac{\text{Result achieved}}{\text{Actual cost}}\right)*\text{Time}}{\left(\frac{\text{Planned result}}{\text{Planned cost}}\right)*\text{Planned time}}$	$\left(\frac{\text{Actual result}}{\text{Planned result}}\right)*100$	$\frac{\left(\frac{\text{Efficiency Score}+\text{Effectiveness Score}}{2}\right)}{\text{Maximun score}}$	% Total=Efic %+Efica %+Efect

Note: * The result will be a percentage that the institution can assess comparatively. That is, if it falls within the lower percentiles, the work will be considered ineffective.

** The resulting percentage will reflect the degree of effectiveness of the measured action.

Step one: Record the general data of the program or department.

Table 2

General data of the program or department

Period	Anual
Departament	
Number of faculty per program	
Type of research project initiative	Research project Outreach project Culminating Study Project: Master's, Specialization, or Doctoral Degree
Type of research	Research units Research centers Specialized laboratories
Specialized research units	Research units Research centers Specialized laboratories

Step two: Evaluation of efficiency as a research professor.

Table 3

Efficiency: Research professor

$\frac{(RA / CA * TA)}{(RE / CE * TE)}$		
Rangos 0< - <80% 80< - <100 = 100	Calificación Ineficiente Moderadamente eficiente Muy eficiente	Puntos 1 3 5

The efficiency of faculty who are researchers is measured by: time, salary, and scientific productivity. For example, how many years they have worked at the university, their salary compared to their scientific productivity results. In other words, an efficiency evaluation is conducted, analyzing the relationship between resources invested (such as time and salary) and the results obtained (such as scientific productivity). Efficiency is interpreted as the capacity to convert resources (time and salary) into scientific outputs.

Some studies use Data Envelopment Analysis (DEA) or Total Factor Productivity (TFP) Analysis to quantify this efficiency. If a research professor produces more results with the same or less time/salary, they are more efficient. If another has many years of service and a high salary but low scientific productivity, they are less efficient. For example, in Table 4 below, a simulation of 3 academic programs is shown. The scientific productivity of the program is recorded since its founding, including the number of research faculty and the total payroll.

Table 4
Efficiency: Indicator of scientific productivity outputs (or results)

Output (or result) indicators	Program 1	Program 2	Program 3
Number of research professors.	33	32	20
Cantidad de docentes investigadores.	5	14	6
What they are paid.	$	$	$
Number of research projects developed by .professors; student research is not recorded.	5	2	2
umber of published scientific articles.	4	1	1
Research awards received by members of the evaluated unit.	0	1	1
Number of scientific books produced.	5	0	0
Number of research prototypes.	0	0	0
Number of book chapters resulting from research.	2	0	0
Number of manuals.	0	0	0
Number of essays.	0	0	0
Number of bulletins.	0	0	0
Published systematization documents.	0	0	0

Note: These are indicators that directly measure research results themselves.

An academic program with a research profile is efficient when it makes optimal use of resources and, therefore, has the lowest possible cost. That is, the less time or money consumed to achieve the expected objective, the better the performance, and vice versa. The greater the quantity of results obtained per unit of time and cost employed, the more favorable the situation will also be. For example, the following table shows a simulation with research professors belonging to 4 academic programs, whose names will not be revealed due to prior informed consent.

According to regulations, a research professor must publish two scientific articles. Therefore, if they have 10 years at the university, their research profiles should show 20 articles published in indexed journals, whether national or international.

Table 5

Efficacy

Output (or result) indicators	Research professor			
	1	2	3	4
Years of service	11	11	9	10
Active research profiles	2	2	1	1
Number of published scientific articles	4	3	1	1
Research awards achieved by members of the evaluated unit	0	0	0	0
Academic degree	M Sc.	M Sc.	M Sc.	M Sc.
Number of research projects (does not apply to graduation formats)	1	1	0	1
Number of scientific books produced	0	1	0	0
Number of research prototypes	0	0	0	0
Number of book chapters resulting from research	0	0	0	0
Number of manuals	0	0	0	0
Number of essays	0	0	0	0
Number of bulletins	0	0	0	0
Published systematization documents	0	0	0	0
Cargos vinculados a la investigación	1	1	1	0

Other elements reviewed were:

- **Total years in teaching vs. years in research-related positions:** Editors, Research Coordinators, Research Executives.
- **Rate of activity in research projects:** Number of research projects / number of Ph.D.s in the group. Number of research projects / number of Master's degree holders in the group. Number of research projects / number of Bachelor's degree holders in the group.
- **Percentage of research in collaboration with the State, society, and industry:** Total number of research collaborations achieved with the State, society, and industry / expected research collaborations.
- **Rate of activity in national or international scientific events:** Number of presentations delivered / number of scientific events.

Rate of activity in national or international research networks: Number of research activities / number of research networks.In essence, a research professor is Efficient when the optimization of resources (financial, time, human talent) is achieved to obtain results. It answers the question: Were the results achieved at the lowest cost and in the shortest time possible? Now, how do I know if I am an effective researcher? This is addressed in the following table.

