

Student perception of the Biostatistics course in the master's degree programs at the National School of Public Health

Percepción estudiantil sobre el curso Bioestadística para maestrías en la Escuela Nacional de Salud Pública

Adrián Álvarez Pérez^{1*} <https://orcid.org/0009-0001-3079-5858>

Liliam Quelle Santana¹ <https://orcid.org/0000-0001-8634-6536>

María Esther Álvarez Lauzarique¹ <https://orcid.org/0000-0002-3237-495X>

María del Carmen Pría Barrios¹ <https://orcid.org/0000-0002-2583-631X>

Ileana Castañeda Abascal¹ <https://orcid.org/0000-0001-6880-5890>

Carmen Orayda Tenorio Moirón¹ <https://orcid.org/0000-0002-7267-7032>

¹ University of Medical Sciences of Havana. National School of Public Health. Havana. Cuba.

* Corresponding author. Email: odeiadrian1970@gmail.com

ABSTRACT

Background: The Biostatistics course taught in the master's programs at the National School of Public Health has presented difficulties for master's students; it is necessary to maintain feedback from the faculty and restructure teaching methods to make it more accessible and interesting for them.

Objective: To implement a questionnaire to obtain the opinion of master's students regarding the Biostatistics course taught at the National School of Public Health.

Methods: an exploratory research study was conducted to understand the nature of the existing situation with the Biostatistics course in the master's programs at the National School of Public Health, using a mixed-methods approach for item generation and construction of measurement instruments. Theoretical methods were used: analysis-synthesis, inductive-deductive, and historical-logical; empirical method: a questionnaire validated by experts, applied to 100% of the enrollments in three of the master's programs offered during the February–November 2025 period.

Results: The dimensions Relevance, Impact, and Infrastructure received Insufficient ratings in very low percentages. The negative elements were the limited course time for practical work and the limited use of computer laboratories.

Conclusions: The applied questionnaire allowed for understanding the process of assimilation of the taught contents and provided insight into the master's students' perception of the need for continuous improvement of pedagogical methods to achieve greater acceptability of teaching activities.

MeSH: training courses; health postgraduate programs; education, professional; learning; education, medical

RESUMEN

Fundamento: el curso de Bioestadística impartido en las maestrías en la Escuela Nacional de Salud Pública ha presentado dificultades para los maestrantes; se precisa mantener una retroalimentación del claustro y reestructurar los métodos docentes de manera que sea más asequible e interesante para ellos.

Objetivo: implementar un cuestionario para obtener la opinión de los alumnos de las maestrías sobre el curso de Bioestadística que se imparte en la Escuela Nacional de Salud Pública.

Métodos: se realizó una investigación exploratoria para comprender la naturaleza de la situación existente con el curso de Bioestadística de las maestrías en la Escuela Nacional de Salud Pública con enfoque cuantitativo para generación de ítems y construcción de instrumentos de medición. Se utilizaron métodos teóricos: análisis-síntesis, inductivo-

deductivo e histórico-lógico; empírico: cuestionario validado por expertos, aplicado al 100 % de las matrículas de tres de las maestrías que se cursan en el periodo febrero-noviembre 2025.

Resultados: las dimensiones Pertinencia, Impacto e Infraestructura fueron señaladas con evaluaciones de Insuficiente en porcentos muy bajos. Los elementos negativos fueron el escaso tiempo del curso para realizar prácticas y el poco uso de los laboratorios de computación.

Conclusiones: el cuestionario aplicado permitió conocer sobre el proceso de asimilación de los contenidos impartidos y propició la percepción del maestrante sobre la necesidad del mejoramiento constante de los métodos pedagógicos para una mayor aceptabilidad de las actividades docentes.

DeCS: cursos de capacitación; programas de posgrado en salud; educación profesional; aprendizaje; educación médica

Received: 04/30/2026

Accepted: 09/02/2026

INTRODUCTION

Postgraduate education is currently considered the highest level of higher education and is responsible for providing professional development processes. It is made up of two areas: professional development and academic training. The first is responsible for professional development and training activities; the second has the responsibility of directing and controlling the training processes in the field of doctorates, master's degrees, and specialties.^(1,2)

Biostatistics is a specialty whose topics are included in all study programs of medical and health sciences specialties, and in all master's degrees and doctoral programs offered in the

National Health System (SNS). It is an indispensable tool in the scientific and research preparation of health professionals, so the adaptation of its contents to the current demands of professional development must be constant.

