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Original article

Preliminary study of the statistical content orientation during the formation process of the Physical culture professional

Estudio preliminar de la orientación del contenido estadístico durante el proceso de formación del profesional de Cultura Física

Estudo preliminar da orientação do conteúdo estatístico durante o processo de treinamento do profissional de Cultura Física

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ABSTRACT

The study of the Statistic as a discipline on majoring at Physical Culture has a great importance for its application in scientific research and its high impact in the fields of professional performance, besides the scientific contribution to the Cuban sport movement. For these reasons the study of the statistical content should be considered



to express a widespread interpretation from the different sciences. The objective of the research was to value the orientation of the study of the statistic, from the use of the interdisciplinary cores, during the process of professional formation in students of Physical Culture. During the research process it was necessary the use of empiric methods as the document review, the survey, the interview and the observation, besides, the methodological triangulation as confirmation tool. It is intended as possible solution to transform the reality achieved during the carried out diagnosis, the design of a methodological strategy to favor the teaching and learning of the statistical content in students of Physical Culture.

Keywords: Disciplines; Statistics; Professional formation; Syllabus; Interdisciplinary nodes.

RESUMEN

El estudio de la Estadística como disciplina, en la carrera de Licenciatura en Cultura Física, reviste gran importancia por su aplicación en investigaciones científicas y alto impacto en las esferas de actuación profesional, además de la científicidad que aporta al movimiento deportivo cubano. Por estas razones, el estudio del contenido estadístico debe considerarse a partir de una interpretación generalizada desde las diferentes ciencias. El objetivo de la investigación consistió en valorar la orientación del estudio de la Estadística, desde la utilización de los nodos interdisciplinarios, durante el proceso de formación profesional en estudiantes de Cultura Física. En el proceso investigativo, fue necesario la utilización de métodos empíricos como la revisión de documentos, la encuesta, entrevista y la observación, además de la triangulación metodológica como herramienta de comprobación. Se propone como posible solución para transformar la realidad obtenida durante el diagnóstico realizado la elaboración de una estrategia metodológica para favorecer la enseñanza y el aprendizaje del contenido estadístico, en estudiantes de Cultura Física.

Palabras clave: Disciplinas; Estadística; Formación profesional; Plan de estudio; Nodos interdisciplinarios.

RESUMO

O estudo da Estatística como disciplina, no Bacharelado em Cultura Física, é de grande importância devido a sua aplicação na pesquisa científica e alto impacto nas esferas de atuação profissional, além da científicidade que contribui para o movimento esportivo cubano. Por estas razões, o estudo do conteúdo estatístico deve ser considerado a partir de uma interpretação generalizada das diferentes ciências. O objetivo da pesquisa foi avaliar a orientação do estudo da estatística, a partir do uso de nós interdisciplinares, durante o processo de formação profissional em estudantes de Cultura Física. No processo de pesquisa, foi necessário utilizar métodos empíricos como revisão de documentos, pesquisa, entrevista e observação, além da triangulação metodológica como uma ferramenta de verificação. A elaboração de uma estratégia metodológica para favorecer o ensino e a aprendizagem do conteúdo estatístico em estudantes de Cultura Física é proposta como uma solução possível para transformar a realidade obtida durante o diagnóstico realizado.

Palavras-chave: Disciplinas; Estatística; Formação profissional; Plano de estudo; Nós interdisciplinares.



INTRODUCTION

Currently, new transformations are sought in the educational systems and, specifically, in the teaching-learning processes that contribute to the formation of the integral knowledge of the student, preparing him/her for his/her professional performance. This implies the achievement of an education, not only committed to the appropriation of knowledge, but also to the development of their potentialities and the transformation of knowledge into positive moral and behavioral convictions, necessary to have a creative and transforming attitude towards society.

In this sense, **Sánchez (2019)** states that "education is the process through which the individual is provided with essential tools and knowledge to put them into practice in everyday life"; hence the need for these contents to be increasingly comprehensive, **Pestana (2016)**.

The centers responsible for the formation and improvement of the sports professional to meet the objective of providing integral knowledge to the learner, have the demanding challenge of designing and implementing teaching-learning processes that prepare students for their incorporation into working life and that can solve the problems that arise in their social environment and provide answers to them, from the integrative conception of the sciences.

