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Original article

Assimilation of statistical techniques: a necessity in the formation of the Physical Culture and Sports professional

Asimilación de técnicas estadística: necesidad en la formación del profesional de Cultura Física y Deporte

A assimilação de técnicas estatísticas: uma necessidade na formação do profissional de Cultura Física e Desporto

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ABSTRACT

The mastery of statistical techniques represents numerous benefits by virtue of the formation of competent professionals. In the field of Physical Culture and Sport, it acquires greater significance due to its applicability in the four graduate profiles, hence the importance of the assimilation of this science in the formation process of its professionals. The objective of this study was to determine the state of assimilation of statistical techniques in the training of Physical Culture and Sport professionals in Cuba. The research required the use of various methods, among which the following should be mentioned: document review, surveys, a pedagogical test and methodological triangulation. Likewise, as part of the statistical methods, the empirical frequency distribution tables were used. All of them made it possible to determine the level at which the state of assimilation of statistical techniques in the formation of these professionals was framed, as well as the teachers' knowledge of learning strategies, as a crucial result of the research. With the identification of the most influential elements in this problem, the need and importance of implementing actions in the scientific, teaching and methodological work system to improve the levels of assimilation of this science is confirmed.

Keywords: Statistical techniques; Levels of assimilation; Learning strategies.

RESUMEN

El dominio de técnicas estadísticas representa numerosos beneficios en virtud de la formación de profesionales competentes. En la rama de la Cultura Física y el Deporte, adquiere mayor significación por su aplicabilidad en los cuatro perfiles de egreso, de ahí la importancia que tiene la asimilación de esta ciencia en el proceso de formación de sus profesionales. El objetivo del presente estudio fue determinar el estado de la asimilación de las técnicas estadísticas en la formación del profesional de Cultura Física y Deporte en Cuba. La investigación exigió la utilización de diversos métodos entre los que se deben enunciar: revisión de documentos, encuestas, una prueba pedagógica y la triangulación metodológica. Asimismo, como parte de los métodos estadísticos se emplearon las tablas de distribución empíricas de frecuencias. Todos ellos permitieron determinar el nivel en que se enmarcaba el estado de la asimilación de las técnicas estadísticas en la formación de estos profesionales, así como el conocimiento de los docentes sobre las estrategias de aprendizaje, como resultado crucial de la investigación. Con la identificación de los elementos más influyentes en esta problemática, se constata la necesidad e importancia de implementar acciones en el sistema de trabajo científico, docente y metodológico para mejorar los niveles de asimilación de esta ciencia.

Palabras clave: T écnicas estadísticas; Niveles de asimilación; Estrategias de aprendizaje.

RESUMO

O domínio das técnicas estatísticastrazmuitosbenefíciosemvirtude do treinamento de profissionais competentes. No ramo da Cultura Física e do Esporte, adquiremaiorrelevânciadevido à suaaplicabilidade nos quatroperfis de graduação, daí a importância da assimilaçãodestaciência no processo de formação de seusprofissionais. O objetivo desteestudofoi determinar o estado de assimilação de técnicas estatísticasnaformação de profissionais de Cultura Física e Esportesem Cuba. A pesquisa exigiu a utilização de vários métodos, entre os quais se destacam: revisão documental, inquéritos, prova pedagógica e triangulação metodológica. Da mesma forma, como parte

dos métodos estatísticos, foram utilizadas as tabelas empíricas de distribuição de frequência. Todos eles possibilitaram determinar o nível de assimilação de técnicas estatísticasnaformaçãodessesprofissionais, bem como o conhecimento dos professores sobre estratégias de aprendizagem, resultado fundamental da pesquisa. Com a identificação dos elementos mais influentes neste problema, confirma-se a necessidade e a importância de implementar ações no sistema de trabalho científico, pedagógico e metodológico para melhorar os níveis de assimilaçãodestaciência.

Palavras-chave: Técnicas estatísticas; Níveis de assimilação; Estratégias de aprendizagem.

INTRODUCTION

The continuous evolution of social processes and the growing technological progress demand systematic improvement in the multiple areas of knowledge. For this reason, the formation of future professionals, who are called to play an active role in the acquisition of new knowledge through research processes, acquires great relevance.

