Original article

The assimilation of statistical techniques in the training of professionals in physical culture and sports

La asimilación de técnicas estadísticas en la formación del profesional en cultura física y deporte

A assimilação de técnicas estatísticas na formação de profissionais em cultura física e esporte

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ABSTRACT

The assimilation of statistical techniques is of great importance during the training of the Physical Culture and Sports professional, given the need for their application in scientific research work from the four graduate profiles and transversally in all disciplines of the career. The implementation of learning strategies as tools for their assimilation represents numerous benefits by virtue of forming competent professionals. The diagnosis made to 107 students of the day course and seven professors of the subject Computer Science and Data Analysis at the *Manuel Fajardo* University of Physical Culture and Sport Sciences allowed detecting, in the students, insufficiencies in the assimilation of these techniques, which prevents their correct application. Teachers show a lack of mastery of learning strategies as tools that enhance self-learning and self-regulation. The objective of the study is to design a didactic strategy that contributes to the assimilation of statistical techniques in the training of Physical Culture and Sport professionals. Among the methods used, the analytical-synthetic, modeling, structural-functional systemic, surveys and empirical frequency distribution tables were used. The theoretical evaluation of the proposal, stated by the specialists in the ATJ matrices, allowed predicting, with satisfactory criteria, the validity of the didactic strategy presented for its subsequent implementation.

Keywords: Statistical techniques; Assimilation; Learning strategies.

RESUMEN

La asimilación de las técnicas estadísticas tiene gran importancia durante la formación del profesional de Cultura Física y Deporte, dada la necesidad de su aplicación en los trabajos científicos investigativos desde los cuatro perfiles de egreso y de forma transversal en todas las disciplinas de la carrera. La implementación de estrategias de aprendizaje como herramientas para su asimilación, representa numerosos beneficios en virtud de formar profesionales competentes. El diagnóstico realizado a 107 estudiantes del curso diurno y siete profesores de la asignatura Informática y Análisis de Datos en la Universidad de Ciencias de la Cultura Física y el Deporte *Manuel Fajardo* permitió detectar, en los estudiantes, insuficiencias en la asimilación de estas técnicas lo que impide su correcta aplicación. Los profesores manifiestan falta de dominio sobre las estrategias de aprendizaje como herramientas que potencian el autoaprendizaje y la autorregulación. En el estudio, se propone como objetivo diseñar una estrategia didáctica que contribuya a la asimilación de técnicas estadísticas en la formación del profesional de Cultura Física y Deporte. Entre los métodos empleados se utilizaron el analítico-sintético, la modelación, el sistémico estructural funcional, las encuestas y las tablas de distribución empírica de frecuencia. La valoración teórica de la propuesta, declarada por los especialistas en las matrices ATJ, permitió pronosticar, con criterios satisfactorios, la validez de la estrategia didáctica presentada para su posterior puesta en práctica.

Palabras clave: Técnicas estadística; Asimilación; Estrategias de aprendizaje.

RESUMO

A assimilação de técnicas estatísticas é de grande importância durante a formação dos profissionais de Cultura Física e Desporto, dada a necessidade da sua aplicação em trabalhos de investigação científica dos quatro perfis de pós-graduação e em todas as disciplinas da carreira. A implementação de estratégias de aprendizagem como ferramentas para a sua assimilação, representa inúmeros benefícios em virtude da formação de profissionais competentes. O diagnóstico feito a 107 alunos do curso diurno e sete docentes da disciplina de Informática e Análise de Dados da Universidade Manuel Fajardo de Cultura Física e Ciências do Desporto permitiu detectar, nos alunos, insuficiências na assimilação destas técnicas, o que impede a sua correcta aplicação. Os professores mostram falta de domínio sobre as estratégias de aprendizagem como ferramentas que potencializam a autoaprendizagem e a autorregulação. O objetivo do estudo é: desenhar uma estratégia didática que contribua para a assimilação de técnicas estatísticas na formação de profissionais de Cultura Física e Esportes. Entre os métodos utilizados estão analítico-sintético, modelagem, funcional estrutural sistêmica, levantamentos e tabelas empíricas de distribuição de frequência. A avaliação teórica da proposta, declarada pelos especialistas das Matrizes ATJ, permitiu prever, com critérios satisfatórios, a validade da estratégia didática apresentada para sua posterior implementação.

Palavras-chave: Técnicas estatísticas; Assimilação; Estratégias de aprendizagem.