In this sense, the Syllabus E, in force since the school year 2016-2017, states that the integral formation of the university student has as a fundamental principle the training to contribute, in a creative way, to find solutions to the problems that arise in their daily practice and the main way to achieve this task is from the teaching-learning process.

It also establishes that the graduate of the Bachelor's Degree in Physical Culture has the need to put into practice, in the different areas of the exercise of his profession, the physical exercise in an organized and sustainable way, for which he must be trained in the search, compilation and treatment of information.

The student must value and transform the activity to be developed with scientificity, by applying the appropriate use of statistics, with the purpose of satisfying needs, motives and interests of physical development, community sports practice, recreational, as well as prophylactic and therapeutic purposes.

Everything expressed above justifies the need for statistical knowledge in the plan of the teaching process, which as stated by **Numa et al., (2017)** has the function of preparing students to apply statistical methods to databases obtained from the methodologists, which require the interpretation of the given situation, its modeling, solution of the problem and interpretation of the result, which brings as a consequence that, even when students satisfactorily overcome the contents of the course, they are very limited in applying them to the solution of a given professional problem. For this reason, it is necessary to periodically reorganize the teaching-learning process from a methodological conception, which contributes to solve this problem, in correspondence with the social changes that are developing.

Salinas and Mayén (2016) state that "learning statistics has become indispensable for citizens because it allows them to analyze, interpret and make decisions based on the available information". Consequently, **Ramos (2019)** considers it a fundamental element in modern society, since citizens need statistical training to understand the space in which they develop, it will allow them to critically evaluate data in social contexts and



will provide them with the ability to make decisions. **Numa et al., (2019)** consider that the development of statistical knowledge also requires the capacity to seek and obtain the information implicit in the professional problem, seeing inquiry as the link between the content proper to the object of the profession and the content of Statistics.

Statistics and the accelerated evolution of new technologies currently constitute the great binomial of applied research. Hence, a Physical Culture professional must possess the necessary and updated statistical tools to draw work strategy and provide solutions to pressing situations in the area of sport (**Ross 2018**).

In this sense, **Blanco (2018)** asserts that the evolution of Statistics poses specific challenges in the field of university teaching, while **Comas et al., (2017)** consider that, "attitudes are an integral part of all learning subjects and occupy a central place in the educational act, guiding the perceptual and cognitive process" (p.480).

Due to its application in different branches of society, Statistics has currently become an emerging discipline in continuous consolidation and expansion (**Andrade, Fernández, & Alfonso, 2017**), which is making significant progress, even greater than other branches of mathematics, in terms of its extension and depth (**Batanero, 2018**).

Considerations made by **Mesa (2001)** explain that the development of Statistics should be carried out through the elaboration and use of activities focused on the spheres of professional performance, where the need for statistical knowledge for its solution is manifested. In turn, **Estrella (2017)** states that "in this challenging and dynamic scenario, the didactics of Statistics has become a growing and exciting field of research and development" (p. 173).

From the considerations made, it is conceived then, that in the development of statistical knowledge, new methodological conceptions should be promoted, characterized by the need to form in students the capacity to analyze, model and solve problems posed in different contexts and its systematic practice can be developed from the disciplines of the career, during the process of professional training at the University.

Muñoz et al., (2018) consider that the class is interdisciplinary in its content and form, which from the structuring of the topics establishes the internal relationships, essential and necessary to achieve integrative knowledge in students. The teacher as responsible for building this knowledge, articulating the selection of contents, organizing and hierarchizing them, must know the methods, means and procedures to bring integrated knowledge to students, from the teaching-learning process.

Offering integrated knowledge implies the need to establish links between the disciplines that make up the career curriculum, starting from considering the possible links between the contents of the disciplines for the use of interdisciplinary articulation nodes, necessary to guide the statistical content, where the teacher's interdisciplinary preparation plays a determining role.

Pérez (2010) conceives interdisciplinarity as the relationship that can be established between two or more subjects based on a common object of study, in such a way that they allow the student to form a generalized system of integrated knowledge, without unifying the subjects, since each one of them must preserve its particularities and specific objectives. However, **Ramos (2019)** considers that "in many university classrooms there are still traditional models of education that focus excessively on the teaching of content" (p. 70).



