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Limitations and challenges in knowledge management for primary Physical Education teachers

[Limitaciones y desafíos en la gestión del conocimiento de los profesores principales de Educación Física]

[Limitações e Desafios na Gestão do Conhecimento dos Professores Principais de Educação Física]

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ABSTRACT

Introduction: Knowledge management is a key process for professional performance in the educational context. In Cuban Physical Education, the third professional development program imposes new methodological demands on lead teachers, who face limitations in accessing specialized information.

Objective: To characterize the knowledge management linked to the methodological preparation of the main Physical Education teachers within the framework of the III improvement, with a systemic approach.

Methods: A descriptive and systematic study was conducted with the 14 principal teachers of the municipality of Camagüey, Cuba. Surveys, interviews, observation guides, and document analysis were used. A 40-hour professional development course was implemented. Data were analyzed using descriptive statistics (absolute and relative frequencies, mode) and 95% confidence intervals (Clopper-Pearson method), with methodological triangulation.

Results: In the initial assessment, 64.3% of teachers were at the initial development level, with only 21.4% at the advanced level. After the training intervention, the advanced level increased to 50.0%, and the initial level decreased to 14.3%. The odds ratio (OR) for reaching the advanced level after the course was 3.67 (95% CI: 0.73–18.4). Significant shortcomings were identified in the dimensions of problem identification, comparative analysis, design of alternatives, and dissemination of results.

Conclusions: Knowledge management among lead teachers presented significant limitations. The training intervention proved effective in improving professional development levels, although challenges related to sustained access to specialized resources remain. It is recommended that the experience be extended to other municipalities and that a systemic knowledge management strategy be designed.

Keywords: knowledge, knowledge management, Physical Education.

RESUMEN

Introducción: la gestión del conocimiento constituye un proceso clave para el desempeño profesional en el contexto educativo. En la Educación Física cubana, el III perfeccionamiento impone nuevas exigencias metodológicas a los profesores principales, quienes enfrentan limitaciones en el acceso a información especializada.

Objetivo: caracterizar la gestión del conocimiento vinculada a la preparación metodológica de los profesores principales de Educación Física en el marco del III perfeccionamiento, con un enfoque sistémico.

Métodos: estudio descriptivo y sistémico con los 14 profesores principales del municipio Camagüey, Cuba. Se aplicaron encuestas, entrevistas, guías de observación y análisis

documental. Se implementó un curso de superación profesional de 40 horas. Los datos se analizaron mediante estadística descriptiva (frecuencias absolutas, relativas, moda) e intervalos de confianza al 95% (método de Clopper-Pearson), con triangulación metodológica.

Resultados: en el diagnóstico inicial, el 64,3% de los profesores se ubicó en nivel inicial de desarrollo, con solo el 21,4% en nivel avanzado. Tras la intervención formativa, el nivel avanzado aumentó al 50,0% y el nivel inicial se redujo al 14,3%. La razón de probabilidades (OR) para alcanzar el nivel avanzado después del curso fue de 3,67 (IC 95%: 0,73–18,4). Se identificaron insuficiencias significativas en las dimensiones de identificación de problemas, análisis comparativo, diseño de alternativas y socialización de resultados.

Conclusiones: la gestión del conocimiento de los profesores principales presentó limitaciones importantes. La intervención formativa demostró ser efectiva para mejorar los niveles de desarrollo profesional, aunque persisten desafíos relacionados con el acceso sostenido a fuentes especializadas. Se recomienda extender la experiencia a otros municipios y diseñar una estrategia sistémica de gestión del conocimiento.

Palabras clave: conocimiento, gestión del conocimiento, Educación Física.

RESUMO

Introdução: a gestão do conhecimento constitui um processo-chave para o desempenho profissional no contexto educacional. Na Educação Física cubana, o III aperfeiçoamento impõe novas exigências metodológicas aos professores principais, que enfrentam limitações no acesso a informações especializadas. **Objetivo:** caracterizar a gestão do conhecimento vinculada à preparação metodológica dos professores principais de Educação Física no âmbito do III aperfeiçoamento, sob uma abordagem sistêmica.

Métodos: estudo descritivo e sistêmico com os 14 professores principais do município de Camagüey, Cuba. Foram aplicados questionários, entrevistas, roteiros de observação e análise documental. Implementou-se um curso de aperfeiçoamento profissional de 40 horas. Os dados foram analisados por meio de estatística descritiva (frequências

absolutas, relativas, moda) e intervalos de confiança de 95% (método de Clopper-Pearson), com triangulação metodológica.

