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SELF-MANAGEMENT OF LEARNING IN HIGHER MATHEMATICS I IN THE DISTANCE MODALITY

AUTOGESTIÓN DEL APRENDIZAJE EN MATEMÁTICA SUPERIOR I EN LA MODALIDAD A DISTANCIA

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ABSTRACT

Distance Education has become stronger on a universal scale. In this context, the preparation of the teacher and the student to face it successfully through the self-management of learning in the subject Higher Mathematics I of the Accounting and Finance career, constitutes one of the current problems of the educational sciences, from the insufficiencies revealed in the study carried out that allowed determining the need to contribute to the self-management of learning, in the teaching-learning process of the subject Higher Mathematics I of the Accounting and Finance career in the distance modality. The research developed from the dialectical materialist conception supports the selection and application of methods, techniques and procedures, its theoretical foundation contributes to this process. A didactic alternative was designed with premises that direct the self-management of learning mediated or not by Information and Communication Technologies. The application of the expert criterion method evidenced its feasibility and its practical implementation was developed in the Municipal University Center "Enrique Rodríguez-Loeches" of Jagüey Grande belonging to the University of Matanzas by means of a quasi-experiment, which allowed verifying its scientific validity and contribution to the pedagogical practice.

Keywords: Self-management of learning; Accounting and Finance; Distance education, Higher Mathematics I.

RESUMEN

La Educación a Distancia se ha fortalecido a escala universal. En este contexto, la preparación del docente y del estudiante para afrontarlo con éxito a través de la autogestión del aprendizaje en la asignatura Matemática Superior I de la carrera de Contaduría y Finanzas, constituye uno de los problemas actuales de las ciencias de la educación, a partir de las insuficiencias. revelado en el estudio realizado que permitió determinar la necesidad de contribuir a la autogestión del aprendizaje, en el proceso de enseñanza-aprendizaje de la asignatura Matemática Superior I de la carrera de Contaduría y Finanzas en la modalidad a distancia. La investigación desarrollada desde la concepción materialista dialéctica sustenta en la selección y aplicación de métodos, técnicas y procedimientos, su fundamentación teórica contribuye a este proceso. Se diseñó una alternativa didáctica con premisas que orientan la autogestión del aprendizaje mediado o no por las Tecnologías de la Información y las Comunicaciones. La aplicación del método del criterio experto

evidenció su viabilidad y su implementación práctica se desarrolló en el Centro Universitario Municipal "Enrique Rodríguez-Loeches" de Jagüey Grande perteneciente a la Universidad de Matanzas mediante un cuasiexperimento, que permitió comprobar su validez científica. y contribución a la práctica pedagógica

Palabras clave: Autogestión de aprendizaje, contabilidad y finanzas, educación de distancia,Matemática I Superior.

INTRODUCTION

The university, in charge of training professionals, resizes the way of teaching in each of its study modalities, with greater emphasis on the distance modality since distance education gains more strength in learning activities in the 21st century (Rodríguez et al., 2020; Medina et al. 2022; Gaidelys, 2023) due to its direct relationship with the new possibilities generated by access to information and communication technologies (ICT) (Martínez et al. 2021; Delgado et al. 2022), which allow greater access to education and in which self-management of learning for teacher and student preparation are decisive (Zae et al. 2020; Farray et al., 2023). However, the availability of computers for educational purposes (Ríos, 2021) is not equal for all people enrolled in Higher Education specifically in the distance modality.

Cuba is not exempt from the situation described above, despite the enormous efforts of the State in the informatization of society and its digital transformation. Therefore, it is necessary to deepen on the design of the teaching-learning process (PEA) in the distance modality with the means to be used, the availability of access and use of technology in all sectors of society (digital divide), for which alternatives should be sought to help overcome these scenarios and stakeholders have access to it, which will positively affect the self-management of learning. In this way, EaD will favor education for all and without exception (Quintela et al. 2023) by contributing to goal four of the Sustainable Development Agenda until 2050, when it refers to "Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all" (p.45).

