Original article

Methodological conception of the professionalization of mathematics teaching for the Accounting Technician

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ABSTRACT

Mathematics plays an important role in the development of analytical and logical potential in students. Hence, the present research was proposed to design a theoretical-methodological conception of the professionalization of the content of Mathematics for the professional training of the intermediate technician in Accounting, which, after the case study carried out at the Polytechnic Institute Asdrubal Lopez Vazquez. The results obtained showed that it can contribute to a better methodological preparation of the teachers to develop the process of professionalization of the teaching of Mathematics with the students of the Accounting specialty.

Keywords: Professionalization; Mathematics teaching; Professional training; Methodological work; Theoretical-methodological conception

Introduction

From the transformations that occur in Technical and Professional Education as part of the improvement of the National Education System, as a systematic and continuous process, creates the conditions for the development of a teaching-learning process, with the quality required for each educational system. The above leads to recognize the

importance of the permanent updating of the conceptions and ways of developing methodological work, as the main alternative for the effective participation of teachers in the teaching-educational process.

However, in the review of the bibliography carried out on the professionalization of Mathematics in Technical and Vocational Education (TVE), it was found that, in a general sense, systems of exercises, teaching tasks and practical activities have been proposed in the teaching-learning process of the subject for different specialties, but there has been no deepening in the alternatives of methodological preparation of teachers to face this process. Similarly, in the case of the Accounting specialty, the largest number of researches carried out refer to Higher Education.

A preliminary research carried out to deepen this approach, showed an insufficient integration of the contents of Mathematics with those of the subjects of the technical area of the Accounting specialty, induced, among other aspects, by limitations in the preparation of Mathematics teachers to face the process of professionalization from the classroom.

Based on this situation, the objective of the present research was to design a theoretical-methodological conception for the professionalization of the mathematical content that contributes to the professional training of the Accounting Technician. This conception was corroborated through a case study, which showed its real possibilities of fulfilling the objective for which it was designed.

Development

At present, Technical and Vocational Education is responsible for the general and comprehensive training of students who opt for a career in the technical area, an independent technician or worker, reflective and committed to face the challenges that today's society imposes on them to fulfill complex labor and social tasks, in correspondence with the transformations that are taking place in the country, both economically, politically and socially.

In correspondence with these transformations, the objectives of Cuban educational policy and the demands posed to the teaching-educational process of Technical and Professional

Education, the need for continuous improvement of the teaching of Mathematics, a subject called to play a relevant role from its objectives, directed to demonstrate a scientific conception of the world and a political-ideological culture, which is materialized through the way in which its contents are argued to be interpreted in daily work, is evidenced.

In this sense, approaches such as those expressed by Cedeño, Escalona & Verdiel (2019) are shared, who state that Mathematics makes it possible to adequately form analytical and logical thinking, the demonstrative rigor of reality, the sense of accuracy and the real approximation of information, the calculation that is performed and the numerical objectivity with which one works.

Similarly, other researchers such as Fernández & Domínguez (2010), Milián, Gato, & Sánchez (2017) and Sánchez (2019), reflect on the role of Mathematics in the training of middle technicians in different specialties and make valuable observations on the subject, stating that, the skills of analysis, demonstration, calculation and mathematical procedures provide them with the necessary tools for their working and professional life as an active entity of production and services.

Likewise, the authors of this research agree with the ideas put forward by Cedeño, Escalona & Verdiel (2019), for whom mathematical calculation is increasingly necessary for professionals in the financial world at all levels, since many of the financial operations cannot be adequately interpreted or explained without the support of their quantitative behavior and without resorting to mathematical models.

These approaches reinforce the ideas put forward by Caballero & Kerton (2021), for whom the knowledge, skills and values provided by Mathematics to Accounting Technicians allow them to make decisions quickly and accurately, as well as to perform quantitative analyses, and to reform and implement the accounting dynamics of the company, elements that justify the importance and the need for Mathematics in their professional training.

In order to evaluate the level of contextualization of these general approaches to the specific conditions of the teaching of Accounting in Guantánamo, and to know the initial state of the professionalization process in the teaching of Mathematics in this specialty, a factual study was carried out, where after a deep revision of the main normative documents in force for the management and organization of the teaching-learning process