The treatment of Statistics, from the different disciplines of the career, enables the student to solve real problems, posed in the field of professional action, so that he feels he is the builder of his own knowledge, appropriates the statistical contents, enriched with other contents that are also proper of the profession; he relates systematically with the research methods and develops a system of skills with a high level of generality that allows him to apply individualized methods *Numa et al., (2017)*.

González (2016) asserts that the teaching of Statistics has constituted a pretext to apply other mathematical subjects and exercise the capacity of calculation or graphic representation, forgetting the work with real data and the aspects of statistical reasoning. The study of Statistics, according to *Numa et al., (2017)*, requires not only a statistical culture, but also the capacity to search for and obtain information implicit in the problem. *Gorina et al., (2007)* further state that it implies "understanding and using the language and basic tools of Statistics, i.e., knowing what statistical terms mean, using statistical symbols appropriately, knowing and interpreting data representations" (P.10).

The need for statistical knowledge has been addressed by several authors, among them (*Batanero, 2004*); (*Cobo, 2003*) and (*Gorina et al., 2007*), who insist on the importance of developing a Statistical Culture. Currently, other authors have been integrated to the study such as: (*Numa et al., 2017*); (*Muñoz et al., 2018*); (*Placeres, 2020*).

Due to the importance of the topic, in the area of Physical Culture, this has been the subject of study among other authors such as: (*Díaz, 1998*); (*Mesa, 2001*); (*Ruiz, 2003*); (*Tabares, 2005*), who have approached this problematic from different edges.

The objective of the research is to evaluate the orientation of the study of statistics, from the use of interdisciplinary nodes, during the process of professional training in Physical Culture students. From the author's experience as a teacher of the subject Informatics and Data Analysis in Physical Culture, she has been able to observe that there are limitations related to the subject, which were corroborated from the instruments applied, when she found limitations in terms of:

- Orient tasks with a statistical approach in the work of the subjects.
- The activities and tasks developed in the classes show an insufficient link between the subjects of the curriculum and statistics.
- Carry out measurements to form a data base.
- Guide the selection of a sample.
- They present deficiencies in the mastery of techniques to use and process information.
- The orientation of works where the student can formulate and test a hypothesis is limited.
- Analyze correlations to assess the possible relationship between variables under study.
- There are no activities where students use software for data processing.



Analyzing the aforementioned elements, knowing that statistical knowledge can contribute to the integral training process of the graduate of the Bachelor's Degree in Physical Culture, and due to the link with the exit profiles, the following problem situation arises: in spite of the transformations and continuous improvement made to the Syllabus, the indications for the orientation of the statistical content from the disciplines are still insufficient, which results in the deficient interdisciplinary preparation of the teachers.

In order to develop the research, a diagnostic process was used, and theoretical and empirical methods were selected to make its preparation possible. The criteria of *Estévez et al.*, (2006); *Guardo*, (2010) and *Hernández et al.*, (1998) are taken into consideration for the methods that allow the information search process, selecting the most important aspects, in order to elaborate a theoretical basis that facilitates the teacher to guide the use of statistical methods.

MATERIALS AND METHODS

In the development of the research, theoretical and empirical methods were used, within the empirical ones were considered:

The review of documents: it is used with the purpose of analyzing the information related to the professional training process, the model of the professional contained in the normative documents of the Syllabus E for the Bachelor's Degree in Physical Culture, in its link with the application of statistical methods, establishing the indicators in relation to the analysis required in this regard.

The survey: used as a technique for the collection of information from students and teachers, with the objective of determining the level of knowledge regarding the teaching and learning of statistical content during the training process; the importance and necessity of appropriation of this knowledge for the spheres of professional performance, as well as the need to have interdisciplinary actions in the faculty, which favor the teaching-learning of statistical content in students of the career.

The interview: it allowed us to know the opinion of the faculty directors regarding the subject treated.

Observation: 17 classroom observations were made to verify the orientation of the statistical content from the disciplines and to detect existing limitations.

As a verification tool, methodological triangulation is used with the results of the document review, observation, survey and interview, which made it possible to evaluate the behavior of the results as a way of validating the findings.

The random sample responds to a non-probabilistic sampling of accidental or casual type, according to, which is based on the selection of subjects to which the researcher has access. It was composed of professors and managers of the Faculty.