The National Institute of Sports, Physical Education and Recreation (Inder in Spanish) and with it, the Manuel Fajardo University of Physical Culture and Sports Sciences (UCCFD) of Cuba, as an entity that forms its human resources, are immersed in the improvement of its processes. Among those to be mentioned are: the preparation of high-performance athletes, the formation of competent professionals, the work in the community, the use of physical exercise as a rehabilitating agent for different diseases, the school as a basic link that contributes to the development of a healthy body and mind from the Physical Education as a leading subject.

The effectiveness of this improvement, which becomes transformations, is related to the collection of a set of data resulting from the planned variables and measurements. These, in turn, describe the real situation of the object of study through the implementation of statistical techniques as research instruments. The fact of analyzing the results obtained, with the application of these techniques, is of vital importance for future professionals of Physical Culture and Sport, due to their influence on decision-making on the social and sports processes in which they develop.

For such reasons, it is agreed with Pérez, Crespo and López (2018) when they state that:

> "Currently in many countries, including Cuba, research on the teaching of Statistics is increasing, aimed at solving in some way the contradiction that is given, in that on the one hand the applicability of Statistics increases, and on the other hand the preparation in this that is received through higher studies is not enough, since in most of the university careers topics ranging from Descriptive Statistics to Inferential Statistics are taught, but no work is done to ensure that students obtain the best data sets, the most information from the data and the best interpretation of the results through the use of some statistical software for information processing. (p. 341)"

The confrontations in the pedagogical field on the learning of Statistics are directed to a critical analysis and transformations, where the psychological aspects have a determining influence on the final result obtained, on the way in which the learning processes can be developed and thus the assimilation of the contents.

In this sense, Piaget (as cited in Santamaría 2004) states that mental assimilation consists of the incorporation of objects into behavioral schemes, schemes that are nothing more than the framework of actions that man can actively reproduce in reality. For his part, Birchenall (as cited in Raynaudo & Peralta, 2017) refers that assimilation is the phenomenon of making sense of new phenomena from previous conceptualizations. When previous schemes are insufficient to interpret reality, a cognitive conflict is generated that triggers a replacement or reorganization of previous concepts, which is called accommodation.

The future professional puts them into practice, when he/she is able to apply in real situations, the knowledge of statistical techniques assimilated to the dissimilar projections that his/her professional development propitiates in the four graduate profiles (Prophylactic and Therapeutic Physical Culture, Recreation, Physical Education and Sport). With a first action directed to the mental plane, in the conformation of the already mentioned schemes. The second is directed to the practical application of the conceived scheme.

Some authors state that it is the teacher who plays a fundamental role in the activation of the mechanism of assimilation of the contents. Sánchez, García, Steffens and Hernández (2019) refer that teachers have a variety of tools that allow them to interact with students to encourage motivation, participation and interest in the subject, all with the purpose of transmitting knowledge. In addition, they are responsible for modeling the different learning activities with the objective that the student goes through the different "levels of assimilation: reproductive, productive and creative" (Álvarez de Zayas, 1999, p. 78).

Achieving an efficient process of assimilation of statistical techniques in the formation of Physical Culture and Sport professionals in Cuba, leads to think about learning strategies, as a way to achieve a plan designed with the objective of reaching a certain goal. Esteban and Zapata (as cited in Maldonado *et al.,* 2019) assure that a strategy implies an intentional plan that results in learning.

There are several classifications on learning strategies, authors such as Castellanos, Reinoso and García (2001) and Pérez and Beltrán (2014) agree in classifying them into cognitive, metacognitive and learning support strategies. These, in turn, are associated with the will, capacity and autonomy that the student has. Reasons why the authors assume these classifications, they consider them representative in the training process of Physical Culture and Sport professionals, and singularly, in the assimilation of statistical techniques.

Hence, the interest of this study is aimed at teachers to identify the actions that should be strengthened for students to use different types of learning strategies, which enhance self-learning and assimilation of statistical techniques from their pre-professional needs. Therefore, the objective of this work is to determine the state of assimilation of statistical techniques in the formation of the Physical Culture and Sport professional in Cuba.

