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The articulation of the university curriculum of the business administration program, from the anthropological theory of the didactic: the case of the subject logic and mathematics I

La articulación del currículo universitario del programa de Administración de Empresas, desde la teoría antropológica de lo didáctico: el caso de la asignatura lógica y matemáticas I

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RESEARCH ARTICLE

Abstract

The present document has as an objective to describe how to articulate pertinence relations, which results as a way to compare some of the didactic problem dimensions that also proposes the anthropological theory of the didactic and so on (TAD) by the hand of hierarchical structure from mathematics academic curriculum. The didacticization of mathematic knowledge stimulates the articulation of math curriculum, which keeps in context some pertinence relations by theories that interpose themselves in all different experiences from meaningful learning in commitment groups. As well said, this investigation was based on the logical diffuse; nevertheless, it was found that the math disarticulator is the origin of curriculum disarticulation. And, at last, the curriculum cannot disaggregate inside the educational objectives to comprehend what it tries to explain.

Keywords: *Didactic, curriculum, articulation, theory, mathematics, knowledge, pertinence.*

Resumen

El presente trabajo tiene como objetivo describir las relaciones de pertinencia-articulación que resultan de comparar las dimensiones del problema didáctico que propone la Teoría Antropológica de lo Didáctico, en adelante (TAD), con las estructuras jerárquicas del currículo de matemáticas. La didactización del conocimiento matemático favorece la articulación del currículo de matemáticas, que guarda relaciones de pertinencia con las teorías didácticas que intervienen en las diferentes experiencias de aprendizaje significativo del grupo de estudio. La investigación se fundamentó en la lógica difusa. Se encontró que la desarticulación matemática es el origen de la desarticulación del currículo de matemáticas, y que la malla curricular no logra desagregar en el microcurrículo los fines de la educación.

Palabras Clave: *Didáctica; Currículo; Articulación; Teoría; Matemáticas; Conocimiento; Pertinencia.*

Introduction

The objective of this research is to describe the pertinence-articulation relations that result from comparing the dimensions of the didactic problem proposed by the Anthropological Theory of Didactics, hereinafter (TAD), with the hierarchical structures of the mathematics curriculum, located at the University of La Guajira, in the subject Logic and Mathematics I, of the Business Administration Program, in the Faculty of Economic and Administrative Sciences. The description provides an argument to explain a problematic reality in order to propose a logical-conceptual model, which allows showing the relational structures between the elements of the two sets, and to represent the interactions between these elements, to demonstrate the existence of the phenomenon of the disarticulation of the mathematics curriculum and to use the approximate assessment of this relationship in the production of a logical-rational construct that explains, from the TAD, the curricular disarticulation due to the disarticulation of the mathematics curriculum: curricular disarticulation on the one hand, and mathematical curricular disarticulation on the other, which are evidenced in the pertinence of the curriculum as such and of the didactics used by the institution to achieve educational goals.

The model will allow the analysis of the relational structures under study: curricular articulation and relevance. These two structures are present in the dynamics generated within the educational process and highlight the conflict between teaching methods and what is expected from that teaching. The first refers to the structuring of the programs and curricula of the institution in general. The articulation of the mathematics curriculum refers to the programming of curricula and classroom processes, as well as to mathematics textbooks, didactic aids, use of ICT's; that is, the mathematics curriculum as an accumulation of knowledge and also the interconnections that exist with mathematical knowledge in the institution. Mathematical articulation refers to the continuity, coherence, sequencing and gradualness that should exist in the teaching-learning process of mathematics, internally between the levels of complexity of knowledge, within them, and between the segments and fractions of the study cycles to avoid the atomization of teaching (Chevallard et al., 1997).

The first relational structure refers to the curricular articulation that is determined by the articulation of the mathematics curriculum and affects curriculum management. The curriculum, according to Acosta and Del Río (2016), is understood as a cultural construction in two senses: on the one hand, a curriculum contextualized and in dialogue with the institutional culture, and on the other hand, a curriculum that is managed through the articulation of actions that give life to the intentions of an educational institution. There is a gap and a lack of sense of the mathematical knowledge that is put into play in the professional training process.