At the National School of Public Health (ENSAP), several master's programs related to health sciences are offered, and all of them include contents related to the specialty of Biostatistics, grouped into modules.

It is common to hear among master's students about the difficulties they face in assimilating Biostatistics topics; therefore, it is necessary to maintain constant feedback from the faculty that teaches these modules to learn the students' opinions and improve teaching methods so that it becomes more accessible and interesting for them.

One of the methods used to obtain information about students' opinions on any aspect of the teaching-learning process is through different measurement instruments, whose design and development involve complexity, require rigor in their design, and proper administration. The most common approach is the application of questionnaires.^(3,4,5)

The questionnaire is an instrument designed to obtain information, quantify it, and universalize it. For it to be considered valid, it must meet the following characteristics: be reliable and capable of measuring without error; be capable of detecting and measuring changes both between individuals and in the response of the same individual over time; be simple, feasible, and accepted by users and researchers; be suitable for measuring the phenomenon to be assessed and reflect the underlying theory in the phenomenon or concept to be characterized.⁽⁵⁾

Proper questionnaire development requires using appropriate language, not repeating questions, making them simple and brief. This ensures a higher degree of success in terms of understanding the instrument when applied to the target population. It is also important to guarantee participants that their data will be kept under strict anonymity to ensure sincerity in their responses.^(6,7)

For the reasons stated above, the authors set the following objective: to implement a questionnaire to obtain the opinion of master's students regarding the Biostatistics course taught at the National School of Public Health.

METHODS

An exploratory research study with a mixed-methods approach was conducted for item generation and construction of measurement instruments at the National School of Public Health during the February–November 2025 period. The study universe consisted of all master's students from Health Psychology (12), Primary Health Care (18), and Pharmacoepidemiology (19).

Theoretical methods were used:

- Analytical-synthetic: in the interpretation of results and in the bibliographic study of information concerning the research problem.
- Inductive-deductive: during data processing to obtain the necessary theoretical elements and thus develop an adequate questionnaire as a measurement instrument.
- Historical-logical: to learn about the researched topic, its background, and current trends.

Empirical method: a questionnaire applied to the master's students. It was prepared according to the steps described for developing a measurement instrument; it began with the definition and characterization of the object of study, taking into account: the history of the event to be studied, research background on the topic addressed, characteristics of the event in question, background of other instruments constructed, and the dimensions of the variables to be assessed.

The questionnaire consisted of 10 items, comprising general questions, closed-ended single-choice questions, and one open-ended question. Closed-ended questions are used when the possible response categories are known; they are easier for the researcher to code and for the respondent to answer, and they can help better define the responses of the surveyed

subject. These were divided into four dimensions corresponding to the sections evaluated in the accreditation processes carried out by the National Accreditation Board of the Ministry of Higher Education for undergraduate programs and postgraduate processes in Cuban universities: Relevance and Impact, Curriculum or Course Program, Faculty, and Infrastructure, which were evaluated as follows:

- Relevance and Impact: evaluated in items 1 to 3.
- Faculty: items 4 and 5.
- Infrastructure: items 6 to 8.
- Curriculum or Course Program: items 9 and 10.

The closed-ended questions were rated on a three-category ordinal scale: Sufficient, Moderately Sufficient, and Insufficient. Responses were given by selecting only one option according to the individual and subjective criteria of the respondent.

The open-ended question allowed obtaining the respondent's viewpoints in a more fluid and extensive manner.⁽⁷⁾ It was placed at the end of the questionnaire and requested that the positive, negative, and interesting aspects of the Biostatistics course received be stated.

The instrument was developed electronically using a PC with Windows 10, Word 2010, and Excel 2010 for result processing. The printed questionnaire was administered at the end of the last teaching activity of the Biostatistics course in each master's program.

Lages Ruiz *et al.*⁽⁵⁾ state that the questionnaire is a subjective measurement instrument, since the subjectivity of the researcher or the subject being measured mediates in that process. In general, it is an opinion questionnaire since it is a structured data collection instrument that compiles what people think, feel, or prefer about a specific topic; in this case, the subjects' perception of the Biostatistics course taught at the aforementioned institution. It was self-administered, always guaranteeing anonymity and that the information would be used solely for research purposes.