Based on the Strategic Objectives of 2022-2026 and the Guidelines of the Economic and Social Policy of the Party and the Revolution for the period 2021-2026 approved at the VIII Congress of the PCC (Guidelines: 91, 92, 94 and 95); Cuba approves and puts into practice its model for distance education in the Ministry of Higher Education and its attached centers and specifies which careers are studied in the distance modality, as is the case of Accounting and Finance in the Enrique Rodríguez-Loeches Municipal University Center (CUM) of Jagüey Grande of the University of Matanzas, which has within its disciplines: Mathematical Economic Methods and in it, the subject Higher Mathematics I.

The study conducted by the authors with surveys and interviews with students and teachers in municipalities of the province of Matanzas (Quintela et al., 2023a) recognizes Higher Mathematics I as one of the most complex subjects to study without the physical presence of the teacher and independently; due to the level of abstraction, logical reasoning and development of skills required in the performance of their tasks, which is confirmed by Gutiérrez & Jaime (2021) when they propose three challenges in the learning of mathematics for students: technology, attention to students and teacher training to assist them in their learning process and in the development of materials that offer access to the concepts.

This statement was investigated in the research process and the teachers express their deficient theoretical-methodological preparation to face the distance modality in this subject and insufficient or null availability of technological resources; therefore, besides influencing the preparation of the teachers, it will be necessary to investigate the use of other ways to minimize the described situation, which in the Model of Distance Education of Cuban Higher Education is included as one of the characteristics of the teachers.

The review of the international bibliography both books, theses and articles (Faustino et al., 2019; González & Duvergel, 2020; Ríos, 2021; Naveira & González, 2022; Durán et al., 2023; Villamar & Navarrete, 2023) allowed estimating that there are few that address the teaching of Mathematics in Higher Education and study a specific content; but not from the conception of its PEA in the distance modality that has distinctive particularities and where self-management of learning unlike other study modality is more determinant due to the little or no physical presence of the teacher. The contribution of a set of fundamental elements to keep in mind during the process is appreciated; but a system of foundations, principles and laws that describe the development of the PEA of Higher Mathematics in this modality is not formulated and the previous elements for the self-management of learning in this modality are not studied.

Research on self-management of learning with the use of ICT in Mathematics does not address the whole process of self-management of learning in Mathematics and the necessary preparation of teachers and students to face it. It is therefore essential to search for more precise theoretical foundations in this modality in the PEA of Higher Mathematics and also the analysis of new didactic

resources that promote "learning to learn Mathematics", the development of teaching tasks that lead to independent student activity and facilitate their learning process, for which it is important to take into account the student's relationship with the object of learning and give the teacher a guiding and mediating role.

Based on the theoretical background, it is necessary to prepare the teacher. It is required a didactic-methodological and scientific-methodological work, which is intended to the characteristics of the modality of study and the environment of the university center, as well as a previous preparation of the student to self-manage his learning. The bibliographic exploration carried out, as well as the interviews to the directors and teachers of different Centers of Higher Education (CES) point to the scarce presence of researches that contribute to the elements previously stated.

Bearing in mind the restrictions to which Cuba is subjected and the existence of a general model of EaD, a study that contributes to solve the deficiencies detected is urgently needed: difficulties in learning the contents of the subject Higher Mathematics I from the basic knowledge of previous levels; The study also shows a limited integration of the contents of the subject due to a fragmented study of the subject and the presentation of decontextualized mathematical tasks that are neither motivating nor meaningful for the students, weak development of skills in the use of technology to face the contents of the subject Higher Mathematics I and poor development of skills for self-management of learning, difficulties in planning and organizing the PEA in this study modality for the discipline of Mathematics in terms of the selection of teaching methods, The solution of complex tasks is carried out by the teacher in the guide or in the consultation activities without stopping to stimulate the students to carry them out independently, the control and evaluation is almost null, the whole process was observed to be very limited so that the levels of help are scarce and sometimes lead to failure, difficulties in the elaboration of support materials that allow greater self-management of learning on the part of the students.

From the referred scenario and the reality linked to the need to ensure self-management of learning to aspire to a quality professional performance, a scientific contradiction is shown between what Higher Education aspires in transforming the necessary preparation of teachers and students for self-management of learning in the distance mode in the accounting and finance career and the limited methodological didactic procedure for self-management of learning in the PEA of Higher Mathematics in this mode, which contributes to the training of professionals in the Accounting and Finance career at the University of Matanzas. In view of this argument, the following scientific problem is posed: How to contribute to the self-management of learning in the teaching-learning process of the subject Higher Mathematics I of the Accounting and Finance career in the distance modality? The objective of the research is: to design a didactic alternative that contributes to the self-management of learning in the teaching-learning process of Higher Mathematics I in Accounting and Finance in the distance mode. For this purpose, the following variable is defined and studied as a variable in the research: self-management of learning in the teaching-learning process of Higher Mathematics I in Accounting and Finance in the distance mode.