Step Three: Evaluation of efficacy

Table 4

Efficacy

	RA / RE	
Ranges	**Score**	**Points**
a) 0 – 20% b) 21 – 40% c) 41 – 60% d) 61 – 80% e) 81 – 90% f) 91%	Not effective Moderately efficacious Highly inefficacious	a) 0 b) 1 c) 2 d) 3 e) 4 f) 5

Efficacy is measured by: Bibliometric indicators. That is, a research professor is effective when they achieve the planned goals and objectives in research activity, regardless of the resources used. It answers the question: Were the expected results achieved? But to be objective, bibliometric indicators are used.

The German professor and researcher Jaspers (1946), from his experience, stated that the teacher who researches and teaches from their own experience of knowing possesses the original and sequential practice of knowledge development, which allows them to guide the formation of the scientific and innovative spirit in their disciples. They are a reflective and critical intellectual, committed to transforming their own reality and engaged with the world of life.

Bibliometric indicators are numerical data calculated from the bibliographic characteristics observed

in documents published in the scientific and academic world. They allow for the analysis of various features of scientific activity, linked to both the production and consumption of information.

An effective research professor is measured by a journal's Impact Factor (which is the average number of citations received in a given year X by articles published in the two preceding years, divided by the total number of articles published in those two years), or the Collaboration Index (defined as the average number of authors participating in research articles from a specific journal, institution, or discipline).

Likewise, search engines, databases, abstract indexing services, repositories, and specialized platforms are used. Currently, Google Scholar, WoS (Web of Science), and Scopus are the main resources consulted by teachers, researchers, and scientists for knowledge appropriation and dissemination. Measurement also occurs through metrics of publications based on quality.

It is essential to mention that bibliometric indicators do not represent the only way to measure a researcher's contribution, but it is important to recognize their current influence within their evaluation.

Step Four: Evaluation of effectiveness

Table 7

Assessment of effectivenesss

(Efficacy score + Efficiency score) / 2	
Ranges	**Score**
0< - <80% 80< - <100 = 100	Ineffective Moderately effective Effective

Effectiveness is measured by: The contribution of scientific productivity. However, scientific productivity is not measured solely by the quantity of scientific articles, but also by other elements.

The following review involves cross-checking the scientific value of published articles, because there can be research professors who publish extensively but whose impact is debatable, and the other scenario where research professors publish fewer scientific articles, but what they write has generated a significant impact.

A research professor is effective when Efficacy and Efficiency are combined, measuring the real impact and relevance of research results in the social or disciplinary environment. It answers the question: Were the results achieved, resources optimized, and positive, pertinent impact generated? That is, the relevance of scientific productivity refers to the "what" and "for what" of the publication; in other words, the educational intentions that condition other decisions the institution must make to achieve its goals and purposes. Relevance is reflected in the attributes of: pertinence, impact, suitability, and timeliness.

Pertinence refers to the capacity of the research generated by the teacher to appropriately respond to the needs and demands of society. Impact is the degree of internal and external influence it has on the community as an effect of the implemented project.

Conclusions

The dual activity of teaching and researching is of great value to the teaching profession because it allows teachers to stay at the forefront, knowing that the teaching process is conducted from a living mindset, built by teachers and student researchers. The university's mission is to place the student under the intellectual guidance of the research professor, to form academic communities from these two generations in an environment of teaching, learning, and research, based on an interest in theoretical development and the practical utility of knowledge.

The National Autonomous University of Nicaragua (UNAN-Managua) has the Directorate of Institutional Quality Management and the Directorate of Research and Innovation, which have succeeded in consolidating the main theoretical and conceptual elements concerning process management, quality management, and the information management system, achieving the participation of central-level units in guiding the fulfillment of set goals. The research culture is not separate from this strategic purpose of accreditation for academic excellence.

At the university, quality management is understood as the set of policies, strategies, actions, and procedures aimed at maintaining and sustaining continuous improvement at each level of management, academic and administrative bodies, and the strategic, key, and support functions and processes we develop to meet the demands of Nicaraguan society.

The commitment and dedication of the teaching staff to scientific productivity is recognized. However, some of these efforts have not been fully realized, mainly due to administrative or management factors beyond the teachers' scope of action.

In research, you must pay for what it costs; that is, you must invest in resources to generate research. The return on investment (ROI) in research is seen through results—it provides connections, academic status in the long term, beyond just monetary gain.

The competent performance of a research professor, understanding that their responsibility in training professionals is shared by a multidisciplinary team, advocates for a functional and dynamic teaching-learning process that surpasses theoretical and memorization-based methodological practices, making way for learning that connects theory with practice in specific, contextualized situations.

Being a university professor means taking seriously the task of guiding the professional formation of students—a task for which they need to broaden their perspective on new teaching approaches with greater potential to contribute to the history of the teaching profession, bearing in mind that teaching and research are inherent to academic work; together, they build bridges between knowing and doing.

How can the number of efficient, effective, and efficacious research professors be increased? (a) By assisting those teachers who are not yet clear about their research line. (b) The teacher must be in constant professional development, which helps them understand that there are emerging topics to write about. (c) In this sense, it is valuable to continue promoting spaces for dialogue and coordination with the various university bodies, with the purpose of facilitating the execution of these initiatives and making the most of the academic potential.

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