The test validation was carried out qualitatively, through interviews with a group of three expert Biostatistics professors from ENSAP, with 25 or more years of teaching experience, and research experience: Doctors of Sciences, Full Professors, and Second-degree Specialists in the specialty.

The fundamental aspect evaluated was validity, that is, the ability of the test to measure what it is really intended to measure. Of the four fundamental elements (face validity, content validity, criterion validity, and construct validity), the first two were analyzed.

Regarding appearance (face validity), the experts determined that the instrument's items were correctly constructed; and regarding content (content validity), they assessed that the set of indicators making up the preliminary version of the test covers the entire domain of characteristics of the situation to be studied. In all cases, the expert evaluation was categorized as Sufficient.

Once the design and construction process of the instrument was completed according to its methodological aspects,⁽⁸⁾ it was administered to the 49 students enrolled in the master's programs in Health Psychology, Primary Health Care, and Pharmacoepidemiology. The results are presented in absolute numbers and summary measures through tables and figures.

During the research, the ethical principles set forth in the Declaration of Helsinki, ratified at the 75th General Assembly held in that city in 2024, were taken into account.⁽⁹⁾ The research team considered respect for the confidentiality of information and the veracity of the results, which were used only for the purposes of the objectives and design of the study carried out.

RESULTS AND DISCUSSION

The average age of the students was 43 years, and the predominant sex was female. Regarding the distribution of enrollment by profession, more than half were physicians

(59.2%), followed by psychologists (28.6%), Pharmacy graduates (14.3%), stomatologists (10.2%), and one nurse (2.0%).

The distribution of master's students according to their workplace of origin was mostly represented by those coming from polyclinics (31%), followed by those working in hospitals (27%), municipal, provincial, and Ministry of Public Health directorates (22%); and other institutions such as the Placental Histotherapy Center, Prosalud, and Servimed (16%), as illustrated in Figure 1.

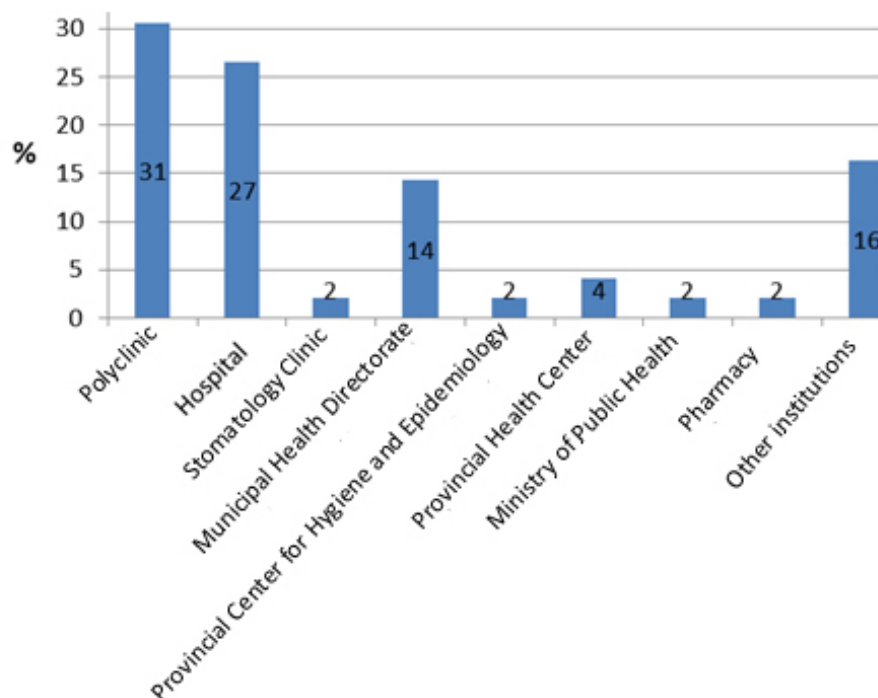


Fig. 1. Distribution of master's students according to their workplace of origin. National School of Public Health. Havana. February–November 2025

Source: questionnaire.