INTRODUCTION

In the National Plan for Economic and Social Development until 2030, analyzed in the VII Congress of the Communist Party of Cuba, one of its strategic axes is defined as: human potential, science, technology and innovation. It also declares as one of the specific objectives the generation of new knowledge in universities (Ministry of Higher Education, 2017-2021). This demonstrates the important role of scientific research and with it the university community, in promoting the scientific, technological and social development of the country.

From this point of view, statistics plays a fundamental role, since it groups a set of methods, procedures and formulas that allow collecting information to later analyze it and draw relevant conclusions from it. It can be said that it is the science of data and that its main objective is to improve the understanding of facts from the available information (Roldán, 2017). From the application of its techniques derive the detection, proposal and possible solution of certain problems through scientific research.

In this sense, the *Manuel Fajardo* University of Physical Culture and Sports Sciences (UCCFD) recognizes the importance of its social task as a training entity, and with it, the need for its students to adequately use statistics in their research projects, which will strengthen their future professional development. The implementation of the techniques provided by this science allows the identification and accurate description of the object of analysis.

In this sense, we agree with (Pérez, *et al.,* 2018) when they state that:

> "At present, in many countries, including Cuba, research on the teaching of Statistics is increasing, aimed at somehow solving the contradiction that is given, in that on the one hand, the applicability of Statistics is increasing, and on the

other hand, the preparation in this that is received through higher studies is not enough. This is due to the fact that in most university careers, subjects 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. "(p. 341)

Currently, the assimilation of statistical contents is a sensitive issue in almost all university careers. Studies reveal that in the field of Physical Culture and Sport there are few authors who have dedicated their work to this topic. Among the scholars that can be cited are: Maureira (2015), Castañeda *et al*., (2018), Pérez *et al.,* (2018), Castañeda *et al.,* (2020), Castañeda *et al.,* (2021a), Castañeda *et al.,* (2021b). Some of those referenced highlight in their work the usefulness and applicability of statistics as a research tool. Others deal with the study of the assimilation of its techniques and the factors that promote or hinder it.

From the position of Castañeda *et al.,* (2021b), it is recognized that "achieving an efficient process of assimilation of statistical techniques in the training of Physical Culture and Sport professionals in Cuba, leads to think of learning strategies as a way to achieve a plan designed with the objective of reaching a certain goal" (p. 454). In this sense, the classifications of learning strategies for the study are assumed to be those offered by Castellanos *et al.,* (2001), who classify them as learning support strategies, cognitive strategies and metacognitive strategies.

According to Hurtado *et al.,* (2018) currently, at the educational level, representative changes are being generated in the role assumed by teachers, students and parents in the art of teaching to learn. In this sense, it is a social demand that students acquire learning skills that allow them to better adapt and learn in an autonomous and self-regulated way (Maldonado *et al.,* 2019). From this point, it is the learning strategies that gain special importance in the process of the assimilation of the contents, in this case of statistical techniques. Their use is defined by decision making and the errors they generate**.** For these reasons, the objective of the study is to design a didactic strategy that contributes to the assimilation of statistical techniques in the professional training of the Physical Culture and Sport.

For the development of this research we used a group of methods, techniques and instruments consulted and transferred from the following authors Da Cunha, (2019); Addine (1998); Collazo (2016); Álvarez de Zayas (1999); Bernard (2006); Cerezal, Herrera, (2010); Pérez (2012); Maureira (2015); Ribadeneira, (2020); Rojas *et al.,* (2021); Morales *et al.,* (2021), Castañeda *et al.,* (2021a); Vides *et al.,* (2021) Jorrin, *et al.,* (2021).

MATERIALS AND METHODS

The study developed is of a descriptive exploratory type, one of its fundamental objectives is to explore problems of the social reality and the professional academic environment for the search of solutions. The research is complemented with the action-participatory research approach as another way to approach the problem and describe the events that take place in the training of the Physical Culture and Sports professional, in this case on the assimilation of statistical techniques, in order to transform it.

In its development, methods such as the following were used:

The historical-logical allowed understanding the evolution and development of the different study plans and with them of the discipline and subject where the topics of Statistics are framed in the formation of the Physical Culture and Sport professional.

The inductive-deductive to analyze from the most general elements that characterize the training of the professional and the need for the insertion of Statistics in this process, to the most representative elements that allowed defining the assimilation of statistical techniques in the training of these professionals.