Resultados: no diagnóstico inicial, 64,3% dos professores situavam-se no nível inicial de desenvolvimento, com apenas 21,4% no nível avançado. Após a intervenção formativa, o nível avançado aumentou para 50,0% e o nível inicial reduziu-se para 14,3%. A razão de chances (OR) para alcançar o nível avançado após o curso foi de 3,67 (IC 95%: 0,73–18,4). Foram identificadas insuficiências significativas nas dimensões de identificação de problemas, análise comparativa, elaboração de alternativas e socialização de resultados.

Conclusões: a gestão do conhecimento dos professores principais apresentou limitações importantes. A intervenção formativa demonstrou ser eficaz para melhorar os níveis de desenvolvimento profissional, embora persistam desafios relacionados ao acesso contínuo a fontes especializadas. Recomenda-se estender a experiência a outros municípios e elaborar uma estratégia sistêmica de gestão do conhecimento.

Palavras-chave: conhecimento, gestão do conhecimento, Educação Física.

INTRODUCTION

The 2030 Agenda for Sustainable Development, within the framework of the Sustainable Development Goals (SDGs) and particularly in the education sector, offers key solutions for development. Similar to the points made by Yépez, JV and Agramonte, R. de la C. (2024), it is noted that it is essential to "ensure that all learners have access to the learning opportunities they deserve."

Consequently, the World Declaration on Higher Education in the 21st Century expressed the importance of working towards "educating and training to foster lifelong learning." "The emergence of new challenges, knowledge management, community engagement, and quality accreditation are key guidelines for the sustainable development of professional advancement" (UNESCO, 1998).

When addressing the term "management," it becomes clear that its treatment varies. Authors such as Quiroga (2021) and Vento (2023) refer to management. While their observations are important, we share Font's (2014) view that "management involves the appropriation and application of knowledge in the professional activity of those involved." Other authors have written about knowledge management (Ammirato et al., 2020; Aranda, 2022; Martínez, 2023; Bautista, Mendoza, and Farías, 2024), agreeing that without knowledge management, organizations cannot function efficiently, meet their objectives with the expected quality, or improve employee performance. In this sense, Gutiérrez (2019) defines: "The constant process of identifying, finding, classifying, projecting, presenting and using in a more efficient way the business knowledge and experience accumulated in the organization, so as to improve the employee's ability to achieve competitive advantages."

Physical Education, as a pedagogical process, requires knowledge management as a crucial element in its direction. From this perspective, knowledge management unfolds dynamically, progressing from an actual level, with individual significance, to a level of potential development, as assessed by the performance of the lead Physical Education teachers. It reaches maturity through open and flexible communication with other lead teachers.

The objective guiding this research is: to characterize the knowledge management of the main Physical Education teachers within the framework of the III improvement, with a systemic approach that will allow the identification of shortcomings and the design of improvement strategies.

MATERIALS AND METHODS

The research was developed under a descriptive and systemic approach, aimed at characterizing knowledge management in the methodological preparation of the main Physical Education teachers within the framework of the III improvement.

The study focused on the intermediate level, represented by the 14 lead physical education teachers in the municipality of Camagüey, who play a key role in organizing and conducting methodological training in educational institutions. Before administering the instruments, the research objectives and procedures were explained to the lead teachers and municipal methodologists. One hundred percent of the participants expressed their willingness to collaborate and signed written informed consent, authorizing the dissemination of data for research purposes. It was verified that the lead teachers met the established requirements for participation in the study.

Training intervention

Following the initial assessment, a 40-hour professional development course was offered, distributed across eight weekly sessions of five hours each. The course covered: theoretical foundations of the third professional development level, knowledge management applied to Physical Education, design of methodological strategies, and sharing of best practices. The course was taught by the lead author, a provincial Physical Education methodologist.

Diagnostic methods:

- Structured survey: allowed the identification of methodological shortcomings derived from the lack of knowledge management on the requirements of the III improvement.
- Semi-structured interview: applied to municipal methodologists of physical education, revealed shortcomings in the theoretical knowledge of the III improvement, in the algorithm of visits to educational institutions, in the application of the rating sheet and in the terminology used.
- Observation guide: used during accompaniment visits in educational institutions of the municipality of Camagüey, showed deficiencies in the treatment of knowledge management with respect to the work algorithm.

- Documentary analysis: included visit reports, meeting minutes and institutional reports, where methodological deficiencies and a lack of depth in the records were found.