In the Relevance and Impact dimension, whose results are shown in Figure 2, the responses to the first two questions obtained a predominant rating of Satisfactory (81.6% and 77.6%, respectively); while in the third question, 2% of the students reached the Insufficient

category, which denotes that the application of what was studied in the module was assessed with difficulties regarding the acquired competencies. More than half of the students perceived this third question as Moderately Sufficient, which compels the specialty faculty to analyze and implement ways to make the practice of the acquired competencies more effective. The general results of the first evaluated dimension are shown in Figure 2.

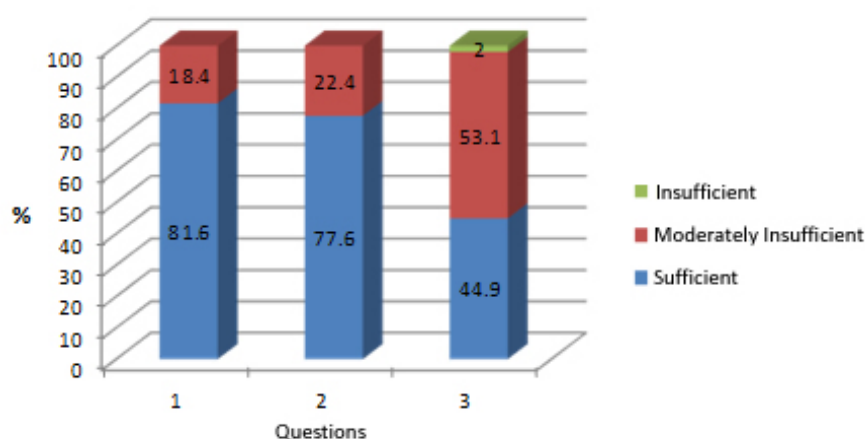


Fig. 2. Results of the evaluation of the Relevance and Impact dimension. National School of Public Health. Havana. February–November 2025

Source: questionnaire.

The second dimension corresponded to Faculty, which inquired about the quality of teaching activities and their scientific preparation (questions 4 and 5). In the latter (question 5), 100% agreed on the Sufficient category regarding faculty integration, while question 4 was evaluated as such by 96% of the master's students, as shown in Figure 3.

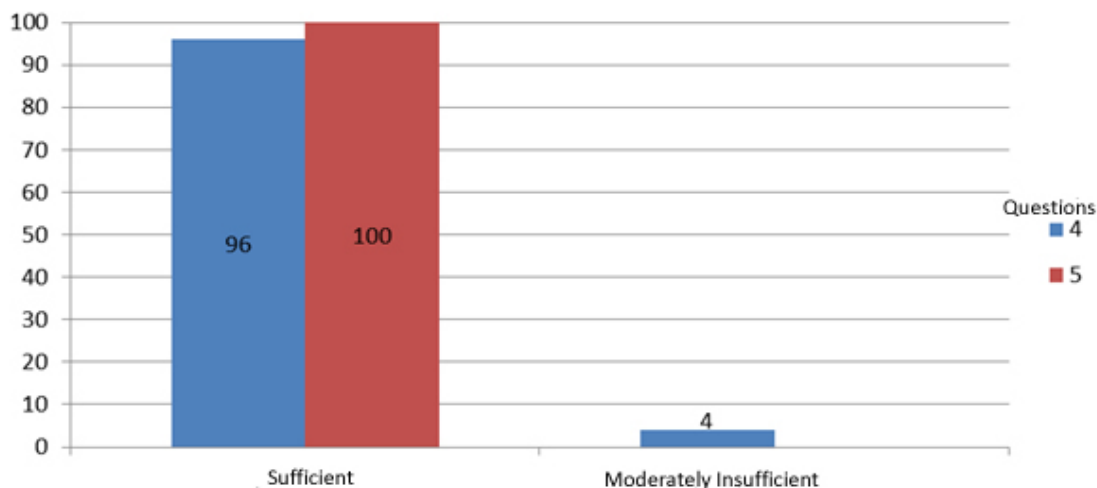


Fig. 3. Results of the evaluation of the Faculty dimension. National School of Public Health.

Havana. February–November 2025

Source: questionnaire.