In the research, 44 subjects were sampled; among them, 27 professors from the Sports Didactics and Applied Sports Sciences departments and 17 faculty managers (Dean, Vice-Dean of Teaching, Vice-Dean of Research and Graduate Studies, career and discipline heads) who have an average of approximately 37 years of experience in the



educational sector. Of these, 12 hold doctorates in science, 30 master's degrees and two bachelor's degrees, ranging in age from 31 to 69 years and graduated in different specialties.

Procedure

The contacts for the interviews and surveys of the participants were made directly. The teachers were gathered and the form with 12 questions was applied to them, with several items that responded to the dimensions and indicators that will be related.

Dimension 1. Motivational component

Indicators:

- Level of significance and importance of the orientation of statistical content from the disciplines.
- Level of satisfaction with the quality of the teaching-learning process with the orientation of the statistical content from the disciplines.

Dimension 2. System of knowledge

Indicators:

- Level of satisfaction about the orientation of statistical content from disciplines.

Dimension 3. Knowledge application

Indicators:

- Self-evaluation in the application of statistical content from the disciplines.
- Application of statistical content from the disciplines in classes, extra-class assignments and scientific research work.

RESULTS

Documents review

The legal and current norms that regulate education in Cuba are used, related to the theoretical references of the teachers' methodological work. With the objective of knowing the interdisciplinary performance of the teachers, analyzing the conception of the curriculum in terms of the orientation of the statistical content, it was found that they do not make clear and precise references to:

- How to face effectively during the teaching-learning process, by teachers, the use of statistical content for which they can use the existing interdisciplinary articulation nodes.
- How to motivate and stimulate the application of statistical content for its usefulness in research and in the spheres of professional performance.



- The attention that should be given to the orientation of the statistical content in the methodological preparations and in the year groups.

A total of 58 research works presented by students in student scientific conferences (JCE in Spanish), 35 course works, belonging to students of different years of studies, selected by random sampling and 28 diploma works presented as an exercise of culmination of studies of different courses, which made it possible to verify the use of statistical content, were reviewed.

In order to carry out the analysis and fill in the guides to each work, the collaboration of five teachers with a master's degree and great experience in research activity was used.

Upon analyzing the information provided by the collaborators, the following regularities could be determined:

- The use of statistical content is limited, it can be used in greater depth, attending to the research problem.
- There is a poor relationship between the research problem and the statistical methods used.
- In the theoretical foundation, the adequate use of terminology about the problem addressed is limited.
- Little depth in the characterization of the sample.

Results of the teacher survey

Motivational dimension

From the indicators established for the dimension, it can be summarized that 100 % of the professors consider that the Physical Culture curriculum has an eminently interdisciplinary character and that interdisciplinarity is a necessity in the training process of the Physical Culture professional. 81.3 % recognize the importance of developing statistical content for Physical Culture students.

The level of satisfaction with the quality of the teaching-learning process, through the interdisciplinary integration of the statistical content, shows that only 37.5 % of the teachers emphasize, in a systematic way in their classes, the importance of the same to solve problems that may arise from their discipline or from the professional performance, without going deeper or showing how to do it. 56.2 % consider that in the Syllabus of the Physical Culture career, the interdisciplinarity between their discipline and Statistics for the formation of integral knowledge is not adequately emphasized, arguing that the references that are made or interpreted are in terms of Research Methodology or Computer Science, without emphasizing the role of statistical content, in addition, the interdisciplinarity with statistical content when it is oriented is without specifying: who, how, and in which thematic it is established.

The 100 % of the professors would like to carry out methodological activities that allow them, from their subject, to guide the statistical content to the students.



Knowledge system dimension

The 28.1 % of the professors state that they have adequate knowledge, related to the statistical content that the students receive in the course, in the subjects Computer Science and Data Analysis in Physical Culture to establish interdisciplinary relations. The 6.25 % consider that they have the necessary knowledge to establish these relations. The essential cause is the lack of knowledge of the statistical content that students receive and how to orient it from their discipline.

When self-evaluating the knowledge they have about the interdisciplinary nodes of their discipline, where statistical knowledge can be articulated, only 6.25 % recognize that they have the knowledge and use it very adequately. On the other hand, 68.7 % consider that their knowledge on the subject is little or not adequate.