The second relational structure refers to a dimension of teaching quality. Intrinsic value in the relationships aimed at the consensus of curricular norms and contents, according to Bárcenas Ortiz (2009), it is concluded that:

From these points it follows that, for the formal pragmatics of interactions, aimed at achieving a normatively intrinsic consensus on the pertinent curricular standards and contents so that the subjects of education who interact within the classroom define the quality of the curriculum, it is necessary to have a formal pragmatics of interactions, aimed at achieving a normatively intrinsic consensus on the pertinent curricular standards and contents so that the subjects of education who interact within the classroom define the quality of the curriculum and the content of the curriculum.

In the case of teaching, there must be a practical discourse in these interactions that goes beyond the arrangement of an instrumental rationality and that seeks in each case to reach a normatively intrinsic consensus for those involved (p. 356).

Between the two relational structures of curriculum articulation and relevance, a process of mutual interpellation is developed as an underlying dynamic that affects what is determined as an ideal of quality in curriculum management, where curricular articulation plays a fundamental role as a general guide for the educational process that integrates from the governmental levels, macro-curriculum, passing through the meso-curriculum, which has the function of converting the contents of instruction into pedagogical actions and operations, to the micro-curriculum, which is the point of contact with the students.

The study begins with a review of the works that, in the TAD line of research, place special emphasis on the structure of the curriculum that orients training in a professional academic program. This reading provides elements of judgment to compare, by means of the criterion of relevance, the way in which the elements of the two con- cerns are connected in a functional relationship. The analysis of these relationships is necessary to structure an admissible answer to the research question: How can the phenomenon of curricular disarticulation be approached from the perspective of TAD? Specifically, the research asks: What are the articulation-relevance relationships between the hierarchical components of the mathematics curriculum and the dimensions of the didactic problem of TAD?

THEORETICAL FOUNDATIONS OF RESEARCH ANALYSIS

Conceptual Reference of the Anthropological Theory of Didactics

TAD emerges as a consequence of the need to incorporate into the mathematics teaching-learning process other pedagogical-didactic approaches that conceive the process of learning mathematical knowledge as the product of a study activity within a work group (Bosch et al., 2006). In this sense, TAD is a theory that assumes mathematical activity as the central axis of its work. To this end, it proposes a process of didactic transposition consisting of six moments in which part of the mathematical knowledge is constructed-reconstructed based on a consensus of the study group. He uses the concept of praxeology to denote the dual characteristic of human actions, endowed with a material, tangible component, and another, of meaning, cognitive, i.e. a know-how and a knowledge.

According to this theory, the didactics of mathematics is the discipline that studies the diffusion and acquisition of mathematical knowledge in order to promote the reconstruction of knowledge, according to García et al. (2019), and on the other hand, Chevallard (1998), states that in the didactic transposition, the objective of didactics is to construct, describe and explain didactic phenomena; in the same way as the social sciences are oriented towards the construction, description and explanation of social phenomena (Gascón, 2014).

TAD places the problem of the acquisition of mathematical knowledge at the epistemological and institutional level; an aspect that contrasts with other theoretical positions that have approached this situation from a cognitivist, sociological and linguistic conception, among others. Gascón (2009), affirms that TAD is a pioneering approach in considering as an object of study and research, the entire teaching-learning process, which in addition to the activities, covers from the initial phase of creation and use of mathematical knowledge, to the final phase related to its incorporation in the school in terms of "taught knowledge".

In addition, the aforementioned authors reaffirm that the teacher training proposals, which affect the process itself, are part of the articulation problem that in turn affects the relevance of the students' training. All this implies for the researcher a questioning of the "global epistemological model" that underlies mathematical knowledge, as well as of the "local epistemological models" of mathematical knowledge evidenced in the educational institutions involved in the processes related to didactic transposition (Gascón, 2014).

In this context, TAD is based on the idea that human activities are modeled by means of praxeologies, which are a key tool for constructing mathematical models that explain the analyzed reality. Such models consist of the following phases: i) definition of the system under study and identification of the variables that make up the model ii) construction of the model, with special mention of the relationships between the variables identified in the initial phase; and, iii) application of the model to explain reality (Chevallard, 1998).

Finally, in the framework of the process of modeling mathematical activity, TAD provides study and research paths (REI) conceived as didactic devices that make mathematical modeling explicit as a driving force in the teaching and learning of mathematics (García et al., 2019).