Procedure and analysis

Once the participation requirements were verified, the lead teachers were asked to provide their opinions on the dimensions and indicators described in the materials. These were evaluated using an ordinal rating scale with three levels: beginner, intermediate, and advanced. Descriptive statistics were used to quantify the developmental levels, calculating absolute (n) and relative (percentage) frequencies for each level, both at the initial assessment and after the training intervention. The mode was identified as a measure of central tendency to determine the most frequent developmental level at each point in time. The skewness of the distribution was analyzed qualitatively based on the concentration of participants in the lower or higher categories of the scale.

To estimate the precision of the proportions obtained, 95% confidence intervals (95% CI) were calculated using the Clopper-Pearson method (exact binomial distribution), suitable for small samples. To quantify the magnitude of the pre-post intervention change, a comparative table of differences in percentage points (pp) was constructed , and the odds ratio (OR) for reaching the advanced level after the course compared to the initial diagnosis was calculated , along with its respective 95% CI.

Limited access to up-to-date literature, social media, scientific events, and specialized publications were recorded as contextual variables that could influence the results. All analyses were conducted considering the descriptive and systematic nature of the study, without attempting generalizations beyond the investigated context.

Methodological triangulation

Data obtained from surveys, interviews, observations, and documents were triangulated to compare results, establish trends, and validate the findings. This procedure allowed

for the identification of patterns of inadequacy in knowledge management and in the application of the work algorithm by lead physical education teachers.

RESULTS

Of the 14 lead teachers studied, the initial diagnostic results are shown in Table 1. In the initial diagnostic, most of the lead teachers (9 out of 14, equivalent to 64.3%) were at the initial development level, with a 95% confidence interval ranging from 35.6% to 86.0%. This indicates, with a 95% confidence level, that the actual proportion of teachers at the initial level in the reference population falls within these values.

Only 3 teachers (21.4%, 95% CI: 6.5% - 46.4%) reached the advanced level, while 2 (14.3%, 95% CI: 2.5% - 40.0%) were at the intermediate level. The difference between the proportion of teachers at the initial level (64.3%) and the sum of the intermediate and advanced levels (35.7%) suggests a clearly unfavorable trend in the initial state of knowledge management.

From a descriptive statistical point of view, the initial level is the most common, and more than 60% of the sample is concentrated in this category, which shows a negatively skewed distribution (biased towards lower levels of development) (Table 1).

Table 1. – Development levels of the main Physical Education teachers (initial diagnosis)

Level of development	n	%	95% CI
Advanced	3	21.4	6.5 – 46.4
Intermediate	2	14.3	2.5 – 40.0
Initial	9	64.3	35.6 – 86.0
Total	14	100	–

95% CI = 95% confidence interval (Clopper-Pearson method).

By dimensions (initial diagnosis):

- Dimension 1 (Indicators 1, 2, 3): The main teachers identify and describe the problems related to the III improvement with difficulty, show little initiative in decision making, anticipation and design of alternatives.
- Dimension 2 (Indicators 4 and 5): They show deficiencies in analyzing and comparing specific situations in the context, and limitations in identifying problems inherent to the III improvement.
- Dimension 3 (Indicators 6, 7, 8, 9): Although they empirically distinguish the consequences of the associated problems, they are unaware of the causes and show difficulty in the search for alternatives; insecurity and distrust are evident.
- Dimension 4 (Indicators 10 and 11): They do not consider the need to socialize collectively the tasks related to the verification and evaluation in practice of the results obtained; they do not actively and consciously participate in the making of new decisions.

After the professional development course, the results shown in Table 2 were observed. A substantial improvement in the distribution of development levels was noted. The proportion of teachers at the advanced level increased from 21.4% (95% CI: 6.5%–46.4%) to 50.0% (95% CI: 23.0%–77.0%), representing an absolute increase of 28.6 percentage points. Seven out of every fourteen senior teachers (half of the sample) reached the highest development level.

The intermediate level also showed growth, increasing from 14.3% (95% CI: 2.5%–40.0%) to 35.7% (95% CI: 13.6%–64.6%), a rise of 21.4 percentage points. In contrast, the initial level declined sharply: from 64.3% (95% CI: 35.6%–86.0%) to just 14.3% (95% CI: 2.5%–40.0%). This 50% reduction in the proportion of teachers at the lowest level is the most significant change (Tables 2 and 3).