METODOLOGY

The dialectical materialist method as a general methodology for the analysis and interpretation of social problems and guide for the transformation of society constituted the basis for the research procedure. Theoretical and empirical methods and techniques were used. Among the theoretical ones, the following were used: analysis and synthesis for the process of bibliographic review and normative documents (Study Plan E and Resolution No. 47/22); the historical and empirical method; the historical and empirical method for the analysis and interpretation of the social problems and as a guide for the transformation of society. 47/22); the historical-logical method allowed the study of the trends of the essential moments through which blended learning has gone through, from the assessment of its background and modes of manifestation of the problem studied: needs of preparation and development of skills of teachers and students to assume the PEA of Higher Mathematics I in this way; the inductive-deductive method is used for the foundation of the research problem, its proposed solution and its implementation.

Among the empirical methods to ascertain and substantiate the research problem as well as to evaluate and characterize the behavior of the dimensions that make up the research variable were used:

Surveys to students to obtain data on their preparation needs in the subject Higher Mathematics I and to verify the mastery of blended learning in the PEA. The interview to teachers was directed to know the procedures they use to contribute to the self-management of learning and the methods used to teach Higher Mathematics I. In the analysis of documents to study the real and desired situation of the variable, the program of the discipline in the Study Plan E, and Resolution 47/22, the teachers' class preparations, the materials elaborated, the documents in interactive platforms, the students' evaluations,

the methodological work plans, the teachers' evaluations, among others, were used.

In the case of teachers, we worked with the CUMs of the province where the course is taught in blended learning conditions. Regarding the previous experience of teachers in the direction of this process in the distance modality, it was possible to specify that 50% have taught it in this modality once or never, which constitutes a weakness in the diagnosed population if it is taken into account that the experience contributes to the improvement and deepening of the direction of the teaching-learning process.

A simple random sample of 168 students was selected from a population of 280 students. An error of 5% and a reliability of 95% were used, the expression used for the calculation of the sample size is. (1)

$$n = \frac{N Z^2_{\propto_{\overline{2}}} P(1-p)}{e^2 (N-1) + Z^2_{\propto/2} P(1-p)} \quad (1)$$

Where:

n: sample size

N: population size: 280

(1- 100%: reliability: 95%)

Z α/2: value of the normal for a given reliability: 1.96

P: expected proportion of the percentage to be measured: 0.5

e: error: 5%.

Fourteen consultations were observed in the subject differential calculus and four methodological activities, in addition, the preparation of the subject Higher Mathematics I in each university center was reviewed prior to the development of the teaching-learning process of the subject in which the consultations were visited.

The interview was applied to the directors of the municipal university centers and to the department heads, as well as to those responsible for the subject Mathematics in the municipal university centers. All of them are graduates in education with more than 20 years of teaching experience.

Two surveys were applied, the first one to 100% of the teachers, where 62.5% are graduates in Education in the specialty of Mathematics and 37.5% are university graduates in engineering careers. The second survey was applied to 168 first year students of Accounting and Finance in the distance modality of the University of Matanzas.

For the analysis of documents, the following were taken into consideration: Study Plan E of the Accounting and Finance course for the blended course, base curriculum, program of the subject Higher Mathematics I plan E for the course by meeting, lesson plans of each of the teachers who gave consultations in the first year of the Accounting and Finance course in the distance modality, Resolution 47/2022, particularly in relation to blended learning and the distance education modality.

As a pedagogical test, the questions on applications of differential calculus to economics of the final exams of the second year of Accounting and Finance in which the diagnosis was made were considered.

In the statistical processing, the median of the data obtained with the instruments applied was calculated. In the case of the student survey, the Kolmogorov-Smirnov goodness-of-fit statistical test was applied with a significance level of 1%, which allowed the determination of trends in the students' opinions.