Fuzzy Logic

Logic is the universe of formal concepts and abstract mechanisms that have been used in a systematic and discriminative way to ensure the internal coherence of a theoretical construct. Fuzzy logic makes it possible to deal with imprecise information in terms of fuzzy sets that are combined with rules to define actions. In this case, set theory is used to relate elements by means of relevance criteria. Since all reasoning is referred to an object and a way of knowing it, the different tools of logic have been grouped around different kinds of objects or different modes of knowledge. Casanova, in particular, says in this regard:

> Thus, fuzzy logic, a concept introduced in 1965 by Lotfi A. Zadeh at the University of California at Berkeley, has great potential for understanding systems that are elusive to be developed by analytical methods due to their complexity. Problems other than a linear logic are frequently observed, where their degree of uncertainty makes it convenient to use universal approximators, that is, systems that describe in a certain way the behavior of complex systems, usually nonlinear (Casanova, 2011, p. 114).

Curricula are conceptual constructs where everything that has to do with education is expressed as a declaration of principles. Curricular systems are studied on the basis of variables defined by categories for subsequent analysis. This facility makes it possible to include the uncertainty of the uncertainty and imprecision of the exact value that a variable admits. Uncertainty in this case refers to the difficulty of measuring factors that do not admit continuous values, i.e., they are associated with qualitative, not quantitative, assessments.

Curricular disarticulation

In the process of teaching and learning mathematics, students and teachers encounter foreseeable obstacles that are hidden in the didactic contract, one of them is that the construction of general concepts such as, for example, variation, which is dispersed within the mathematics curriculum of basic education, in different content blocks; ra- zones and proportions, rational numbers, direct magnitudes, inverse magnitudes; and at different levels; 7th, 8th, 9th, and make up the cognitive layer, variational thinking. This difficulty, which results in a fragmented and blurred knowledge, is the product of the mathematics curriculum within the general education curriculum, according to Chevallard (1998). This situation creates an additional tension to the first university mathematics course, which becomes a leveling course. Systems of variation are the foundations on which calculus and the higher cognitive stratum of systemic thinking are built, according to Torres and Mejía (2015, p. 528). In this sense, the difficulty can be specified in the path of actions that were taken to reach the current state. According to Tou- rón (2021, p. 12), the standards that become an expression of what a student should know and know how to do in a content area, with a public and clear criterion that establishes what a learner should know and know how to do, that to achieve or exceed it, achievement indicators are determined, which are manifest behaviors, representative evidences, signs, clues, traits or sets of observable traits in performance. From the TAD, it is proposed that one of the factors of this failure could be the existence, within the institutions, of a dominant epistemological model (MED), which mediates and conditions the teaching task and, according to Lorenzo et al. (2014, p. 280), causes certain disarticulation and misunderstanding in students.

In Colombia, during the last 30 years, mathematics education has not developed in harmony with the curriculum; reforms aim at solving the problem with old recipes, the best textbooks, the best teachers; but the bulk of the difficulties are foisted on the teacher and ultimately on the Institutional Educational Project (PEI) Molano (2011). In the case of variational thinking, the problem of the curriculum is that it does not allow defining from the teaching practice how to approach it, it does not establish what it is, nor how it is developed from the interest of the study group (Vasco, 2002).

Relevance

It is a measure of the quality of education and is the dimension of the evaluation of the educational system that makes it possible to detect, as a gap, effectiveness, as the level or rate of fulfillment of the academic objectives defined by the curriculum, efficiency, or the capacity to perform or adequately fulfill this function, and the effectiveness or degree of fulfillment of the general objective of the educational system. In general terms, we can say that education is pertinent when it keeps the following characteristics

congruence, that is, convenience, coherence and logical relationship, with social conditions and needs, with the norms that regulate social coexistence and with the specific characteristics of the learners in their diverse natural and social environments of interaction.

From a re-reading of the PNDE 2006-2016, the response we propose, which does not have exclusive or all-encompassing pretensions, assumes that relevance must be given, at least, in the following areas: 1. with the Constitution and the Law (normative area), 2. with economic, social and human development (area of the country's vision), 3. With the demands of a globalized world (global scope), 4. With the cultural, social and geographic environments (contextual scope), 5. With the need to live together in peace and democracy (political scope), and 6. With the diverse characteristics of the learners (pedagogical and didactic scope) (MEN, 2009). (MEN, 2009).