In the Infrastructure dimension (questions 6, 7, and 8), 90% rated as Sufficient the bibliographic support for the course contents (question 6), while the availability of classrooms and computers for studying the taught contents (question 7) was evaluated as Sufficient by 63%, and Insufficient by 4%. The possibility of using computers (question 8) was rated as Sufficient by 57% of the students, while 6% considered that the possibility of using these means was Insufficient. The general results are shown in Figure 4.

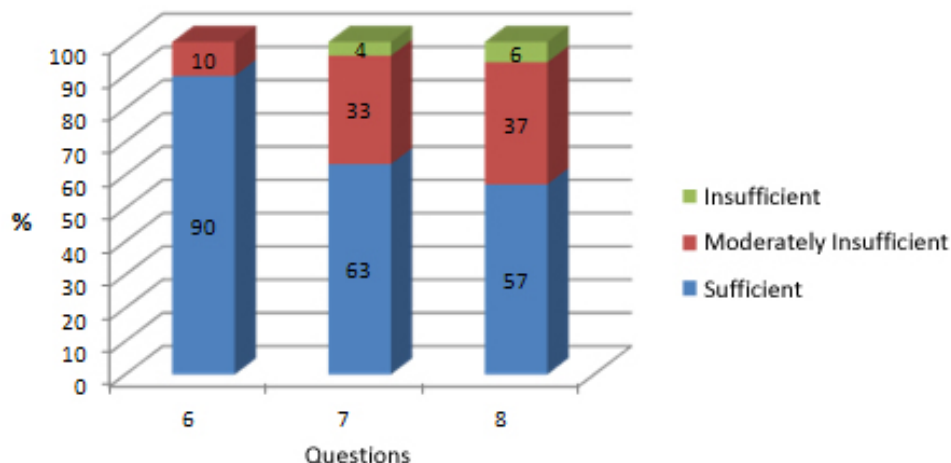


Fig. 4. Results of the evaluation of the Infrastructure dimension. National School of Public Health. Havana. February–November 2025

Source: questionnaire.

In the Curriculum or Course Program dimension, question 9, related to the objectives of the Biostatistics module, was rated as Sufficient by 92% of the respondents; and question 10, regarding the contribution of the knowledge to future clinical and research work, was rated with the same category by 88%. The results of this dimension are shown in Figure 5.

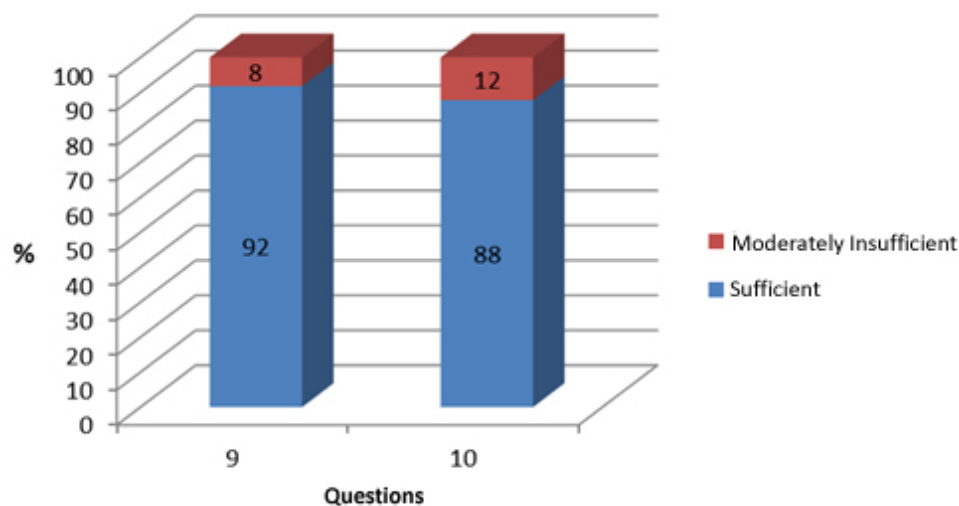


Fig. 5. Results of the evaluation of the Curriculum or Course Program dimension. National School of Public Health. Havana. February-November 2025
Source: Questionnaire.