MATERIALS AND METHODS

The study has been developed based on the descriptive exploratory research paradigm, whose main objective is to explore and solve problems of the social reality from the contribution of practical results. As a complement to the study, participatory action

research is assumed, since it is described on the reality and daily life of the events, which implies understanding and exposing the action developed to transform it.

The instruments chosen for the collection of information were a questionnaire and a pedagogical test addressed to the students, as well as a questionnaire to be answered by the teachers. The instruments were adjusted to the context of the study, with the purpose of determining the real state of assimilation of statistical techniques by the students and how much the teacher influences this process.

For the selection of the instruments, the following variable was taken into account: the assimilation of statistical techniques in the formation of the professional in Physical Culture, which is defined as the mechanism that allows the student to incorporate, relate, organize, accommodate, reproduce and apply a system of statistical knowledge on the practice of the actions he/she carries out in his/her academic-social environment and which favors his/her professional.

For the parameterization of the dimensions and indicators identified, it was used the assessment rating scale proposed and adjusted to the context of the study, which comprises three levels: low (level 1), medium (level 2) and high (level 3). The first level represents undesired results; the second level, results far from desired, and the third level, desired results.

To determine the state of assimilation of statistical techniques in the formation of the Physical Culture and Sport professional, the following methods were used: review of documents; surveys and a pedagogical test to students, as well as a survey to teachers. Methodological triangulation was used, with the intention of crosschecking different data sources to reach general conclusions.

Likewise, the statistical processing of the data obtained was carried out with the use of the statistical method empirical distributions of frequencies arranged in tables.

The study was carried out at the Manuel Fajardo University of Physical Culture and Sport Sciences. In the institution, three types of courses are developed: the regular daytime course, the course by meetings for workers and the course by meetings for athletes; the research was specifically focused on the regular daytime course with students taking Syllabus E, which began to be applied as a result of the reforms developed by the Ministry of Higher Education in the country. These reforms were aimed at reducing undergraduate formation times, increasing competitiveness and broadening the profile of graduates, in addition to providing more options for university access.

The student population consisted of third and fourth year students of the regular daytime course, from the different municipalities of The Capital of the country, aged between 21 and 25 years old. It is at these levels where the results of greater veracity can be obtained, since the students are better prepared and immediately need the application of statistical techniques for the realization of their scientific research work. At this stage, it is possible to identify the weaknesses in their cognitive structures, and the quality of the classes received in the subject where the topics of Statistics (Informatics and Data Analysis) are taught.

The sampling used is of the stratified probabilistic type. The strata declared were previously conformed, since the third and fourth year of the course were assumed. To determine the sample size in each stratum, the sample size corresponding to the

selected population was initially calculated. The following formula is used to calculate the sample size of a finite population (n) (Equation 1).

$$n = \frac{N}{1+\left[\frac{e^2(N-1)}{Z^2pq}\right]} \quad (1)$$

Caption:
N = population size;
e2 = squared sampling error allowed;
Z2 = confidence level squared;
pq = population variance.

The sample was determined by 107 students within the totality of the population under study. The determination of the sample size for each stratum was based on the author's own criteria. The following formula was used for this purpose (Equation 2).

$$\text{fh} = \frac{\text{n}}{\text{N}} \quad (2)$$

fh = factor of each group in the sample;
n = sample size;
N = population size.

Based on the above procedure, 61 and 46 third and fourth year students, respectively, were identified as part of the study. Subsequently, a simple random sampling was applied within each stratum to determine the students of each year that would make up the sample.

The population of teachers selected for the research was determined by the 11 teachers who teach Computer Science and Data Analysis in one or the other semester. For the sample, the criterion of selecting only those teachers who systematically taught the regular daytime course, which had 80 class hours assigned to the subject where the topics of this science are taught, was followed. The sample consisted of seven teachers, representing 63.6 % of the total number of teachers.