Expert judgment was used to theoretically assess the proposed alternative and the evaluation of the planned actions.

RESULTS AND DISCUSION

In the educational field there are several ideas and definitions related to the term alternative and they are mostly classified as pedagogical, methodological or didactic. Among the definitions of didactic alternative analyzed are: Ballester et al. (2018) and Finalé et al.2021, all agree in stating that a didactic alternative is one more option to develop a certain ADP. These definitions within the didactic context provide fundamental aspects that characterize a didactic alternative; however, it is considered necessary to make reference to the fact that this other option must have its own requirements, must contemplate which are its distinctive aspects and how to be inserted in the existing curriculum.

The previous aspects constituted referents to assume the definition of Cuétara (2016) when he expresses that: "It is a grounded variant, applicable in a flexible and contextualized way, with its own demands for the improvement of the teaching-learning process" (p.61). This definition admits the improvement of self-management of learning in the PEA of Higher Mathematics I in the Accounting and Finance career in the distance modality, since it allows contextualizing the PEA in the Higher Education Centers.

For the elaboration of the didactic alternative, the current demands of Cuban society were considered. The social function of mathematical content is revealed from the close relationship between science-technology-society and the link between higher education and the community. The demands of Higher Education in the distance

modality on a pedagogical, scientific and technological basis, demand the integral formation of the personality of the young person, the young adult and the adult in their way of thinking and acting in different contexts from the development of a general culture. Mathematics provides tools to solve problems of the environment, thus enabling students to enrich their knowledge and, at the same time, to acquire an active attitude in the resolution of problems and situations of the profession.

Accordingly, the research variable (self-management of learning in the PEA in the subject Higher Mathematics I of Accounting and Finance in the distance mode) was defined as an integral, organized and correctly oriented process, essentially asynchronous, with or without the use of information and communication technologies, which favors the active participation of the student in the teaching-learning process, which requires a high degree of interest, commitment and responsibility to respond to the demands of the development of skills to solve professional problems of the accountant in Higher Mathematics I. (Quintela et al. 2023)

An integral process because it prepares the student to know, to do, to be and to live together; planned, organized and guided by both the teacher and the student, since the latter, in order to self-manage learning, must plan, organize and guide his learning according to his possibilities and capacities in an active way with or without the use of ICT; asynchronous because it is produced essentially without the physical presence of the teacher, where the student is responsible for his training with the teacher's accompaniment, where his interest and commitment to learn the contents that will help him to solve the problems of his profession must predominate.

For its diagnosis and evaluation, it was operationalized in three dimensions with their respective indicators: 1. Performance of the course teacher, 2. The reflection of these is in the elaboration of the designed alternative, transversalizes its process and allows its evaluation during its implementation.

For the didactic alternative, the didactic principles supported by the General Didactics, the Didactics of Mathematics and those proposed in the distance education model of the Cuban Ministry of Higher Education are proposed:

- The principle of flexibility (the diagnosis of the context and the preparation of the teacher and student for the demands of the PEA of Higher Mathematics I in the distance modality plays an important role, as well as the structuring of the PEA towards the active search of knowledge by the student. It allows adjustments to be made at any stage of its application, both:
- from the curricular point of view (to favor the development of the subjects involved among the different contexts, rhythms, styles and strategies for the appropriation of knowledge. Individualization or differentiation, socialization, intuition, creativity, autonomy are favored).
- from the technological point of view (selection of educational resources, variety of storage formats, and in the distribution of educational resources).
- from the organizational point of view (according to the institutional practices and to the requirements in terms of regulations)
- from the spatial-temporal (according to the conditions and possibilities of teachers and students; which favors the appropriation and responsibility with the training process).
- The principle of interaction and communication (with a permanent orientation of the motivation towards the study activity and its constancy for the self-management of learning, the stimulation towards the formation of concepts and the development of the logical processes of thought to contribute to the self-management of learning. The existence of a guided didactic conversation, oriented towards learning (virtual or face-to-face), with a subject-subject interaction, asynchronous or synchronous, should be encouraged. This principle should promote active, collaborative, individualized learning with responsibility and commitment to the training process).
- The principle of convergence and technological integration (enables access to educational resources and learning activities from different devices: radio, television, computer, mobile devices, among others, depending on their conditions).