In the open-ended question where students expressed the positive, negative, and interesting aspects of the course, the main results were:

- Positive: quality of the class, teacher preparation and excellent professors (61.2%), and student preparation and acquired knowledge (28.6%).
- Negative: little time for practical work (46.9%), too much content in too little time (26.5%), and use of laboratories (14.3%).
- Interesting: served as comprehensive and research-based preparation (84.1%) and better preparation for research and data management (55.3%).

The opinion study applied to the master's degree students was based on two fundamental elements in its design: according to the quality criteria of the teaching-learning process that internationally govern university training and professional development, and according to the dimensions of the undergraduate and postgraduate accreditation process of the programs.

Regarding the quality of the training processes, the authors agree with the criteria of authors⁽⁸⁾ who state that the movement towards quality is a worldwide phenomenon that is acquiring increasing relevance due to its influence on spheres of human activity; therefore, a university of excellence must focus its attention on raising the quality of its fundamental processes and the academic figures developed within it.

In Cuban higher education, the concept of quality is considered as the result of the conjunction between academic excellence and comprehensive relevance. In this regard, quality management in higher education institutions today constitutes a complex, necessary phenomenon with its own identity, which is still in full development. In this context, valuable contributions arise regarding its theory and reality, approaches, models, systems, support tools for its development, determining factors, problems and challenges, and innovations,

among others. Its scope includes dimensions at the institutional level, processes, and university programs, but the practices achieved with the latter in favor of a quality culture are not always presented with sufficient clarity.⁽⁸⁾

This topic in medical sciences universities is positioned as a critical and conditioning axis for their development; therefore, it is a decisive and crucial issue for effective management of their programs, closely connected with the Declaration of the 2008 Regional Conference on Higher Education in Colombia, where it was noted: "The objective is to configure a scenario that allows, in a creative and sustainable way, the articulation of policies that reinforce the social commitment of higher education, its quality and relevance".⁽¹⁰⁾ That is why it is decided to maintain, on a permanent basis, feedback on the quality of the teaching of Biostatistics topics at the National School of Public Health, in Havana.

Senú González *et al.*⁽⁸⁾ highlight the importance of evaluation and accreditation of university programs to achieve quality higher education.

The authors of the present investigation, taking into account that quality is the result of a series of internal and environmental factors, as well as adequate management and university practice, were motivated to design and implement the evaluation instrument for the Biostatistics specialty for students taking the different master's degrees linked to the field of public health.

Numerous international organizations from European and Latin American nations advocate for prioritizing quality management in the education sector; an aspect that is currently personified in Cuban medical universities. In line with the above, the Ministry of Higher Education recognizes in objective No. 8 of its strategic project: "To ensure the quality of Cuban higher education endorsed by the accreditation of its programs and institutions with a higher category." All of this is very much in tune with the improvement of the 2000 University System of Accreditation Programs, known since 2018 as the Higher Education Evaluation and Accreditation System.⁽¹⁰⁾

In Cuba, the Evaluation and Accreditation System for Postgraduate Specialties (SEA-EP) was approved through Resolution No. 307/2015 for all specialties of higher education institutions and came into force on January 10, 2016, after previous validations in several universities and ministries. There, the general objective is conceptualized as: "The continuous improvement of quality management, therefore it is oriented towards achieving the objectives, strategies and goals of postgraduate education in Cuba".⁽¹¹⁾

Some investigations on the impact of accreditation on raising the quality of institutional programs, and particularly of postgraduate specialties, highlight the relationship between evaluation, accreditation, and continuous improvement. Thus, according to Addine Fernández *et al.*:⁽¹¹⁾ "... impacts are the permanent and sustainable changes over the medium and long term experienced by organizations, communities, and participants in the development process; significant changes that tend to be lasting and measurable or quantifiable over time".

These premises declared in the SEA-EP are those taken into account when designing a questionnaire for the evaluation of master's degrees.

The quality of the instruments used in health research is very important, since researchers obtain solutions through the information collected. A simple way to understand this process is to imagine it as a cumulative sequence of evidence aimed at supporting the interpretation and application of results through an instrument.⁽¹²⁾

The main results in each dimension show that in all the variables investigated there was a predominance of the "Sufficient" category. Although the evaluation scale is not exactly the same as that of the SEA-EP, other authors⁽¹¹⁾ also showed variables with favorable results in the majority of the indicators considered.