Knowledge application dimension

Only 6.3 % of the surveyed professors consider that the orientation of the statistical content of their discipline is very adequate. 71.9 % recognize that no methodological activities related to the orientation of the statistical content have been developed in the discipline group, nor in the year group.

Results of Student survey

Motivational dimension

Twenty-four percent are motivated by academic activities and 29.2 % by research activities; however, 59.4 % of the students did not present research work during the first year of their studies. 91.6 % of the students recognize that the application of statistical methods is very necessary in the course and in the development of their professional activity.

The 86.5 % of the students consider that the professors almost never or never rely on their statistical knowledge to solve practical problems of their subject.

The 70.8 % of the students feel motivated to apply the statistical knowledge acquired from the disciplines to solve practical problems that may arise in their future professional training, claiming the extra effort it represents for them.

Knowledge system dimension

The 59.4 % of the students surveyed stated that the professors almost never or never guide them to integrate statistical knowledge from the disciplines.

Knowledge application dimension

The 60.4 % state that they almost never or never apply in the course work final assignments and papers for JCE and that they apply some type of statistical method received in the course of study. 84.4 % of the students state that the professors sometimes or almost never or never guide them to integrate the statistical knowledge, which they possess, to the activities of the discipline. As for the security of possessing statistical knowledge to put it into practice, only 16.7 % feel secure; 19.8 % almost always feel secure, however, 48.9 % state that they almost never or never feel secure. Regarding the use of software for data processing, from other disciplines, 18.8 % stated that they have sometimes used it and 76.7 % have never used it.



Results of the management interview

The 100 % of the directors agree that the students graduated by day course, undoubtedly, develop research skills during the course of the career, but that the statistical knowledge lacks support and therefore, the aspirations of the professional model at the level of the requirements aspired by the Ministry of Higher Education are not yet satisfied. 100% agree that it is very necessary for the Physical Culture and Sport professional to have an adequate statistical training because of the problems that he/she can solve from his/her profession.

The 23.5 % of the managers state that it is not very common to see in the class controls, that activities are oriented for the student to develop this knowledge, only sometimes some statistical action is oriented. 100 % of the managers recognize that it is very necessary to develop actions that help to strengthen the statistical knowledge of the students in the faculty.

The 100% agree in not being totally satisfied with the statistical knowledge that students have at the end of the course and that actions should be developed in this sense, besides strengthening the methodological activities that generally are not directed to the teaching and learning of the statistical content, from the disciplines.

When carrying out the methodological triangulation of the results obtained in the application of the instruments, some deficiencies are crossed that show the coincidences found in the diagnosis carried out and that will be summarized below:

- The importance of statistical knowledge to solve problems that may arise in the professional field is not systematically emphasized in the classes.
- The development of the methodological work presents few activities directed to the treatment of the statistical content, from the disciplines.
- The 93.6% of the professors do not recognize the interdisciplinary nodes to guide the statistical content.
- Unlimited actions of the professors aimed at orienting the use of statistical content during the teaching-learning process.
- The 97 % of the surveyed faculty members do not know the statistical contents that students receive in the course and that are necessary to orient their application and establish interdisciplinary relations.
- There is a need to develop in the faculty actions aimed at achieving the use of statistical content from the disciplines.

With the application of these methods, some potentialities and deficiencies of the researched object were recognized, which determine their attention.

The following are recognized as potential:

- The willingness of teachers to participate in methodological activities, where the topic is addressed, allowing them to expand their knowledge and efficiently address the orientation of statistical content from the disciplines.



- That methodological work is the effective way to prepare teachers and obtain positive results.
- The need for students to understand the importance of the use of statistical knowledge for their professional sphere of action, daily life and scientific research.
- Teachers motivated to guide, from the classroom, activities to promote the use of statistical knowledge from their disciplines.

The following are identified as lacks:

- Insufficient use of statistical content as one of the essential elements within the scientific and research component in the training process of the Physical Culture professional.
- Low level of utilization of statistical methods, according to the research problematic
- The 43 % of the students present difficulties in the selection of statistical methods, according to the research problem.
- The 52 % of the students show deficiencies in the theoretical foundation with the use of the adequate terminology, according to the problem approached.
- The 97 % of the teachers do not guide activities to use some statistical method from the disciplines, they use the nodes of interdisciplinary articulation.
- The 89 % of the teachers do not identify the topics that constitute interdisciplinary nodes, where they can enhance the orientation of the statistical content.