In this sense, relevance is a concept applicable to the three hierarchical levels of the curriculum and determines different views on what is to be investigated. In the case of the subject Logic and Mathematics I, it is the pedagogical and didactic field that is being studied.

Methodology

The methodology used to explain the relevance relations between the Anthropological Theory of Didactics (TAD) and the university curriculum of the subject Logic and Mathematics I, oriented in the Business Administration Program of the University of Guajira (UNIGUAJIRA), was based on fuzzy logic, which is derived from classical logic, but differs from it by its imprecise boundaries.

Ruvalcalva and Vermonden, (2015) define a fuzzy set as "a class of objects with a continuum that shows its degree of membership of that set" (p. 243). Each member of the set is characterized by a membership function, which by its nature and characteristics can take values between zero and one.

On the basis of fuzzy logic, a logical-rational model was structured to explain the pertinence relations between the Anthropological Theory of Didactics (TAD) and the university curriculum of the subject Logic and Mathematics I, as a basis for curricular articulation. This model was developed from two phases. In the first, of an explanatory nature, the structural elements of TAD and the university curriculum in Logic and Mathematics I are specified; while in the second, the pertinence relations between the components of both sets are established.

First phase

In this phase, the identification categories are used to define sets that are re-presented in their complexity, by the basic and sufficient components to contrast with another theoretical body, and correspond, for the TAD, in the three dimensions of the didactic problem, according to Gascón (2011), Lucas and Gascón (2019), in which the interaction of the systemic structures of the didactic problem is demonstrated.

The dimensions identified as the variables, elements of the set, on which the study is based, make it possible to analyze the relationships that affect and the interactions that produce the problem. These dimensions, identified as the variables, elements of the set that underlie the study, allow us to analyze the relationships that affect them and the interactions that produce the problem, which, due to their diffuse nature, have a blurred boundary. For the purposes of the research, a valuation table tested in a context of relevance between two sets of knowledge is borrowed from the doctoral thesis of Dr. Ligia García Lobo (García and Anido, 2012).

Methodologically, this phase was based on the guidelines of fuzzy logic, conceived as an approximate reasoning technique that uses the relevance values of the elements of each fuzzy set, in their relationship with the elements of the other set, and necessary to find an approximate value of that same relationship, which is characterized by linguistic valuations, since they are complex qualities that admit multiple values (Ballester and Colom, 2006; Arroyo and Antolínez, 2015).

For TAD, the investigation of a didactic problem points to the identification of three dimensions that contain it, as characteristics, and that are the structural elements of a problem. See Table 1. This characterization is useful to define the relationship of each one of them with the hierarchical structures of the curriculum, which define it in its complexity. See Table 2. In these terms, it is possible to describe an expanded didactic problem with the diffuse elements that determine it from the outside and that impose new characteristics and possibilities of analysis, and therefore another way of seeing and treating it. It allows the assessment of its relationship with other sets, in this case that of the curriculum, in order to compare the degree of interrelation of its presence in the problem, in relation to its counterpart in the other set.

Table 1.
TAD dimensions

Dimensiones de la TAD	Definición
Epistemológica. (T_1)	Toda investigación didáctica se fundamenta en una postura que orienta los procesos de observación e interpretación de los hechos empíricos. Tal postura, en el caso concreto de la TAD se precisa en la organización matemática y la organización didáctica que se definen en el modelo epistemológico de referencia (MER) (García, 2007).
Económico-institucional. (T_2)	De manera sintética decimos que la dimensión económica de un problema didáctico contiene las cuestiones en torno a «¿cómo son y cómo se comportan las praxeologías matemáticas y didácticas en la contingencia institucional?». Con ello, abarca las cuestiones relativas al sistema de reglas y principios (nomos) que regulan – en una institución– la organización y funcionamiento de las PM y PD involucradas en el problema didáctico (Gascón, 2011, p. 213). (Lucas y Gascón, 2019).
Ecológica. (T_3)	De forma simplificada, decimos que la dimensión ecológica de un problema didáctico contiene las cuestiones en torno a: ¿por qué las praxeologías matemáticas y didácticas son como son en la contingencia institucional y qué condiciones se requerirían para que fuesen de otra forma dentro del universo de lo posible? (Gascón, 2011, p. 217).

Source: Own elaboration based on Gascón (2011).