RESULTS AND DISCUSSION

In order to study the variable under study and interpret the significance of its presence in the documents that regulate the formation of professionals in Physical Culture and Sports, the following documents were examined with their corresponding units of analysis:

- Syllabus E.
- Program of the discipline Methods of Analysis and Research in Physical Culture.
- Program of the subject Informatics and Data Analysis.
- Scientific research works defended in the department of Basic Sciences at the UCCFD *Manuel Fajardo*.

Syllabus E responds to the broad profile formation model, based on a basic formation that provides the professional with tools to face the main problems that arise, and ensures greater employability of the graduate in his or her different spheres of action. In correspondence with the social task, the modes of action have an eminently pedagogical character, and are put into practice through professional skills that respond to: *to know*, *to know how to do* and *to know how to be* of the professional in Physical Culture and Sports.

Likewise, the basic professional skills reflect the need to use research methods and techniques to identify, define and solve professional problems; however, the specific professional skills do not specify the use, during diagnosis, of statistical techniques for the planning, control and evaluation of physical activity. Similarly, the functions of these professionals are stated, where it is not reflected that to: "evaluate the processes of Physical Culture with objectivity and scientific level..." (Aguilar et al., 2016, p.9), statistical techniques should be used, supported by the reliability and validity of the instruments used to assess their results.

The discipline Methods of Analysis and Research in Physical Culture groups together the subjects of Research Methodology, Computer Science and Data Analysis and Basic Mathematics. Two of which have a direct implication in the research processes. In the general objectives of the discipline itself, reference is made to the use of Data Analysis and ICT resources. From this approach, it is inferred that it declares to apply statistical techniques in the professional activity, although it is not explicitly expressed. In the development of the program, there are elements that demonstrate the identification and application of these techniques.

In the program of the subject Informatics and Data Analysis, a system of skills is declared in correspondence with each subject. They contribute to the application of statistical techniques. As a distinctive element, there is no evidence in the skills to be developed of self-management of knowledge or self-learning, which was stated in the general objective of the subject and is a basic principle of the current syllabus.

In the review made to 12 diploma works and 27 course works defended in the department between the years 2018 and 2020, randomly selected; it was found the insufficient application of statistical techniques, it was also specified errors that attempt against the reliability of the proposals made. Of the 39 research works reviewed, 50 % used measures of central tendency circling mean, mode and median. Four of these works applied a second technique that corroborated the veracity of their proposals.

In none of the works were the tenths or hypothesis tests applied, which are of great help, in some cases, to measure the significance levels of the measurements made, especially in diploma works. It should be noted that only one student used correlation, a very representative technique within its spheres of action, but which is still an association statistician of descriptive statistics. In 13 of the papers, empirical frequency distribution tables were applied to describe the results, although not with all their elements. In one of the papers, no statistical technique was applied, only a simple percentage calculation.

Results by dimensions of the instruments applied

For the analysis of the results, reference was made to the relationship among the instruments applied, objectives, characteristics and indicators that are evaluated and the relationship of the indicators of each dimension with the items of each instrument.

This allowed verifying that the assimilation of statistical techniques in the formation of the Physical Culture and Sports professional has affectations in its three dimensions: reproductive assimilation, productive assimilation and creative assimilation, which are manifested in level one (Low) with undesired results.

Surveys to students

One hundred seven students of third and fourth years of the regular daytime course were surveyed, who showed impairments in the three dimensions. Among the most affected indicators is indicator 3.2 referring to recognizing their mastery of the application of statistical techniques, located at level one (B) with 35.5 % (38). This leads to the fact that indicator 3.3 concerning cognitive, metacognitive and support strategies is shown at level one (B) with 38.8 % (41), due to the close relationship established between knowing what they know about the subject and being able to deploy strategies to assimilate it.

At level one (B), with values below 50 %, is the indicator knowledge of the basic concepts of statistics with 44.4 % (48), in general they do not master the basic elements of this science, nor do they recognize the techniques most used in their fields of action. Likewise, the indicator cognitive and support strategies is shown with 40.1 % (43), which demonstrates the little knowledge that students have of the subject in question and their low possibilities of deploying actions to learn it.

In this sense, there is an indicator that is of vital importance, framed in level two (M) with The 66.3 % (71) referring to the need to use statistical techniques, which shows the recognition of the importance that these acquire in the formation process, in correspondence with the need for their application.