The diagnosis of students' characteristics in terms of motivations, interests, knowledge, skills, abilities, habits, capacities and other psychological formations of the personality; learning through self-management, selection of teaching content, the results of the development of science; the use of productive teaching-learning methods such as: problémica exposure, partial search and the investigative; the relationship between theory and practice; the conscious assimilation of the content; the student as an active subject in his own learning; the systemic character of the PEA and therefore the necessary relationship between its didactic components, the need to teach strategies for learning to learn Mathematics among others. The importance that more and more importance is given to the PEA of Mathematical science as a tool to solve problems of life and in particular of their profession was valued. Its

use as a tool in professional activities of all kinds is revealing since the very development of Mathematics as a science.

In short, Didactics of Mathematics provides the foundations associated with the integral formation of the personality and the peculiarities of the didactic components for this subject. Likewise, all those underlying the general methodological approach of the subject are considered, in a distinctive way, the one related to developmental teaching, the strengthening of conceptual understanding, the research attitude against the preference of reducing knowledge to technique; the ways of working and thinking typical of Mathematics such as logical reasoning, the linking of Mathematics with real world situations concerning the students' field of interest; the use of computer resources, not only to perform calculations, but also as a didactic resource that makes the self-management of learning feasible.

Self-management of the learning of mathematical content is the main idea assumed in the alternative. The aim is to encourage students to consciously and autonomously appropriate theoretical generalizations in the theory-practice relationship in order to operate concepts, establish links and relationships, which will favor the development of reflective thinking and make learning more meaningful for them. Self-management of learning also allows students to be consciously involved in their learning, the use of ICT, self-evaluation and continuous feedback during the process.

The didactic alternative and its components

The didactic alternative is composed of: objective, didactic requirements, implementation and evaluation. Its objective is to contribute to the self-management of learning in the PEA of Higher Mathematics I in the Accounting and Finance career in the distance modality, so that students can learn to learn Mathematics to solve economic problems through the applications of the subject. Based on the results of the systematization of the theoretical-methodological assumptions and the diagnosis of the state of the variable, the didactic alternative designed as a solution to the scientific problem adds a foundation that takes the form of didactic requirements for teachers and students and the didactic components.

Its didactic demands are constituted by the didactic components that should contribute to the self-management of learning in Higher Mathematics I in the Accounting and Finance career in this modality.

- The objectives should be oriented towards:
- The importance of self-management of the mathematical content, for the solution of economic problems of the profession, as well as the valuation of the main contributions to mathematical science of outstanding personalities.
- The resolution of problems that imply the application of the contents of the subject.
- The link between Mathematics and life, based on the topics of greatest interest to students.
- Encourage self-management of learning, the development of learning strategies, independent study and the use of computer resources.
- The contents should cover:
- Knowledge system: Relations and functions, properties and graphical representation, Limit and continuity, differential calculus.
- System of skills and habits: Finding and graphing the equation of a straight line by given forms and data. Find the polar coordinates given a point, the distance between two points, between two straight lines, find the intersection points of a pair of curve. Plot graphs of inequalities, regions for inequalities or systems of inequalities. Define and identify a relation as a subset of ordered pairs of real numbers. Define concept of function. Identify the different functions, their properties, behavior and graphical representation. Solve exercises. Define the limit of a function at a point, its properties and calculation. Demonstrate the continuity or not of a function at a point and in an interval. Interpret geometrically the concept of derivative, derive functions with the rules of derivation and the table of immediate derivatives. Solve indeterminate forms of the limit with the derivatives. Solve economic problems through differential calculus (optimization, marginal function, elasticity of demand) and its economic interpretation that are proposed to be taught in Higher Mathematics I to eliminate the fragmentation of the content.

The habits seen as a way of knowing how to do are: planning the actions to be performed, working in an organized manner, regulating and monitoring actions to detect possible errors, searching for topics in different sources and working in a cooperative manner.

- System of experiences of creative activity. In their work, students should achieve intrinsic motivation to learn to learn Mathematics and establish cognitive independence, the development of logical reasoning. They should develop methods of cognitive activity for problem solving, particularly for economic problems of the profession with the application of the contents of the subject. Also important within these methods are heuristic procedures (search for relationships and

dependencies, analogy, reduction to an already known problem, among others) and cognitive, metacognitive and auxiliary learning strategies.