DISCUSSION

In Cuba, different researches have been developed with the purpose of developing statistical knowledge at university level, however, the way in which students interpret the need to integrate statistical content to practice denotes the need to articulate this knowledge in the teaching-learning process and coincides with the results achieved in researches carried out.

In the country, there have been researches related, in some way, to the topic addressed, where coincidences in the results are shown.

For example, in the studies conducted by *Muñoz et al., (2018)*, related to the theoretical bases of interdisciplinarity for the scientific-research training of university students, they stated that:

- The 86 % of the students consider it very important that teachers handle the concept of interdisciplinarity.
- The 50 % of the students indicate that the methodological strategies of the teachers are not effective in all subjects.



- The 62 % of the students have difficulties in using scientific methods.
- The 52 % of the students consider that the academic activities they carry out in the institution have a positive influence on the development of research knowledge.

On the other hand, 100 % of the teachers state that the methodological strategies used are effective in all subjects they teach.

- The 100 % of the teachers consider it important to study interdisciplinarity.
- The 75 % of the teachers believe that the academic activities carried out in their institution have a positive influence on the development of research skills of students.

González (2014) makes, in his studies, an assessment of the statistical training of students and highlights that, in the observations made in classes, it is found that the potentialities of the content are not exploited to form the attitudes inherent to the statistical training, although they are treated as general values. He states that there are limitations to communicate with specialists in statistics, expressed in the scarce command of technical and scientific language and the elementary concepts of Research Methodology and Statistics, such as: tendency, frequency, proportion, indicative probability, incidence, measurement, variable, value, among the most common ones.

Many of the students do not perceive the integration, in teaching, of the contents of the subjects of the profession as the solution of health problems through scientific research, which they consider another obstacle to learning and to understand the applicability of Statistics in the practice of the profession and thus be motivated by its study.

It stands out that the teachers in the classes do not treat Statistics with the methodological and practical essence it possesses and in more than 80% of the audited works, a stereotype of conceiving the results as a set of tables and graphs, which are commented in isolation, is found.

According to the perception of a high proportion of managers who were interviewed, the level of development of statistical training skills was evaluated as fair and poor in most cases.

A part of the students admit that the understanding of the subject could be increased if independent work tasks of a research nature were oriented, with experiences in the community, and some even showed enthusiasm for this idea, although others were afraid of the additional time and effort that this type of activity would take up.

It also refers to the insufficiencies in the methodological preparation of the professors of the career to develop a statistical training process, based on the professional performance mode in an integral and systemic way. And to the gnoseological and pedagogical inadequacies of the Medical School faculty in the mastery, systematization and integration of the contents of the training process to favor, in a sequenced manner, the integral character of this, in the relation of the curricular and extracurricular.

The study conducted by **Ramos (2019)** highlights, within the recommendations, limitations and projections made, three large blocks that encompass some problems in the study and application of statistics in the university context.



The first includes the study of attitudes towards statistics, which play a very important role in the teaching-learning processes of the subject; the second is related to the evaluation of the student's aptitudes, and the third is related to the students' aptitudes and the context of the class. For which, the number of students in the classroom, access to technology, students' interests, the relationship of the contents with the professional program, the teacher's own knowledge and attitudes towards statistics, among other factors that may have influence, should be considered.

Likewise, **Ramos (2019)** considers that the subject of statistics is presented as a challenge due to the inherent difficulties involved in its use; it is also an opportunity for teachers to strengthen their skills and create creative strategies that promote the development of statistical thinking. All this implies that the teacher must be a professional in constant preparation for teaching it.

Placeres (2020), in his research on the resolution of biostatistics problems by students of the Faculty of Agronomy, obtained similar results and identified the following shortcomings:

Students use statistical methods and, sometimes, there is no correspondence between the selected method and the objective, they do not correctly interpret the statistical result, so they make decisions and propose solutions that do not correspond to the logical knowledge of the profession and that are not validated by the statistical processing performed; other students applied the statistical methods without needing to do so.

According to the studies, these results were influenced by the presence of young teachers of the Biostatistics subject group, so they teach the subject with little link to the profession. In addition, the interdisciplinary link to contribute to statistical training with the problems that are solved in classes, related to the professional profile of the Agricultural Engineer, is very limited.