In the present study, the variable evaluated as Moderately insufficient was that related to the degree of competencies acquired in the Biostatistics course. International studies^(13,14) also mention difficulties in acquiring practical skills and professional competencies in the teaching development of programs taught in a blended and distance learning format;

therefore, it is necessary to maintain constant updating and feedback through the evaluation of content and communication with students.

The final results of the analysis of the applied instrument showed that when carried out systematically and transparently, it promotes practice and organizational and professional learning. On the other hand, as shown by foreign studies,⁽¹⁵⁾ they are part of a process initiated by the educational center to systematically collect information about its operation, analyze and assess that information considering the quality of educational processes, and make decisions to propose new proposals and recommendations.

Scientific contribution

The results of the application of a well-designed questionnaire are provided, applied as a powerful tool to improve educational quality and contribute to scientific development in the field of health sciences, according to the quality criteria of the teaching-learning process that internationally govern university training and professional development, and the dimensions of the undergraduate and postgraduate accreditation process of the programs. Instruments like this help the development of the teaching-learning process of Biostatistics and make it a friendlier, useful science, easy to internalize and apply in professional performance.

CONCLUSIONS

The application of the questionnaire allowed us to learn about the process of assimilation of the content taught, which served as feedback to the teaching staff on the degree of understanding and application of the module in the master's degrees developed at the ENSAP, and fostered the master's student's perception of the need for constant improvement of pedagogical methods for greater acceptability of teaching activities.

BIBLIOGRAPHICAL REFERENCES

1. República de Cuba. Ministerio de Educación Superior. Reglamento de la Educación de Posgrado de la República de Cuba. Resolución No.140/2019. La Habana: MES; 2019.
Available at: <https://cuba.vlex.com/vid/resolucion-no140-19-810750577>
2. González Juárez G, Cocolotl González D, Romero Martínez E. Reflexiones de la autoevaluación para la acreditación de un programa de posgrado en ciencias de la salud. Universidad Nacional Autónoma de México. Congreso internacional de educación y evaluación. 2022. Rev Debates en Evaluación y *Curriculum* [Internet]. 2023 [cited 10/07/2024];6(6):[aprox. 15 p.]. Available at:
<https://centrodeinvestigacioneducativauatx.org>
3. Casimiro Urcos CN, Tobalino López D, Casimiro Urcos WH, Fernández BJ. Competencias laborales y formación profesional de profesoras de Educación Inicial, en el distrito de Lurigancho en Perú. Rev Univers y Soc [Internet]. 2020 [cited 10/07/2024];12(4):444-53.
Available at: <http://scielo.sld.cu/pdf/rus/v12n4/2218-3620-rus-12-04-444.pdf>
4. Fleites Did TY, Pérez Gallego YC, Gispert Abreu GA. Validación de instrumentos evaluativos del conocimiento sobre salud bucodental. Rev Med Electron [Internet]. 2021 [cited 27/04/2024];43(1):[aprox. 17 p.]. Available at:
<http://www.revmedicaelectronica.sld.cu/index.php/rme/article/view/3998/5029>
5. Lages Ruiz J, Martínez Trujillo N. Validación de instrumentos para estudio de referenciación en enfermería oftalmológica. Rev Cubana Enfermer [Internet]. 2023 [cited 06/02/2025];39:[aprox. 17 p.]. Available at:
http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S086403192023000100003&lng=es
6. González Arroyo AP, Bermeo Escalona JR. Metodología para la construcción y validación de instrumentos en el área de salud. Ibn Sina- Rev Electron Semestral en Ciencias de la Salud [Internet]. 2024 [cited 29/04/2024];15(1):[aprox. 18 p.]. Available at:
<http://revistas.uaz.edu.mx/index.php/ibnsina>
7. Cuevas Rodríguez FA, Moreno Moreno MA. Validación de un instrumento para evaluar metodología de enseñanza de la lengua en docentes de educación secundaria. Rev UNACIENCIA [Internet]. 2021 [cited 27/04/2024];14(27):[aprox. 15 p.]. Available at:
<https://doi.org/10.35997/unaciencia.v14i27.635>
8. Senú González I, Escobar Yéndez NV, Valiente Hernández Y, Bandera Sosa L, Berenguer Guarnaluces M. Evaluación y acreditación de la calidad del posgrado en las especialidades de Medicina Interna y Dermatología en Santiago de Cuba. MEDISAN [Internet]. 2021 [cited