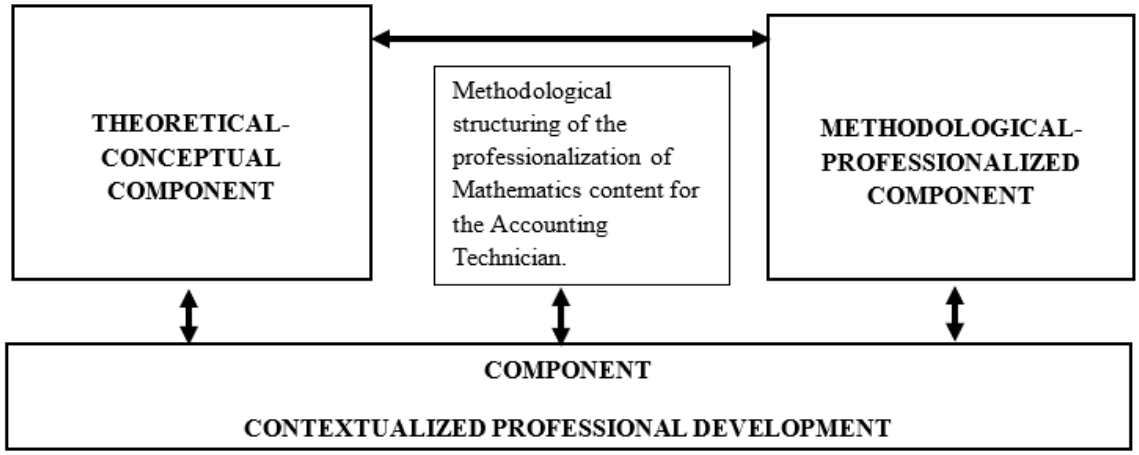
of mathematics, surveys were applied to 10 mathematics teachers and to 20 teachers of basic and specific professional training subjects of the Accounting specialty, as well as to 10 municipal and provincial methodologists of Technical and Professional Education. In addition, mathematics classes in the Accounting specialty were also monitored.

From the triangulation of the results, the following regularities were obtained:

- The normative documents recognize the need to project the development of professional skills from the general education subjects based on professionalization; however, teachers must face this process, generally, from individualized methodological preparation.
- As a result of the methodological preparation by area of knowledge, there is no deepening of interdisciplinary work in general and towards professionalization in particular, in Mathematics classes.
- Professionalization is not focused as a process, but as a moment where the proposal of mathematical exercises that make reference to terms of the specialty is used, prevailing the tendency to the traditional teaching of Mathematics contents, in fusion of the entrance to Higher Education.

Taking into account these regularities, a Theoretical-Methodological conception is designed, containing three components that are related to each other, with an internal logic, which emanates from the dependence and conditioning inherent to their own dynamics, which makes them essential, stable and necessary relationships between the respective elements that make up the theoretical-conceptual, methodological-professionalized and Contextualized Professional Improvement components, from which emerges the methodological structuring of the professionalization of the content of Mathematics for the Accounting Technician (See Graph 1).

Source: Self elaboration



Graph 1: Theoretical-methodological conception of the professionalization of the Mathematics content for the Accounting Technician.

The following is a summary of the basic aspects of this theoretical and methodological conception.

The theoretical-conceptual component was conceived to reveal the system of mathematical concepts necessary in the professional training of the intermediate technician in Accounting, from the epistemological treatment of the contents of Mathematics, therefore, it emerges from the relations established between the concepts, principles and mathematical relations, with the definitions and indicators of the subjects of the specialty of Accounting for the intermediate technician.

This theoretical-conceptual component is materialized from two directions of methodological work that complement each other: on the one hand, to relate the potentialities of the mathematical contents that can serve as support to the accounting definitions and indicators, and on the other hand, to identify the needs of mathematical skills required by the students, for the treatment to the contents of the accounting profession.

In summary, the theoretical-conceptual component is structured in a system of didactic principles, conceptualized according to the characteristics of professional pedagogy and the conditions of the teaching-learning process of Technical and Professional Education, from whose interrelation emerges the need for professionalization of the content of Mathematics for the Accounting Technician. This professionalization should be achieved from the integration of the processes of Foundation, Problematization and Systematization of the contents of the teaching of Mathematics for the intermediate technician in Accounting, which have as a transversal axis the mathematical-accounting interdisciplinarity.

The interdisciplinarity of Mathematics with Accounting is conceived as the transversal axis of the referred processes, because, in the first place, the foundation of Mathematics for the accountant must be approached from the intra and interdisciplinary relationships, since, according to Regueiferos, Medina & Briso (2021), professionalization depends largely on the relationships between basic and technical subjects, so that the mathematics teacher selects and organizes the way of defining, explaining and exemplifying the contents of his subject, according to the needs of the specialty.

This means to make a joint work of all the disciplines that the accounting technician receives, to approach the teaching from specific and non-specific contents, defining the cognitive nodes of different disciplines, in such a way that it is worked in function of the linkage of the subjects, because as a whole, all are aimed at the professional formation of the student, who needs a system of integrated professional skills, to solve the problems of the professional practice.