The analytical-synthetic to understand the information studied and to establish the multiple relationships between the object of study and the different factors involved in the assimilation of statistical techniques, as well as for the processing of information. The modeling was used to represent the process of professional training in Physical Culture and Sport, as well as to establish the relationships and characteristics of the process of assimilation of statistical techniques and thus determine the important elements to be taken into account for the design of the strategy.

The system approach facilitated the establishment of systemic links between the theoretical references, the empirical inquiries and the didactic strategy for the assimilation of statistical techniques, as well as the creation of coordination relationships between each of the stages of the didactic strategy.

The review of documents made it possible to review the study plans, discipline and subject syllabus where the topics of Statistics are taught, course work and diploma, all of which made it possible to adopt theoretical positions related to the object of study.

The surveys were applied to the Computer Science and Data Analysis professors who systematically teach the regular day course, with the objective of determining if they enhance the assimilation of statistical techniques in the development of classes and with them self-learning and self-regulation, through actions that contribute to the formation of learning strategies. The student survey made it possible to determine insufficiencies in the assimilation of statistical techniques in the classes.

The pedagogical test was applied to the students before, in order to obtain the necessary information about their possibilities for the application of statistical techniques, in situations related to their future fields of action.

Methodological triangulation allowed cross-checking the results obtained from the application of the following methods: document review, surveys and pedagogical test. The ATJ matrices were used to predict the validity of the teaching strategy prior to its implementation, through a team of 14 evaluators, selected from a convenience sample. From the statistical-mathematical method, descriptive statistics were used to calculate absolute and relative frequencies in order to determine the representativeness of the group data obtained by dimensions and indicators.

For the diagnosis, the instruments selected for the students were a questionnaire and a pedagogical test. All of them were adjusted to the context of the study, which has the particularity of being carried out with students in the final years of the regular daytime course and with professors who teach the subject Computer Science and Data Analysis in the same type of course. Its purpose is to determine the actual state of assimilation of statistical techniques by the students and what was the teacher's influence in the process. A document review guide was also applied, aimed at analyzing Study Plan *E*, the program of the discipline Methods of Analysis and Research in Physical Culture and

the program of the subject Informatics and Data Analysis. For the theoretical assessment of the proposed didactic strategy, the ATJ matrices were selected. These are simple and useful techniques in their application, which allow modifications, meet the requirements of the research and the practice itself. Their integration made it possible to know the validity of the proposed didactic strategy through an evaluative criterion obtained from the average result of its dimensions.

The selection of these instruments was marked by the study variable: Assimilation of statistical techniques in the training of the Physical Culture and Sport professional. For the selection of the study dimensions and indicators, the classifications of learning strategies were adopted (Figure 1).

Fig. 1. - Dimensions and most representative indicators of the variable

The ordinal rating scale was used for the parameterization, which comprises three levels: level 1 (Low) represents undesired results, level 2 (Medium) represents results that are far from desired, and level 3 (High) represents desired results.

The study was carried out at the *Manuel Fajardo* University of Physical Culture and Sport Sciences of Cuba. The sampling used is of the stratified probabilistic type. The strata declared were previously conformed, since the third and fourth year of the career was assumed. To determine the sample size of each stratum, the sample size corresponding to the selected population was initially calculated.

Simple random sampling was applied within the strata to determine the students in each year that would make up the sample. A proportional sample was selected. The population of teachers selected was determined by those who teach Computer Science and Data Analysis in one or another semester. For the sample, the criterion of selecting only those teachers who systematically taught the regular daytime course was followed. A no probabilistic sampling by criterion was used for the procedure (Table 1).

Table 1. - Population and sample

Participants	Population		Sample	%	Instruments applied
Students	3rd year	379	61	16,1	Survey and Pedagogical test
	4th year	281	46	16,3	
Subtotal	660		107	16,2	
Teachers	11		7	63,6	Survey

RESULTS AND DISCUSSION

The analysis of the results was based on the relationship between the instruments applied, objectives, characteristics and indicators evaluated and the relationship between the indicators of each dimension and the items of each instrument (Table 2).