- System of relationships with the world. Students must show independence, responsibility, perseverance, reflective character, critical spirit, creativity, solidarity, respect for the judgment of others, confidence in their own possibilities and ability to work independently and collectively. To develop interest in the sciences, particularly Mathematics, as well as to strengthen philosophical, political, moral, ideological convictions related to Mathematics and in particular to Higher Mathematics I.
- The methods should correspond to those of a developmental teaching, based on problems (problem-based exposition, partial research and research), the link with practice, cooperative work and the link with other subjects.
- For the means, the proposal consists of the use of the texts proposed in the study program, other complementary and support materials elaborated by teachers such as didactic guides, the use of computer resources in moodle platform and connectivity through cell phones, tablets and computers seen with heuristic purposes, which favor motivation and self-management.

The implementation of the alternative places at its center the self-management of learning in the PEA of Higher Mathematics I in the Accounting and Finance career in the distance modality. The implementation includes a systematic and integral diagnosis of the context, the methodological preparation of teachers and the performance of both teachers and students. The teachers' performance is marked by a structuring of the didactic components that promotes self-management of learning with a developmental didactic procedure that emphasizes the use of learning strategies that favor the assimilation and fixation of the new subject. The student's performance is determined by the self-management of learning based on the use of learning strategies (cognitive, metacognitive and auxiliary) that require them to reflect, ask questions, work cooperatively and develop personality qualities such as industriousness, perseverance, responsibility and creativity.

Evaluation is considered a continuous process throughout the implementation. This component will provide particular feedback on the Mathematics PEA itself, the methodological preparation of teachers and the diagnosis of the context; it will also make it possible to assess the extent to which the objectives proposed for the process have been met through the application of the didactic alternative.

The didactic alternative is structured as a system. Its dynamics results from the functional interrelationships among its components and essential elements. The interrelations are summarized in the essential relation of the developmental character of the performance of the teacher of the course and the students; the functional relations, in function of the self-management of learning in Higher Mathematics I. From the integral progress of the didactic alternative, an essential regularity emerges: the relationship of dialectic character between the PEA of Higher Mathematics I and the students' learning in terms of knowledge and skills, development of their logical reasoning and personality qualities that allow them to self-manage their learning and solve economic problems of the profession through the applications of the subject.

The constant transformations that occur in the Mathematics PEA, the didactic alternative takes them into account, it is flexible to adapt to new conditions. They constitute a new starting point to redesign it, the level of development reached by the actors and the conditions of the context at a given moment, which is an expression of the integrity of the system that is renewed from the constant feedback and the interrelations with the context.

Implementation of the didactic alternative

Diagnosis of the context: includes the diagnosis of students and teachers regarding the relationship of both with the content, of them with each other and with the environment that surrounds them from the actions that are carried out for this purpose in the university centers. This first part of the implementation of the alternative implies diagnosing the situation in the university center, home, community or work centers, in terms of the students' educational problems (interest in studying) and knowing the topics that most arouse their interest. It is a question of starting from the conditions of the context because, as it has been stated, it is not possible to conceive a PEA and in particular of Higher Mathematics I without considering the main existing realities in the environment that surrounds students and teachers, for example: at least in the territory where the CUM of Jagüey Grande is located, there is no laboratory with Internet connection possibilities in the institution itself, all students do not have the necessary economic liquidity to systematically maintain connectivity, among other necessary conditions to carry out the PEA of Higher Mathematics I in the distance modality.

Methodological preparation of teachers: the proposed actions (methodological teaching meeting, instructive methodological class and methodological teaching workshop) are aimed at the preparation of teachers regarding the contents of Higher Mathematics I, mainly those referring to the knowledge system and the system of skills and habits. It is also intended that they acquire a preparation referred to the didactic-methodological requirements for the PEA of Higher Mathematics I in the distance modality.

These actions should be started in the previous period in which the teachers will face the PEA of Higher Mathematics I; they will be directed by the person in charge of the subject or another teacher designated from their preparation and will take place mainly within the framework of the preparation of the subject.