On the other hand, for the problematization of the teaching of mathematics, it is essential to recognize the mathematical needs of the practical exercises and activities of all the subjects of the specialty in order to link them with the treatment of mathematical-professional problems, whose arithmetic solutions must be interpreted with concepts and approach of the accounting, financial and economic sciences.

Likewise, the systematization of mathematical contents, in the case of this subject for the intermediate technician in Accounting, constitutes a permanent and cumulative process of creation of knowledge from the critical interpretation of the pedagogical experiences accumulated in this teaching, which allows recording and reconstructing, in an orderly manner, the theoretical basis of Mathematics, combined with the logic of the accounting processes that are addressed in the subjects of the specialty and starting from a systemic approach of the content.

The methodological-professionalized component expresses the procedures with a professionalized approach so that the teacher can act in correspondence with the transformation demanded not only by the subjects of the specialty, but also by the professional needs of the students for their future incorporation to production and services, giving him/her the possibility of selecting the steps to follow in the teaching process of Mathematics for their professionalization, from the modeling of a professional training process, which allows an approach between the student's modes of action and the demands of the graduate's profile.

This conception is based on professionalization, as a process of selection and methodological structuring of the mathematical contents resulting from the foundation and problematization, considered in the theoretical-methodological component, to be used in the topics, classes and other specific activities of the teaching-learning process.

Professionalization is recognized from three directions, closely interrelated with each other and with academic, work, research and educational activities, but with specific objectives that complement each other to achieve as a general objective the best professional training of the student. They are: the professionalization of the mathematics teacher in accounting, the professionalization of the mathematics content for the accountant and the professionalization of the student from mathematics.

The professionalization of the mathematics teacher in accounting is based on the recognition that, in accordance with the teacher's role in the teaching-learning process, effectiveness depends, first of all, on the personalized understanding of the meaning of the main accounting definitions and indicators and the level of dependence and interrelation of these with the contents foreseen in the program of the subject Mathematics for each subject and academic year. This must be materialized in the elaboration of the class system with the corresponding coherence to ensure the professionalization of the particularized teaching in each of the teaching activities developed with the students.

The Professionalization of Mathematics content for accountants implies the organization of the selected contents in the foundation and problematization, in correspondence with the logic of the Mathematics subject program, so that they can be approached according to the objectives of the subject. First, it is based on the elaboration of methodological indications for the teachers, so as to ensure some level of homogeneity, complementation and exchange among the teachers who participate in this process, in addition to promoting systematization and continuous improvement. Secondly, it is based on the preparation of study guides for students, so that they have a regularized orientation to carry out independent study in correspondence with the professionalization objectives conceived for each subject.

Thirdly, the professionalization of the content of Mathematics for accountants is based on methodological suggestions for the teachers of the subjects of the specialty, so that, also from their classes, they highlight the role of Mathematics for the understanding, interpretation and solution of mathematical-professional problems.

For its part, the Professionalization of the student from Mathematics is aimed at awakening interest in the subject, from the recognition of its usefulness, motivation and professional training for the specialty, from highlighting the importance of arithmetic, percentages, ratios, functions and other mathematical content for the control and evaluation of the progress of accounting, financial and economic processes of production and service entities.

It is necessary to emphasize that in the proposed theoretical-methodological conception, it is recognized that the classroom is the main scenario for the professionalization of the student, however, as this process is also developed in extra-teaching and educational activities, it is recommended to use folders, stickers, contests, murals, digital materials, etc. that can be very useful to encourage the interest of students in the profession.

Similarly, in line with the current trends of adolescents, of link with digital resources, it is recommended to prepare a set of digital messages and educational micro videos for dissemination through internal networks, some of which could be created by the centers for these purposes, even with the students' own participation in their development, as practical or complementary activities, but in all cases, they should be referenced in classes, on specific topics and used as exercise activities and / or independent study.

The third component of the proposed theoretical-methodological conception, the professionalized training for the Mathematics teacher, is based on the need for the teacher to have a starting preparation, since there is no specific training by specialties for the Mathematics teacher in Technical and Vocational Education. Therefore, it is conceived the organization of the Diploma Course "Mathematics in the professional work of the Accountant", to update the teachers with scientific, methodological and didactic elements necessary to raise the quality of the Teaching - Learning Process and the professional training of the Accounting Technician in particular, through this postgraduate course, coordinated with the University.

In this component, the self-preparation of the Mathematics teacher is recognized, with basic elements of the Accounting specialty, as the activity where the teacher self-manages his knowledge independently, creating the necessary conditions for its use during the teaching-learning process.