Table 2. - List of questions and indicators. Results of the calculation of the indexes of the indicators based on the weighting criterion

Instrument/ Ask	Dimension/ Indicator
	Dimension 1: Reproductive level of assimilation
Ee-5,2(a,b);Pp-1,7	1.1-Knowledge on basic concepts of Statistics.
Ee-1(a,b),7;Pp-2	1.2-Utility and applicability of statistical techniques.
Ee-4(a,b,c); Pp-1;Ep-1	1.3-Learning support strategies.
	Dimension 2: Level of productive assimilation
Ee-1c; Pp-2	2.1-Necessity of using statistical techniques.
Ee-5a;Pp-6	2.2-Identification of the applicable statistical techniques according to the context under study.
Ee-6,2(a,b); Pp-3; Ep-2,3	2.3-Cognitive and learning support strategies.
	Dimension 3: Level of creative assimilation
Ee-8; Pp-3,4	3.1-Application of statistical techniques in scientific research works.
Ee-9; Pp-5	3.2 Recognize mastery of the application of statistical techniques.
Ee-10; Pp-8; Ep-4	3.3 Cognitive, metacognitive and learning support strategies.

Legend:
Ee- Student survey.
Ep- Teacher survey.
Pp- Pedagogical test.

Establishing the relationship between the dimensions and indicators with each of the questions of the instruments applied made it possible to parameterize the variable under study. The results obtained from each questionnaire made it possible to evaluate the variable. The following is an example of one of the scales used to evaluate the dimensions. Scale to evaluate the dimensions:

- Level 3 (High): all three indicators are at level three. Two are at level three and one is at another level.

- Level 2 (Medium): all three indicators are at level two. Two are at level two and one at level three. Two are at level two and one at level one. If there is one indicator in each level.

- Level 1 (Low): if all three indicators are at this level. If two are at this level and one at any of the other levels.

The following table summarizes the evaluative results obtained by indicators, dimensions, as well as the variable under study (Table 3).

Table 3. - Evaluation of the indicators, dimensions and variable based on the frequencies calculated by instruments (initial diagnosis)

Dimension 1: Reproductive level of assimilation				
Indicators	Survey to students	Survey to teachers	Pedagogical test	Evaluation
1.1	B (low)	-	B (low)	100% B
1.2	B (low)	.	B (low)	100% B
1.3	B (low)	A (high)	B (low)	66,6% B
Evaluation	B (Level 1)	A (Level 3)	B (Level 1)	66,6% B
Dimension 2: Level of productive assimilation				
2.1	B (low)	.	B (low)	100%B
2.2	B (low)	.	B (low)	100%B
2.3	B (low)	M(medium)	B (low)	66,6%B
Evaluation	B (Level 1)	M (Level 2)	B (Level 1)	66,6%B
Dimension 3: Level of creative assimilation				
3.1	B (low)	-	B (low)	100%B
3.2	B (low)	-	B (low)	100%B
3.3	B (low)	B (low)	B (low)	100%B
Evaluation	B (Level 1)	B (Level 1)	B (Level 1)	100%B
Evaluation of variable B (Level 1) with undesired results				

Taking these results as a starting point, it can be seen that 90.4 % of the relative frequencies calculated to know the level of the indicators measured show undesired values, only indicators 1.3 and 2.3 in the survey applied to the teachers show desired or acceptable results according to the scale. This means that they propitiate, to some extent during the development of the classes, the use of cognitive and learning support strategies, but not the metacognitive strategies in charge of the regulation of the whole process. In the case of the instruments applied to the students, they showed, through each one of the indicators, the little domain they achieve on the statistical techniques

during the development of the teaching-learning process of the subject, which is projected in the weaknesses manifested for their application.

These values have a direct influence on the evaluation of the dimensions. In the case of the first two dimensions, despite having one indicator that was not evaluated at level 1, six of the seven frequencies calculated are evaluated with B (low) results. The third dimension is also evaluated with undesirable results, 100 % of the calculated frequencies confirm this. Consequently, the variable: assimilation of statistical techniques in the training of the Physical Culture and Sport professional, is evaluated at level one (low), with undesired results.

Methodological triangulation of the results obtained with the application of the instruments

For the methodological triangulation of the results, the procedure of calculating the indexes of the indicators in each of the instruments applied was used. In this way, the index that describes the behavior of the dimensions and the variable under study is known. To analyze the results, the values of each of the levels established in the parameterization of the indicators were used, and the following scale was used to categorize the indexes of each indicator by instrument according to the referenced authors:

Index ≤ 1 level 1 (Low); Index ≤ 2 level 2 (Medium); Index ≤ 3 level 3 (High).