These dimensions of TAD belong to a schematization that allows it to be observed as a whole, a model, in which each has a specific function and defines a factor of analysis of the process of studying the problem as such. Mathematics, as a science, strongly conditions human activity, which can be expressed through praxeologies, and its object of study is mathematical knowledge, "wise knowledge", expert knowledge, which must be brought into play during the process of didactic transposition. To this end, he studies the didactics of mathematics and the mechanisms it uses to achieve a firm and shared "transposed knowledge". One of his sources of research is the approach to the professional training of teachers and their corresponding teaching practice. These general elements participate in the integral formation of students. TAD assumes that the transpositional process is carried out by institutionalized study groups.

Table 2:
Hierarchical structures of the curriculum in Logic and Mathematics.

Nivel jerárquico	Concepto.
Macrocurrículo (C_1)	Abarcan los aspectos relacionados con la comprensión del objetivo de la actividad matemática y sus fundamentos. Surgen como respuesta a la siguiente interrogante: ¿Cuáles son las obras matemáticas que la sociedad considera relevantes para estudiar en la escuela?
Mesocurrículo (C_2)	Comprenden los aspectos relacionados con el saber hacer que caracterice el ejercicio profesional de la actividad matemática, e intentan responder a las siguientes interrogantes: ¿Hasta qué punto es necesario enfatizar en los fundamentos de estas obras? ¿Qué debe el individuo ser capaz de hacer con ellas? Es la planificación y organización del trabajo conducente al desarrollo gradual de lo que los estudiantes deben aprender con respecto a un área determinada del currículo.
Microcurrículo (C_3)	Incorporan los valores, actitudes y normas que regulan el ejercicio de la actividad matemática. De manera general, fundamentan el lugar de las matemáticas en el conjunto de obras de la sociedad, así como algunos aspectos de la actividad matemática que no pueden abordarse como tareas o procedimientos. Propedéutica: contenidos conceptual o declarativo, procedimental y actitudinal.

Source: based on casanova (2011. p. 114).

Following Casanova (2011):

Under this perspective, the curriculum will have three (3) levels: (a) macro level: where the conception of man, education and its purposes are expressed in a prescriptive way, whose summarized expression will be the professional academic profile, (b) meso level: represented by the curricular grid, making explicit the scope of the curricular areas, axes or lines (organization and organization of the curriculum), and (c) meso level: represented by the curricular grid, making explicit the scope of the curricular areas, axes or lines (organization and organization of the curricular areas, axes or lines of the curriculum).

(c) the micro level: the plan of the programs of the curricular units (p. 114).

The curriculum is composed of three basic elements: 1- Subjects, who participate before, during and after; 2- Elements, and 3- Processes. The levels of curricular concretion are: 1- Institutional, 2- Curriculum, 3- Area plan, and 4- Classroom plan. The curricular grid, on the other hand, is the graphic representation of the distribution of the training cycles and courses contemplated in the curriculum; the curricular grid makes it possible to make visible the relationships of priority, sequencing and articulation of the courses among them and with the cycles. On the other hand, as a network scheme which takes into account the cycles, fields, disciplines and areas, it establishes grade relationships, systemic sequences and correlativities between the different courses of the study plan, vertically and horizontally (García, 2007).

The goals of education, defined at the macro level of the curriculum, do not materialize in reality. The declarative component is developed satisfactorily, partly because the mathematical articulation privileges the conceptual to the detriment of the procedural, and the attitudinal component is relegated to the background as the student's responsibility. The mesocurriculum defines the operability of the macrocurriculum, in terms of curricular grid, locates and determines subjects in degrees of pre- cedence or importance. The micro-curriculum is determined by the conceptual or declarative, procedural and attitudinal mathematical content. It is at the micro level that mathematical disarticulation occurs, which determines the disarticulation of the curriculum.