It is proposed to carry out at the end of the first period a methodological teaching workshop summarizing the work developed. The methodological teaching meeting, the instructive methodological class and the intermediate workshops, prior to the integrative workshop, will prepare the teacher to assume the challenge of the implementation of the alternative. In response to the suggestions made by the experts, a preparation course for teachers is proposed, which can be adjusted according to the conditions of each context (Villalonga et al. 2023). It is also proposed to include in the subject the applications to economics, because they are conceived according to the program for the subject Higher Mathematics II.

Two workshops are proposed with the aim of exchanging and discussing different aspects related to the PEA of Higher Mathematics I in this study modality and, within this, to emphasize its application to economics based on the knowledge, experience and self-preparation of the teachers who teach it. For the workshops we propose topics related to:

- Methodological teaching workshop I: To discuss about the precisions for the didactic components offered. The self-management of learning in the PEA of Higher Mathematics I, in particular with regard to learning strategies. Consultation. The use of didactic guides.
- Methodological teaching workshop II: To discuss developmental teaching in Mathematics, teaching methods, consultation and didactic treatment of applications in economics.

Methodological teaching meetings are planned with the objective of analyzing, discussing and making decisions on the didactic components in order to concretize the methodological analysis of the subtopics related to the PEA of Higher Mathematics I.

- Methodological teaching meeting I. Objective: analysis, discussion and decision making on the development of the objectives, contents, methods, means in the consultation system for economic applications.
- Methodological teaching meeting II. Objective: analysis, debate and decision making about the evaluation and tasks for each topic.

It is suggested to carry out an instructive methodological class on how to develop a consultation of the subject Higher Mathematics I supported in the self-management of learning based on the requirements offered in the didactic alternative, where the student will trace learning strategies from the content for independent study.

Demonstrative methodological classes and open classes will be developed after the beginning of the period to check from the results of other methodological activities carried out, how the general heuristic program is applied to solve problems, in which the student appropriates the algorithm and draws learning strategies, where the teacher achieves an enriched educational environment and that students build their knowledge on their own during the independent study. From his role, the teacher is an organizer and guide, he must help to learn how to learn, in this case Higher Mathematics. His/her influence on the students' work should be such as to promote independence, creativity and self-management of learning.

Performance of the course teacher and of the students

The performance of the course teacher is closely related to the didactic procedure, which for the planning, organization, regulation, control and evaluation of the PEA is conditioned by the didactic demands of the designed alternative. In their performance, students must show that they are capable of self-managing their learning, of designing learning strategies, of working cooperatively and showing positive attitudes towards learning and with the demands of the distance education model in Cuba.

The consultation system is planned according to what is established in Res 47/22 in its article 293: "Its frequency depends on the individual and group needs of the students, that the teacher can cite the students who in his opinion require it" (p. 78) in any modality of study and this didactic alternative requires at least two or three hours per month depending on the individual and group needs of the students. In addition to the content, the system of consultations should include at least 5 minutes in each one to address issues related to the use of learning support media such as technologies in the broad sense of the word and to prepare students for self-management of learning, since this subject is one of the first to be chosen, as it is a precedent for the rest of the subjects and disciplines of the curriculum.

When guiding the assignments, students should be made aware of the role of self-management of learning in their formation as future professionals and in the resolution of problems related to their profession and life. The teacher should raise questions, offer impulses, demand that the different ways of resolution be explained in order to value the best ones, emphasize the heuristic and metacognitive resources that have been useful, while attending to individual differences and organizing, if possible,

collaborative relationships among students, but always trying to get them to overcome their difficulties through their own efforts. Students should be accustomed to take notes about what they found useful, their mistakes, where they should be careful on future occasions, among other aspects that can help in their learning. It is necessary to establish relationships between the new knowledge with what the students already have, with their personal experiences and with their affective-motivational environment, which requires the integration of cognitive, affective and evaluative elements. The formation of feelings, attitudes and values should not be overlooked, which become evident from the assessment they make of the influences that the mathematical content has on the improvement of their own professional, moral and social conduct.

Motivation for learning mathematical contents applied to the profession must be achieved, which requires a positive self-esteem to obtain favorable results in the process and indeed perseverance to solve the problems posed despite the failures and obstacles that may arise. When working with economic problems, the teacher must imbue the students with the methodology for solving problems (general heuristic program) and relate this to the problems of the profession. In the optimization problems, algorithms will be used (Algorithmic Succession of Indications) and that the students appropriate it for the calculation of the 1st and 2nd derivative, its zeros and the analysis to obtain a maximum or a minimum. It is proposed not to make the analysis only to obtain one of them but the complete analysis independently of what the problem asks for. In fact, tasks should be proposed in which students are not instructed to obtain one of them, but to calculate all the extremes and their economic significance.