Pedagogical test

In the pedagogical test applied to the 107 students, it is reflected that the future professionals of Physical Culture and Sport have low mastery of these topics, due to the importance of these results (Table 1).

Table 1. - Results of the indicators in the pedagogical test

Dimensiones and indicators	**High**		**Medium**		**Law**	
	Absolute frequency	Relative frequency	Absolute frequency	Relative frequency	Absolute frequency	Relative frequency
Dimension 1: Reproductive assimilation level						
Indicators						
1.1 Knowledge of basic statistical concepts.	10	9,3	14	13	83	77,6
1.2 Utility and applicability of statistical techniques.	5	4,7	8	7,5	94	87,9
1.3 Strategies to	14	13	18	16,8	75	70

support learning.						
Dimension 2: Productive assimilation level						
Indicators						
2.1 Necessity of using statistical techniques.	5	4,7	8	7,5	94	87,9
2.2 Identification of the applicable statistical techniques according to the context being studied.	0	0	10	9,3	97	90,7
2.3 Cognitive and learning support strategies.	5	4,7	44	41,1	58	54,2
Dimension 3: Creative assimilation level						
Indicators						
3.1 Application of statistical techniques in scientific research works.	3	2,8	6	5,6	99	92,5
3.2 Recognize the mastery of the application of statistical techniques.	7	6,5	24	22,4	76	71
3.3 Cognitive, metacognitive and learning support strategies.	2	1,9	7	6,5	98	91,6

Note: The table shows the absolute and relative percentage frequencies obtained with the application of the pedagogical test, according to the indicator to which the question refers and the certainty of the answer given.

For the evaluation of the indicators, in correspondence with the scale assumed, correct answers were taken into account for high (A), regular answers for medium (M) and incorrect or unanswered answers for low (B).

All indicators show notable difficulties with values below 15 %, which places them in level one (B), in close relation to the results of the surveys applied to them. Only 9.3 % (10) of the students have positive results in the indicator knowledge of the basic

concepts of Statistics, which reaffirms the difficulty they show in the resolution of this subject.

One of the most representative results, in the enunciated range, is shown by the indicator support strategies with 13 % (14), since these students were the ones who created links for the solution of the exercises, with expressions that were given to them in the formulation of the question itself. The indicator identification of applicable techniques according to the context being studied is distinguished with a value of 0, none of the students was able to identify any technique applicable to a given situation according to the study variable. Distinctive element that demonstrates the insufficient assimilation of statistical techniques, during the development of the teaching-learning process of the subject.

Survey to teachers

The survey was applied to the seven teachers who systematically teach Computer Science and Data Analysis classes in the regular daytime course. The survey measured the three indicators referring to the types of learning strategies, with the intention of knowing how they favored their implementation.

In the case of indicator 1.3 learning support strategies, 85.7 % (6) of the teachers are in level three (A), 14.2 % (1) are in level two (M) and no frequency is found in level one. This allows placing the indicator in level three (A) and demonstrates that the majority of teachers favor the use of this type of strategy.

Indicator 2.3 cognitive and supportive strategies, with 71.4 % (5) at level three (A), 28.6 % (2) of the respondents at level two (M) and none at level one (B). Therefore, the indicator is evaluated at level two (M). With such results, it is inferred that a high percentage of the professors contribute to the application, on the part of the students, of their knowledge to practical situations related to their graduate profiles, giving equal importance to their motivations, feelings and ways to solve them.

In indicator 3.3 cognitive, metacognitive and support strategies, 57.1 % (4) of the teachers are at level three (A), 28.6 % (2) at level two (M) and 14.2 % (1) at level one (B), which places the indicator at level one (B) by a few tenths, since the change of level is made on 58 % of the respondents according to the scale.

The above elements place the three dimensions at level one (B) (Table 2).