18/04/2025];25(2):[aprox. 19 p.]. Available at:

<https://medisan.sld.cu/index.php/san/article/view/3394>

9. World Medical Association. Declaración de Helsinki de la AMM – Principios éticos para las investigaciones médicas en seres humanos. Octubre 2024. Available at:

<https://www.wma.net/es/policias-post/declaracion-de-helsinki-de-la-amm-principios-eticos-para-las-investigaciones-medicas-en-seres-humanos/>

10. República de Cuba. Ministerio de Educación Superior. Junta de Acreditación Nacional. Sistema de Evaluación y Acreditación de la Educación Superior (SEAES). [Internet]. La Habana: Editorial Ciencias Médicas; 2018. Available at: <https://www.gacetaoficial.gob.cu>

11. Addine Fernández F, García Batista G. Evaluación de impacto de los resultados científicos, desarrollo sostenible y calidad de los procesos universitarios. Actas del 12^{do} Congreso Internacional de Educación Superior “Universidad 2020”. 10-14 Feb 2020. La Habana, Cuba: MES; 2020. Available at: <http://www.congresouniversidad.cu/xii-taller-internacional-de-evaluacion-de-la-calidad-y-acreditacion-en-la-educacion-superior>

12. Aliaga Pacora AA, Juárez Hernández L G, Herrera Meza R. Diseño y validez de contenido de una rúbrica analítica socioformativa para evaluar competencias investigativas en posgrado. Rev de Ciencias Sociales [Internet]. 2021 [cited 18/04/2025];29(4):415-427. Available at: <https://doi.org/10.31876/rcs.v29i4.41265>

13. Rinaldi Sebastián M. Contribuciones de los procesos de evaluación y acreditación de posgrados al desarrollo de la función docente en Argentina. Rev Electron Calidad en la Educación Superior [Internet]. 2022 [cited 18/04/2025];13(1):164-188. Available at: <http://dx.doi.org/10.22458/caes.v13i1.3975>

14. González-García Victoria E. Agencias acreditadoras de carreras en la Universidad de Costa Rica: sus modelos de autoevaluación. Rev Electrónica Calidad en la Educación Superior [Internet]. 2022 [cited 18/04/2025];13(1):189-225. Available at: <http://dx.doi.org/10.22458/caes.v13i1.3206>

15. Cancino Jiménez D. Acreditación de competencias profesionales y su relación con la calidad en salud. Rev Salud Cienc Tecnol [Internet]. 2022 [cited 18/04/2025];215:[aprox. 15 p.]. Available at: <https://doi.org/10.56294/saludcyt2022125>

Declaration of interests

[This journal is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License](#)

The authors declare that they have no conflict of interest.

Authors' contribution

Conceptualization: María E. Álvarez Lauzarique, Adrián Álvarez Pérez, and Liliam Quelle Santana

Data curation: Adrián Álvarez Pérez and María del Carmen Pría Barrios

Formal analysis: Adrián Álvarez Pérez and Ileana Castañeda Abascal

Funding acquisition: Adrián Álvarez Pérez and Liliam Quelle Santana

Investigation: Adrián Álvarez Pérez, Carmen Orayda Tenorio Moirón, and María del Carmen Pría Barrios

Methodology: María E. Álvarez Lauzarique and María del Carmen Pría Barrios

Project administration: Adrián Álvarez Pérez

Resources: Adrián Álvarez Pérez and Liliam Quelle Santana

Software: Carmen Orayda Tenorio Moirón and María del Carmen Pría Barrios

Supervision: María del Carmen Pría Barrios

Validation: Ileana Castañeda Abascal and María E. Álvarez Lauzarique

Visualization: Adrián Álvarez Pérez and Liliam Quelle Santana

Writing – original draft: Adrián Álvarez Pérez and Ileana Castañeda Abascal

Writing – review & editing: Ileana Castañeda Abascal and Liliam Quelle Santana

This article is published under the [Creative Commons](https://creativecommons.org/licenses/by-nc/4.0/) licence.