In summary, the studies carried out demonstrate the need for methodological treatment in university teachers, related to statistical content and the real need to develop interdisciplinary actions that benefit their teaching and learning in the university context.

Therefore, the behavior of the applied diagnosis, from the components of motivation, knowledge and application of knowledge, allowed identifying the main difficulties and limitations found in the teaching-learning process regarding the orientation of statistical content, from the disciplines in Physical Culture students.

Using the potentialities recognized by the teachers, it is proposed to elaborate a methodological strategy, where methodological teaching workshops are developed, which show to the teaching staff:

- Statistical knowledge received by Physical Culture students.
- To identify the interdisciplinary nodes of statistical articulation.
- To incorporate integrating exercises related to the profession to favor the orientation of the statistical content, from the disciplines, during the professional training process and to solve the deficiencies detected in the diagnosis.

These workshops, in turn, should be supported by the methodological activities of the departments, from the disciplines and the year groups, with a certain interlocking between them. The elaboration of the proposed methodological strategy would be a way



to attenuate the regularities manifested in students and professors by contributing to the integrative knowledge, from the sciences.

REFERENCES

- Batanero, C. (2004). Los Retos de la Cultura Estadística. *Yupana*, 1, 27-37. <https://doi.org/10.14409/yu.v1i1.238>
- Batanero, C. (2018). TREINTA AÑOS DE INVESTIGACIÓN DIDÁCTICA SOBRE EL ANÁLISIS INFERENCIAL DE DATOS. En *Rutas de la Educación Matemática*. México. *Sociedad Mexicana de Investigación y Divulgación de la Educación Matemática* (pp. 196-209). Sociedad Mexicana de Investigación y Divulgación de la Educación Matemática. https://www.researchgate.net/publication/335527780_TREINTA_ANOS_DE_INVESTIGACION_DIDACTICA_SOBRE_EL_ANALISIS_INFERENCIAL_DE_DATOS
- Blanco, A. B. (2018). Directrices y recursos para la innovación en la enseñanza de la Estadística en la universidad: Una revisión documental. *REDU. Revista de Docencia Universitaria*, 16(1), 251-268. <https://doi.org/10.4995/redu.2018.9372>
- Carlos Manuel, Á. de Z. (1998). *Modelo para el trabajo metodológico del proceso docente educativo en los niveles de carrera, disciplina y año académico en la Educación Superior* [Universidad de Pinar del Río Hermanos Saíz Montes de Oca. Grupo de Estudios de Didáctica de la Educación Superior]. <https://rc.upr.edu.cu/jspui/handle/DICT/330>
- Comas, C., Martins, J. A., Nascimento, M. M., Estrada, A., Comas, C., Martins, J. A., Nascimento, M. M., & Estrada, A. (2017). Estudio de las Actitudes hacia la Estadística en Estudiantes de Psicología. *Bolema: Boletim de Educação Matemática*, 31(57), 479-496. <https://doi.org/10.1590/1980-4415v31n57a23>
- Estrella, S. (2017). Enseñar estadística para alfabetizar estadísticamente y desarrollar el razonamiento estadístico. En A. Salcedo (Ed.), *Alternativas Pedagógicas para la Educación Matemática del Siglo XXI* (pp. 173-194). Caracas: Centro de Investigaciones Educativas, Escuela de Educación. Universidad Central de Venezuela. [https://www.researchgate.net/publication/316524028_Ensenar_estadistica_para_alfabetizar_estadisticamente_y_desarrollar_el_razonamiento_estadistico](https://www.researchgate.net/publication/316524028_Ensenar_estadistica_para_alfabetizar_estadisticamente_y_desarrollar_el razonamiento_estadistico)
- González, B. M. (2016). *La categoría formación. Visión pedagógica de la formación universitaria actual*. Universidad de La Habana.
- Gorina, A. (2007). *La formación integral de los doctores en Ciencias Pedagógicas. Una mirada desde la educación estadística*. In Actas del V Taller Internacional «Innovación Educativa-Siglo XXI» y Primer Simposio de la red de investigación en Ciencias de la Educación para Iberoamérica, Las Tunas, Cuba.
- Hernández, R. (1998). *Metodología de la investigación* (Segunda edición). Editorial Mc Graw Hill.