As a complement to this process, the Professionalized Methodological Preparation, stands as an essential process to maintain the methodological, scientific and didactic updating of

teachers, incorporating to the methodological work system, not only issues related to professionalization, foundation, problematization and other concepts discussed in this proposal, but also the development of study guides, methodological indications, solution of mathematical-professional problems, methodological structuring, etc.

The interrelation between the theoretical-conceptual, methodological-professionalized and contextualized professionalized improvement components favors the methodological structuring of the professionalization of the content of Mathematics for the Accounting Technician, which is defined as the set of didactic-methodological actions that are carried out to select, arrange, order and distribute the didactic-methodological system, as well as the methodological structure of the professionalization of the content of Mathematics for the Accounting Technician, to give a logical sequence or distribution to the system of knowledge and professionalized mathematical skills and modes of action, from a professionalized developmental teaching, in order to achieve that the teachers organize (or reorganize) internally the content of the subject from revealing the links and relationships between its elements (concepts, relationships and procedures) and the concepts and indicators of the basic and specific professional training subjects of the intermediate technician in Accounting.

To assess the feasibility of the proposed theoretical-methodological conception, a case study was conducted at the Asdrubal Lopez Vazquez Polytechnic Institute, during the 2020-2021 school year, which was developed in three stages: pre-application, application and post-application.

The first stage, pre-application, allowed preparing the conditions for the implementation of the methodological theoretical conception, through a methodological strategy, for which teachers of Mathematics and other subjects of the specialty were selected, as well as heads of departments and methodologists who participated in the case study. For this purpose, a socialization workshop was developed where the conception and characteristics of the methodological strategy were explained, managing to motivate and awaken the interest of all those selected.

In the second stage of the case study, application, the methodological strategy was put into practice, conceived through four moments. One of diagnosis, another of organization and strategic planning and a third of implementation. There was also a monitoring and evaluation stage, which began with the diagnosis and made it possible to evaluate the behavior of each of the actions and activities that made up the strategy.

The third stage of the case study, the post-implementation stage, allowed reflection, explanation and evaluation of the results of the actions and activities developed during the application and the definition of the real feasibility of the strategy and therefore of the theoretical-methodological conception. As a fundamental way, the application of instruments for the collection of information from the participating actors was used, as well as socialization workshops, where the results of the research were evaluated through group interviews.

As main results, it was obtained that 100 % of the participants in the case study, agree that the integrated methodological activities between the mathematics teachers with those of the subjects of the specialty, allowed interdisciplinarity to emerge as an essential element to achieve professionalism in the teaching of mathematics, as well as that, the foundation of the teaching of mathematics and the systematization of its contents, are essential for this professionalization to respond to the professional training of the Accounting Technician.

On the other hand, 93.3% of the participants recognize that the problematization of the teaching of mathematics, through mathematical-professional problems, ensures the link between concepts, principles and mathematical relations, with the definitions and indicators of the subjects of the Accounting specialty.

There was also total agreement that the actions and activities for professionalization contributed to improve the effectiveness of the methodological work in terms of the professional training of the future accountant, as well as the improvement actions, as a support to achieve a methodological structuring of the professionalization of the content of Mathematics for the Accounting Technician.

Conclusions

The critical reflection of the findings is fundamental, since the Quality Management Model for Early Education is considered an effective and efficient instrument in the development of educational practices and thus responds to the goals and purposes of this level. For this purpose, planning and evaluation should be articulated as central axes for

decision making by the early childhood educator in her professional role, thus giving meaning, coherence and intentionality to the pedagogical practice.

The application of the instruments and the research technique pointed out that learning experiences do not always propose an educational intentionality. This situation does not allow a clear response to the particularities of boys and girls, and to the formative nature of all pedagogical action. The lack of explicitness of intentionality violates the principles of the Kindergarten Education Curricular Bases, such as wellbeing, unity, singularity, activity, play, relationship, meaning and empowerment. Therefore, it is essential to consolidate enriched and comfortable educational environments where cognitive, affective, positive interactions and play have a central place.

It was concluded that there is a need to strengthen the competencies of the educators when delimiting the didactic action in each moment of the learning experience (beginning, development, closing). Among the scenarios for this are training sessions, monitoring of the management team and access to continuing education programs on the subject. However, an essential scenario for strengthening these competencies is the accompaniment and technical-pedagogical guidance of the early childhood educator by more experienced professionals. This, in turn, should allow her to propose experiences that integrate the cognitive and socio-affective development of boys and girls, and to select educational resources that facilitate the child's protagonism through the exploration of the materials.