As a result of the above procedure, the index of indicators, dimensions and the variable under study was obtained. Indicators 1.1, 1.2, 2.1, 2.2, 2.2, 2.3, and 3.2 showed the greatest affectations with values below 0.50, although both these and the rest are at level 1. The problems already mentioned and surrounding the students' poor command of the basic concepts of statistics are emphasized. Their knowledge of the usefulness, applicability and necessity of using statistical techniques in research work and their future professional development is insufficient. They show weaknesses in the implementation of learning strategies that allow them to learn how to learn these contents or to recognize their mastery of them. According to the exposed results, the general index of each dimension oscillates between the values 0.40-0.46, which places them in level 1 (Low), in the same way occurs with the general index of the variable.

In correspondence with the above, it is concluded that the variable: assimilation of statistical techniques in the training of the Physical Culture and Sport professional at the UCCFD *Manuel Fajardo*, manifests the problems detected through a group of deficiencies described below:

- Discussions of oriented tasks, related to their future profession, and the application of statistical techniques, do not always constitute spaces for reflective debates.

- The identification, application and evaluation of some statistical techniques in correspondence with the variables to be investigated from the exercise of the profession for the realization of research work from the different disciplines of the career are insufficient.

- There is no evidence of an adequate mastery by teachers of learning strategies, nor of their potential to contribute to reflective and self-regulated learning,

despite the fact that in the program of the discipline and subject they refer to educational strategies as a way to enhance self-learning.

- The development of learning strategies by students is not consistently and adequately shown.

In this sense, and with the objective of reverting this situation, it was decided to design a didactic strategy that contributes to the assimilation of statistical techniques in the training of the Physical Culture and Sports professional.

The proposed didactic strategy aims to contribute to the assimilation of statistical techniques in the training of the Physical Culture and Sport professional. Among the characteristics that make it particular are that it is systemic, focused, objective, reflective, contextualized, necessary and flexible.

The strategy consists of three stages, each of which is structured as follows: objective, actions, procedures, participants, responsible party and timing. The following table summarizes some of its most representative components (Table 4).

Table 4. - Structure of the didactic strategy for the assimilation of statistical techniques in the training of the Physical Culture professional

Components		1ʳᵃStage (Diagnosis and planning)	2ᵈᵃ Stage (Execution)	3ʳᵃStage (Evaluation)
Objectives		To design a set of activities based on the results of the diagnosis, which intervenes in the process of assimilation of statistical techniques in students, for their application in scientific research work or in different contexts of action.	Develop the activities planned in the previous stage.	Evaluate the fulfillment of the objective of the didactic strategy.
Phases	Target	**Phase I**: Diagnosis. To determine the current state of the assimilation of statistical techniques in the training of the Physical Culture professional. **Phase II**: Planning. To plan actions that contribute to the assimilation of statistical techniques in the training of Physical Culture and Sports professionals.	**Phase I**: Implementation. Execute each of the actions contemplated in the planning phase of the previous stage.	**Phase I**: Evaluation. Evaluate the fulfillment of each of the phases and actions planned for them. **Phase II**: Assessment. Systematically analyze the achievements and persistent difficulties in the assimilation of statistical techniques in order to reach conclusions.
	Target			

Among some of the planned actions are:

- Delivery of a methodological scientific workshop on the need to enhance the use of learning strategies by students. The theme of this workshop would be: Learning strategies: a way for the assimilation of statistical techniques in the training of the Physical Culture professional.

- Planning of a system of seven workshops, to be given to third and fourth year students, that contribute to the assimilation and application of statistical techniques related to their research topics and their graduation profiles.

In order to present at the workshops, students must meet two fundamental premises:

a) Have identified their research topic.
b) Know their study variables.

- Use of SPSS v.20 software as a complementary material and learning support to carry out the necessary processing or calculations.

ATJ matrices

In order to predict the validity of the proposal, the ATJ matrices were applied. These techniques ensure that it has been constituted by four matrices that determine four dimensions: feasibility, consistency, reliability and legitimacy. For their description, the conceptions given by the referenced authors are assumed:

Matrix A. Viability dimension

Feasibility is the quality of being viable (that it is likely to be carried out or to materialize thanks to its circumstances or characteristics). In the case of scientific research, this concept is related to the possibility of carrying it out in practice or not.

Four indicators were considered to evaluate the dimension:

- Relevance: oriented towards an objective of the career curriculum.

- Operationality: accesses the implementation of the actions that comprise it.

- Applicability: provides appropriate actions for the achievement of the predetermined purpose.