In the consultations to clarify doubts of the independent study, the realization of assessments, the arrival to conclusions and the decision making on what to do to solve the problems faced and influence the analysis and interpretation of the results should be favored. The above contributes to the highest aspiration that students formulate and solve problems involving the solution of situations in their environment so that they can communicate their inferences and assessments about facts, phenomena and processes of an economic-labor, scientific-technological and environmental nature (Ballester et al. 2018).

For evaluation, students should be given a series of indicators such as those indicated in the didactic requirements. Self-assessment should be encouraged throughout the entire PEA. In order for students to face the final exams in better conditions, the resolution of didactic guides created by the teachers and their evaluation in a face-to-face session, where they can explain how they solved each activity, ask them conceptual questions or ask them to explain what changes would be produced in the solution of an exercise if some aspect involved in the problem were transformed.

A combination of individual and group work should be encouraged in the consultations as forms of organization, which are generally important moments in learning. It is recommended to form heterogeneous subgroups of students that maintain a cooperative work during the whole period, so that they can offer and receive help to each other, according to their characteristics. Tasks involving the search for, processing and communication of information or the exchange of knowledge and that favor the development of creativity should benefit the group exchange.

The teacher must act in a way that integrates and systematizes his social and professional task as mediator between knowledge and the integral development of the student's personality, in relation to the context, helping the motivation to learn to learn Higher Mathematics I, that the retention of contents is active, reflective, creative and regulated, that they show skills to solve economic problems of the profession and the development of convictions and qualities of the personality expressed in their attitudes.

The evaluation of the didactic alternative is conceived as a systematic process, which is carried out throughout the implementation. The fulfillment of the proposed objective is verified through the assessment of the actions in each of the other components that integrate it and of the results of the PEA of Higher Mathematics I supported in the self-management of learning. The development of methodological teaching workshops during and at the end of the implementation of the didactic alternative depends on this component, which provide feedback on the preparation of teachers, the development of the PEA and student learning.

Consultation with experts confirmed the theoretical validity of the didactic alternative. They offered suggestions that enriched the final elaboration of the didactic alternative and evaluated the aspects submitted for their consideration as very adequate and quite adequate. During the implementation of the alternative through a quasi-experiment that allowed the improvement of self-management of learning in the teaching-learning process of Higher Mathematics I in the Accounting and Finance career in the distance modality. This is manifested in the adequate management of the teaching-learning process, the structuring of the didactic components in correspondence with the demands of the theoretical-methodological preparation of the teacher, of the consultations and of the activities proposed to the students. In the students' learning, it was

verified in the observed consultations and in the results of the pedagogical test that good results were achieved in the development of skills in the self-management of the mathematical content by the students; they demonstrated a greater mastery of the concepts and applications of differential calculus. From the formative point of view, there was also a positive transformation, which allowed estimating the changes produced in the state of the variable under study, ascertained in a better evaluation of its indicators.

CONCLUSIONS

A didactic alternative is designed where the systematization of the philosophical, sociological, psychological, pedagogical foundations of General Didactics and Didactics of Mathematics in particular are appreciable. The proposal is a contextualization of the PEA of Higher Mathematics I in the Accounting and Finance career in the distance modality to the conditions of the University of Matanzas and its municipal university centers, in which it is insisted on the aspects towards which the objectives should be oriented, with precisions in the contents so that students can solve economic problems of the profession through the application of the contents of the subject. It specifies the methods, means, forms of evaluation and organization to achieve self-management of learning and determines the tasks or activities to be performed. It provides methodological guidelines for the design of didactic guides, suggestions for methodological activities and a program proposal for a preparation course for teachers. The diagnosis carried out confirmed results that corroborate the existence of insufficiencies revealed essentially in the direction of the PEA and the didactic actions of the teachers, which originate limitations in the self-management of the learning of the subject by the students. Consequently, the necessary pedagogical intervention through a didactic alternative is confirmed.

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