Table 2. - Results of the variable assimilation of statistical techniques in the formation of the Physical Culture professional

Indicators	Survey to students	Survey to teachers	Pedagogical test	Evaluation
Dimension 1: Reproductive assimilation level				
1.1	B	-	B	B
1.2	B	-	B	B
1.3	B	A	B	B
Dimension evaluation	B Level 1	A Level 3	B Level 1	B (Level1) Represents 90 %
Dimension 2: Productive assimilation level				
2.1	M	-	B	B
2.2	B	-	B	B
2.3	B	M	B	B
Dimension evaluation	B Level 1	M Level 2	B Level 1	B (Level l1) Represents 90 %
Dimension 3: Creative assimilation level				
3.1	B	-	B	B
3.2	B	-	B	B
3.3	B	B	B	B
Dimension evaluation	B Level 1	B Level 1	B Level 1	B (Level l1) Represents 100 %
Evaluation of Level 1 variable	**100 % of dimensions**			B (Level 1) Represents 93.3 %

The analysis of these results, together with the parameterization established to evaluate the behavior of each dimension, allow to appreciate that dimension 1 (Reproductive assimilation level), dimension 2 (Productive assimilation level) and dimension 3 (Creative assimilation level) are at level one (low), with 90 % of the frequencies calculated in the first two dimensions and 100% of the frequencies calculated in the third dimension, at level one (low).

From these results together with the parameterization established in the process to evaluate the behavior of the variable: the assimilation of statistical techniques in the formation of the Physical Culture professional, allow determining that this is at level one (B), with undesired results. The 93.3 % of the calculated frequencies demonstrate this.

Triangulation of the results obtained with the application of the instruments

For the triangulation, the procedure of calculating the indexes of the indicators in each of the instruments applied was used, based on the results shown. In this way, the index that describes the behavior of the dimensions and the variable under study is known. For Cerezal and Herrera (2010) and reaffirmed by Collazo (2016) the "index" is the value that integrates the data of the different items that make up the same indicator. The index is also used to obtain the value of a dimension from the indicators that comprise it, or the value of the variable, which results from the integration of the values or indices of its dimensions.

The general index of each indicator, of each dimension, as well as that of the variable, was calculated as established by Cerezal and Herrera (2010), based on the scales pre-established in the procedure and in the instruments applied. To analyze the results, the values of each of the levels established in the parameterization of the variable were used, and the following scale was assumed to categorize the indexes of each indicator by instrument:

Index ≤ 1 level 1 (B); index ≤ 2 level 2 (M); index ≤ 3 level 3 (A).

With these values, the weighted mean is calculated, taking as a weighting criterion the weight and importance of the opinion of each subject interviewed or observed (Cerezal and Herrera, 2010). Thus, the following weighting criterion is assumed:

- Weighting criterion (3) for the indices obtained through the student survey.
- Weighting criterion (2) for the indices obtained through the pedagogical test.
- Weighting criterion (1) for the indices obtained through the teacher survey.

Based on the weighting criteria, the indexes for each indicator, each dimension and the variable were calculated as follows:

Caption

- GI (x.x): general index of the indicator (x.x) Ss: student survey.
- GI (D.x): general index of dimension (x) Ts: teachers survey.
- GI (v): general index of the variable Pp: pedagogical test.

Calculation of the general index for each indicator

GI (1.1) = (Ee (3) +Pp (2)) /5 = (0,57(3) + 0,23(2)) /5 = (1,71 + 0,46) /5 = 2,17 /5= 0,43.
GI (1.2) = (Ee (3) + Pp (2)) /5= (0,63(3) + 0,08(2)) /5= (1,89+ 0,16) = 2,05 /5= 0,41.
GI (1.3) = (Ee (3) + Pp (2) +Ep (1)) /6= (0,61 (3) + 0,21 (2) + 0,92 (1)) /6 = (1,83+0,42+0,92) /6
= 3,17 /6 = 0,53.
GI (2.1) = (Ee (3) + Pp (2)) /5= (0,75(3) + 0,08 (2)) /5 = (2,25 +0,16) /5 = 2,41/5= 0,48.
IG (2.2) = (Ee (3) + Pp (2)) /5= (0,71(3) + 0,04(2)) /5 = (2,13 + 0,08) /5 = 2,21 /5= 0,44.
IG (2.3) = (Ee (3) + Pp (2) + Ep (1)) /6 = (0,57(3) + 0,18(2) + 0,78 (1)) /6 = (1,71 + 0,36+ 0,78) /6 = 2,85/6 = 0,47.
GI (3.1) = (Ee (3) + Pp (2)) /5 = (0,70(3) + 0,25(2)) /5= (2,10 +0,50) /5= 2,60 /5= 0,52.
GI (3.2) = (Ee (3) + Pp (2)) /5= (0,54(3) + 0,06 (2)) /5= (1,62 + 0,12) / 5= 1,74/5= 0,35.
GI (3.3) = (Ee (3) + Pp (2) + Ep (1)) /6= (0,61 (3) + 0,06 (2) + 0,71 (1)) /6= (1,83+ 0,12+ 0,71) /6 = 2,63 /6= 0,44.