- Functionality: practical and useful for the performance of your actions.

Matrix B. Consistency dimension

Consistency is the quality of what is stable, coherent and does not disappear easily. It is used in different ways according to the context. In the field of research and statistics, internal consistency is used to refer to the correlation that exists between the different components of the same work or test.

For the evaluation of this dimension, the following indicators were considered:

- Coherent: facilitates the analysis of the connections between components.

- Transformative: it makes it possible to achieve changes in the context in which it intervenes.

- Formative: it favors academic training in terms of the object studied.

- Objective: it is planned, executed and controlled on a real materialization basis.

Matrix C. Reliability dimension

The term reliability is registered as reliable, dependable and probable. It also refers to stable, secure, consistent and predictable results. For reliability, structural corroboration is proposed, which consists of gathering data and information and with them establishing the links of a whole that is supported by parts of the evidence.

The indicators considered for the evaluation of the reliability dimension are as follows:

- Participation: demands and depends on the active and committed participation of those involved.

- Purpose: defines the future state to be achieved.

- Suitability: appropriate to fulfill the purpose for which it was designed.

- Logic: evidence of the knowledge to be established.

Matrix D. Legitimacy dimension

The word legitimacy is considered as: character, quality or condition of what it is legitimate. It is accepted by the scientific, philosophical, cultural or sports community, with respect to whoever constructs or defines the discourse as competent, which is in conformity with the laws and, therefore, lawful. Likewise, by extension, the adjective legitimate is often used to refer to the conformity or veracity of a matter or thing.

This dimension is evaluated by means of indicators:

- Justification: it states the reasons that make it necessary.

- Authenticity: it manifests distinctive features that characterize it.

- Utility: it provides benefits for the context in which it was applied.

- Transcendence: designed for the professional training of Physical Culture and Sports students, with possibilities of application in other contexts.

For the evaluation process of each of the indicators of the four dimensions, an assessment is made using a scale that ranges quantitatively from six to ten and qualitatively from insufficient to excellent. When averaged, it is possible to establish an evaluation criterion by dimensions as illustrated below (Table 5) and (Table 6).

Table 5. - Quantitative scale for calculating the average of the indicators and dimensions of the ATJ matrices

Scale	
Excellent	10
Very good	9
Good	8
Regular	7
Insufficient	6

Table 6. - Qualitative criteria for evaluating the indicators and dimensions of the ATJ matrices

Evaluative criteria of the dimensions	
PD > 8	Complied with
6 ≤ PD ≤ 8	Modifications required
PD < 6	Not met
PS	Average dimension

The study follows the type of convenience sampling for the selection of informants, which has the particularity that it is produced for its own reasons and that respond to the demands of the research, such as:

- Be a professor of the subjects Data Analysis or Research Methodology.

- More than five years of experience as a university professor in these specialties.

- Show willingness to participate in the study.

Fourteen specialists were selected for the application of the instrument, eight professors of Data Analysis and six professors of Research Methodology. The values obtained were represented in the figure (Figure 2).
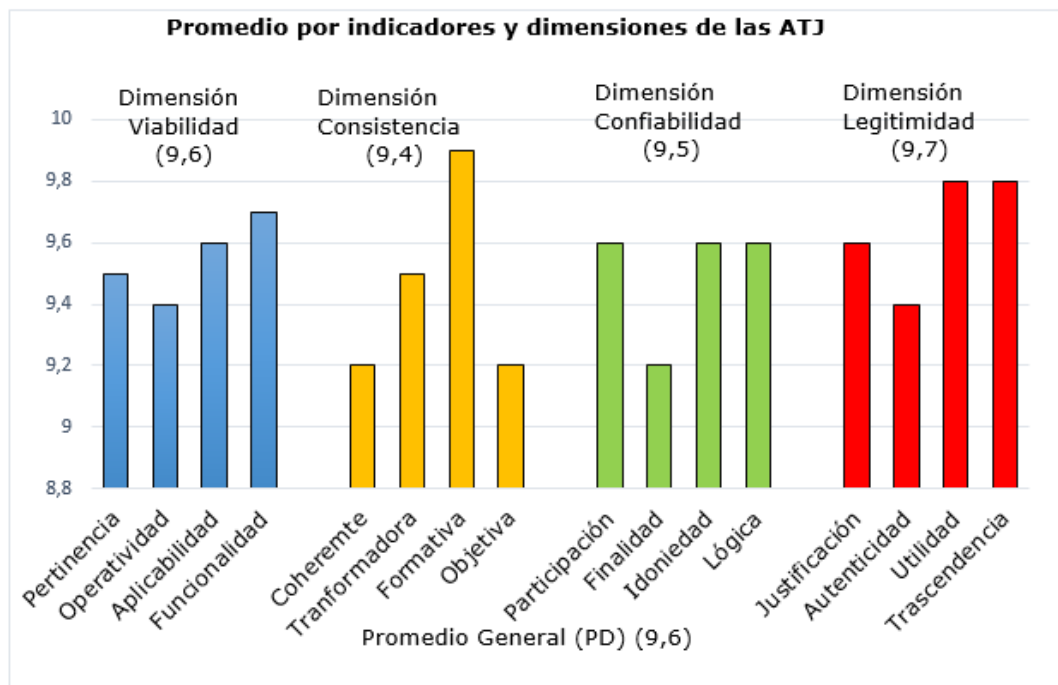