Table 2. - Development levels achieved by the main Physical Education teachers after the course taught

Level of development	n	%	95% CI
Advanced	7	50.0	23.0 - 77.0
Intermediate	5	35.7	13.6 - 64.6
Initial	2	14.3	2.5 - 40.0
Total	14	100	-

Table 3. - Pre-post comparative analysis

Indicator	Initial diagnosis	After the course	Difference
% initial level	64.3	14.3	-50.0 pp
% advanced level	21.4	50.0	+28.6 pp
% intermediate+advanced levels	35.7	85.7	+50.0 pp

pp = percentage points

The odds ratio for reaching an advanced level after the course compared to the initial assessment is 3.67 (95% CI: 0.73-18.4), indicating that lead teachers were almost four times more likely to reach the advanced level after the intervention. Although the confidence interval is wide (due to the small sample size), the observed effect is consistent with the magnitude of the changes in proportions. The mode shifted from the initial (pre) to the advanced (post) level, and 85.7% of teachers (95% CI: 57.2%-97.7%) reached at least the intermediate level, demonstrating the effectiveness of the training intervention.

Qualitative analysis by levels (post-course):

- Initial development (2 teachers, 14.3%): They recognize, describe and compare with difficulty the problems related to knowledge management inherent in the III improvement; they design alternatives with

deficiencies; they do not value the alternatives nor develop a plan to foresee the solution.

- Intermediate development (5 teachers, 35.7%): They recognize, describe and compare problems; they design and evaluate alternatives, although they develop a solution plan with some difficulty.
- Advanced development (7 teachers, 50.0%): They recognize, describe and compare problems; they design and evaluate alternatives; they develop a solution plan and socialize the solution, expressing how they arrived at it, its benefits and meanings.

DISCUSSION

The results obtained in this research coincide with the approaches of Sevim (2020), López *et al.* (2022), and Mora *et al.* (2023) regarding the relevance of knowledge as an organizational and competitive advantage. These authors maintain that organizations that effectively manage their intellectual capital achieve better levels of performance and adaptation to change.

In the Cuban educational context, specifically within the intermediate level of Physical Education, this research demonstrates that knowledge management is not only relevant but essential to meet the demands of the third phase of professional development. The statistical improvement observed—a decrease in the initial level from 64.3% to 14.3% and an increase in the advanced level from 21.4% to 50.0%—supports this assertion.

In contrast to studies conducted in contexts with greater technological and bibliographic resources, such as those cited by Ammirato *et al.* (2020) in the field of knowledge management during health crises, this study demonstrates that the mere existence of a professional development course is insufficient without sustained access to specialized information. The lack of a control group, noted as a limitation, prevents attributing sole

causality to the intervention, although the magnitude of the change (OR = 3.67 for reaching an advanced level) suggests a substantial effect.

In agreement with Oktari *et al.* (2020), who demonstrated that knowledge management is an effective strategy for addressing problems through structured processes, informed decisions, and systemic challenges, this research confirms that, even under conditions of limited resources, a planned training intervention can positively modify levels of professional development. However, limitations persist in the capacity of lead teachers to revise and reorganize plans with an emphasis on the demands of the third professional development period, suggesting that the intervention should be complemented with mechanisms for ongoing monitoring and support.

In line with Aranda (2022) and Martínez (2023), who highlight the need for management models adapted to specific contexts, the findings of this study underscore that knowledge management strategies in Physical Education are context-sensitive, considering the restrictions on access to information, the small sample of professionals in municipalities like Camagüey, and the particularities of the third Cuban professional development program. In contrast to Bautista, Mendoza, and Farías (2024), whose management model focuses on university sports with available technological infrastructure, this study proposes face-to-face training, collective socialization, and shared reflection as the cornerstones of knowledge management.

Finally, it is asserted that human resources and their capabilities are increasingly relevant to an organization's identity. As Quiñonez and Rivera (2021) point out, knowledge is the most valuable intangible asset in the knowledge economy. The results presented highlight the need to develop a knowledge management strategy inherent to the demands of the third phase of educational improvement, one that integrates not only initial training but also access to networks, systematic bibliographic updates, and the creation of communities of practice among senior faculty.

It is recommended to extend the training intervention to other municipalities in the province of Camagüey and the country, to incorporate a control group in future research to allow for more rigorous causality attribution, to guarantee broader access to specialized bibliographic sources through institutional repositories and collaboration networks, and to design a knowledge management strategy that integrates training, support, socialization, and ongoing updating.

CONCLUSIONS

The characterization process developed allows for the diagnosis of significant shortcomings in the knowledge management of the main Physical Education teachers in the municipality of Camagüey, specifically in the dimension of designing alternative solutions to problems associated with the work algorithm of the third improvement phase. These shortcomings negatively affected performance in the three remaining dimensions (problem identification, comparative analysis, and dissemination of results).

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Conflict of interest:

The authors declare no conflicts of interest.

Authors' contribution:

The authors have participated in the writing of the work and analysis of the documents.



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