- Herrera, J. S., & Mayén, S. (2016). Estudio exploratorio de las actitudes hacia la estadística en estudiantes mexicanos de bachillerato. *Avances de investigación en educación matemática*, 10, 73-90. <https://dialnet.unirioja.es/servlet/articulo?codigo=6168888>
- Merino, B. C. (2003). *Significado de las medidas de posición central para los estudiantes de secundaria* [Universidad de Granada]. <https://dialnet.unirioja.es/servlet/tesis?codigo=12700>
- Mesa Anoceto, M. (2001). *Asesoría estadística con enfoque procesual en la investigación del deporte* [TESIS PRESENTADA EN OPCIÓN AL GRADO CIENTÍFICO DE DOCTOR EN CIENCIAS DE LA CULTURA FÍSICA, Universidad de las Ciencias de la Cultura Física y el Deporte "Manuel Fajardo"]. <http://eduniv.reduniv.edu.cu/fetch.php?data=1286&type=pdf&id=1286&db=1>
- Muñoz Verdezoto, P., Bodero, L., Gardenia, J., & González, O. (2018). Bases teóricas de la interdisciplinariedad para la formación científico-investigativa de los estudiantes universitarios. *Revista Lasallista de Investigación*, 15(2), 340-352. <https://doi.org/10.22507/rli.v15n2a26>
- Numa Rodríguez, M. de la C., Sánchez Numa, A., Manzano Salermo, I. M., & Rodríguez Moya, O. S. (2017). Propuesta metodológica para la formación estadística universitaria. *Mendive. Revista de Educación*, 15(1), 94-98. http://scielo.sld.cu/scielo.php?script=sci_abstract&pid=S1815-76962017000100008&lng=es&nrm=iso&tlng=es
- Pérez López, C. G., & Batanero Bernabeú, C. (2012). *La Estadística como Herramienta en la Investigación Psicológica: Un estudio exploratorio*. EAE.
- Pestana Mercader, O. E., Perera Díaz, R., & Ruiz Cañizares, J. M. (2017). *Estrategia metodológica para contribuir a un mejor desempeño profesional del estudiante de Cultura Física en la práctica laboral investigativa de Educación Física*. Editorial Universitaria. <http://eduniv.reduniv.edu.cu/index.php?page=13&id=215&db=1>
- Placeres-Espinosa, I., González-Hernández, W., Hernández-Díaz, M., Placeres-Espinosa, I., González-Hernández, W., & Hernández-Díaz, M. (2020). La resolución de problemas de bioestadística en la carrera Agronomía. *Revista Cubana de Educación Superior*, 39(2). http://scielo.sld.cu/scielo.php?script=sci_abstract&pid=S0257-43142020000200002&lng=es&nrm=iso&tlng=es
- Ross-Rodríguez, A., & Leyva-Rodríguez, N. (2018). La Estadística, una herramienta importante en la formación del profesional de Cultura Física. *Revista científica especializada en Ciencias de la Cultura Física y del Deporte*, 15(36), 128-135. <https://deporvida.uho.edu.cu/index.php/deporvida/article/view/449>
- Ruiz Aguilera, C. A. (2003). *Teoría y práctica curricular*. Editorial Pueblo y Educación. <https://www.worldcat.org/title/teoria-y-practica-curricular/oclc/64664229>
- Tabares, R. M. (2005). Un modelo teórico metodológico para el desarrollo de habilidades investigativas propedéuticas en los estudiantes de la facultad de Cultura Física de Pinar del Río. *EmásF, Revista Digital de Educación Física*.



Vargas, R., & Fernando, L. (2019). La educación estadística en el nivel universitario: Retos y oportunidades. *Revista Digital de Investigación en Docencia Universitaria*, 13(2), 67-82. <https://doi.org/10.19083/ridu.2019.1081>

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Authors' contribution:

Enilda Mariselis Jorri Carbó: Conception of the idea, literature search and review, instrument making, instrument application, compilation of information resulting from the instruments applied, statistic análisis, preparation of tables, graphs, and images, database preparation, general advice on the topic addressed, drafting of the original (first version), review and final version of the article, article correction, authorship coordinator, translation of terms or information obtained, review of the application of the applied bibliographic standard.

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