Fig. 2. - Results of the calculation by indicators and dimensions of the ATJ matrices

Note: The graph shows the average achieved, according to the criteria of the selected specialists, in the cComponents of the matrices that allow assessing the validity of the strategy.

Results of the calculation by indicators and dimensions of the ATJ matrices

It is evident that all the results obtained are within the parameters of compliance according to the scale established for the calculation of the average of the dimension (PD>8). It should be noted that the usefulness, transcendence and formative indicators are revealed with the best results, which allow us to state that the didactic strategy favors, to a great extent, academic training, will provide benefits for the context where it will be applied and it is designed with possibilities of application in other contexts.

In the same vein, mention should be made of the operational, coherent and purpose indicators, since, although their results fall within the parameters of compliance with values above nine, they were below the average values that characterized the dimensions. This suggests analyzing the access to the implementation of the actions that make up the strategy, as well as the ease of analysis of the connections between the components and the definition of the future state to be achieved. Based on these results, it is inferred that the proposed didactic strategy is viable (9.6), consistent (9.4), reliable (9.5) and legitimate (9.7). The overall average achieved was 9.6, which allows predicting its validity.

The implementation of this didactic strategy with the third and fourth year students of the regular day course and during the realization of the research work, demonstrates the transversality of the topics of statistics and its need of application in any of the disciplines of the career. In addition, it suggests giving a turn to the teaching styles used by the professors of the subject where statistics topics are taught in the training process of Physical Culture and Sports professionals. It is intended to be seen as a necessary tool for all the disciplines of the career since it is present in the academic, labor and research components. The actions that compose it are flexible and adjustable to different contexts and scenarios, which guarantee its applicability.

In this study, it is necessary to state that the student should 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, and recreation and for prophylactic and therapeutic purposes. If we do not take into account what its use contributes to the solution of problems, the results will be subject to chance and not to causality. In this sense, the proposal made, based on the results obtained from its evaluation, is considered a path to follow that enhances the learning and application of statistical techniques in the training of the Physical Culture and Sports professional.

The systematization of the theoretical foundations allowed assuming diverse conceptions in the pedagogical and didactic order, on the mechanism of assimilation of statistical techniques in the training of the Physical Culture and Sport professional. The analysis of the current state of the assimilation of statistical techniques in the training of the Physical Culture and Sports professional, revealed that there are difficulties in the treatment provided to the subject to achieve the assimilation of its contents. The didactic strategy designed distinguishes the systemic and gradual transit between the reproductive, productive and creative levels of assimilation, based on the use of learning strategies. The theoretical assessment carried out through the ATJ matrices, predicted its validity oriented to the assimilation of statistical techniques in the training of the Physical Culture and Sports professional.

As part of the discussion of this work, it has been possible to consult some works on the application of statistics to the sciences of Physical Culture, but few have approached the integration of methods and techniques to reach a result. Among the consultations, the optics of the authors related to the importance of this area of knowledge for the training of the graduate of Physical Culture have been analyzed, also specifically applied to physical education, as well as statistics applied to physical rehabilitation (Loiácono, 2017; Carralero *et al.,* 2020; Rodríguez *et al.,* 2022).

CONCLUSIONS

In conclusion, it can be stated that this study served as a basis to demonstrate the effectiveness of a didactic strategy to contribute to the assimilation of statistical techniques in the training of Physical Culture and Sport professionals. The impact of this proposal was possible due to the integration of methods, resources and techniques, among them the ATJ matrix.

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