Calculation of the index for each dimension

GI (D.1) = ((2) IG (1.1) + (2) IG (1.2) + (2) IG (1.3)) /6= (0,43(2) + 0,41(2) + 0,53(2)) / 6 = (0,86 + 0,82+ 1,06) /6= 2,74 /6= 0,46.
GI (D.2) = ((2) IG (2.1) + (2) IG (2.2) + (2) IG (2.3)) /6= (0,48(2) + 0,44(2) + 0,47 (2)) /6= (0,96 + 0,88 + 0,94) /6= 2,78/6= 0,46.
GI (D.3) = ((3) IG (3.1) + (3) IG (3.2) + (3) IG (3.3)) /9= (0,52 (3) + 0,35 (3) + 0,44(3)) /9= (1,56 + 0,70+ 1,32) /9= 3,58 /9= 0,40.

Calculation of the index for each variable

GI (v) = (IG (D.1) (2) + IG (D.2) (2) +IG (D.3) (3)) /7= (0,46 (2) + 0,46 (2) + 0,40 (3)) / 7= (0,92 +0,92 +1,20) / 7 = 3,04 /7= 0,43.

From the results obtained from the calculation of the general indexes of the indicators, it is possible to appreciate the effects they have, with resulting values below one, which correspond to level one (Low). Indicator 3.2 is the most affected with an index of 0.35, which reaffirms what was stated in the previous section. According to the results shown, the general index of each dimension oscillates between 0.40-0.46, which places them at level one (Low), as does the general index of the variable.

From the analysis of the results expressed in the previous paragraphs, the following are identified as the main deficiencies of the variable under study in the UCCFD "Manuel Fajardo", as described below:

- There are difficulties in the treatment provided to the subject to establish the motivations towards it, which conditions the student's willingness to assimilate it.
- There is insufficient identification, application and evaluation of some statistical techniques in correspondence with the variables to be researched from the exercise of the profession for the realization of the research work from the different disciplines of the career.
- There is no evidence of an adequate mastery of the professors on the learning strategies, nor of their potentialities to contribute to a reflective and self-regulated learning.
- The development of learning strategies by students is not shown in a coherent and adequate manner.

The applied procedure allowed concluding that the assimilation of statistical techniques in the formation of the Physical Culture and Sports professional is at a low level (undesired) and with it its applicability in the different fields of action. With the identification of the most influential elements in this problem, it is intended that teachers deploy a system of scientific, teaching and methodological work to improve the levels of assimilation of this science by students in formation.

In this sense, we agree with Cañizares, Espinosa, Guillen, Ramírez, Castillo and Herrera (2019) when they state that:

> "The quality education of the generations of each era brings with it the guarantee of a successful future, (...) all children, young people and adults in their condition as human beings have the right to benefit from an education that satisfies their

basic learning needs in the noblest and fullest meaning of the term, which includes learning to assimilate knowledge, to do, to live with others and to be". (p.25)

In this sense, it is advisable to carry out an analysis of the documentation that regulates the teaching of the subject, as well as the program of the discipline and the basic and specific general skills to be developed, as far as this content is concerned. The study allowed the researchers to reaffirm the importance of the contents addressed for the development of future professionals of Physical Culture and Sport, as well as the involvement of teachers in the development of the potentialities for the self-learning of the elements of this science by the students.

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