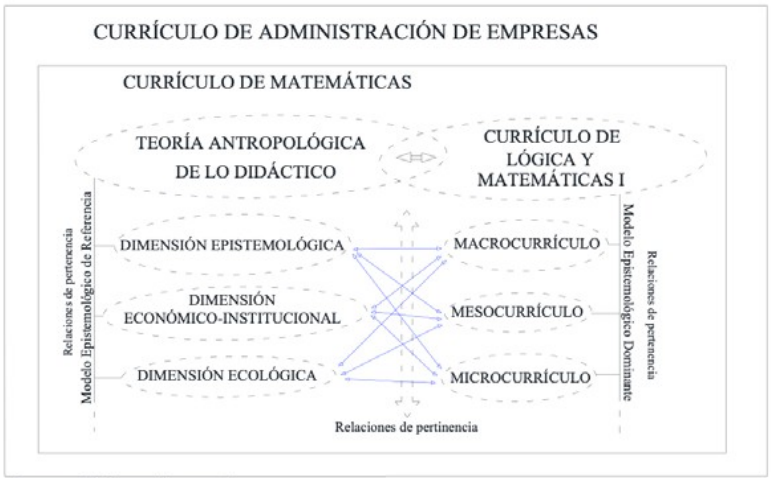
Second phase

The educational process as a complex system, whose objective is centered on the formation of the individual. It comprises variables that admit linguistic values, favoring the establishment of relationships of belonging and relevance in conditions of uncertainty and imprecision within a high complexity. The former is a function in speech that is larger whenever it approaches the value 1, while the latter is the relation established by an element of a fuzzy set with one or several elements of another fuzzy set, expressed as a larger value when it approaches the value 1.

In order to establish the relevance relationships between the dimensions of the TAD teaching problem and the hierarchical elements that structure the university curriculum of the subject Logic and Mathematics I, a general scheme was used as a starting point, in which the structural components of both fuzzy sets are shown.

The TAD covered the following dimensions: Epistemological, Economic-Institutional, and Ecological; while the curriculum in Logic and Mathematics I was structured from the curricular hierarchies that structure it as a subject: Macro, Meso, and Micro-curriculum, in the latter is where the conceptual, procedural and attitudinal contents, which underlie the teaching-learning process in the Business Administration Program analyzed, are worked on as a mathematical activity.

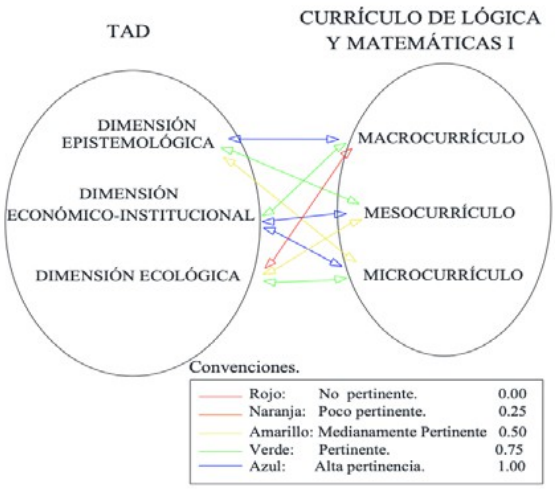
Figure 1:
General outline of the model.



Source: own elaboration

The structural variables of the didactic problem, defined in the TAD. See (Table 1) and the disaggregation of the curriculum in Logic and Mathematics I. see (Table 2), were the basis for the construction of two systems of factors. The first, made up of the dimensions of the TAD, structured around "a didactic problem", as research elements; while the second included the hierarchies that support the Business Administration curriculum, the mathematics curriculum and, finally, the Logic and Mathematics I curriculum. Possible relevance relationships were intentionally constructed between the variables of both systems. The latter was defined as a relationship established between any element and a class of elements, according to which it is determined to what extent the element belongs or does not belong to that class (Padrón, 1998).

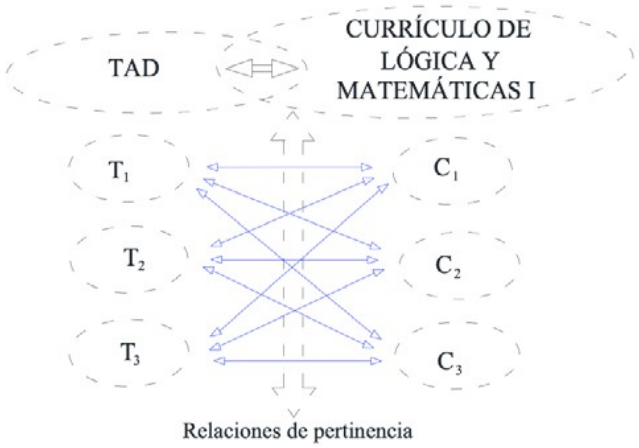
Figure 2:
Relevance relationship between TAD and the Logic and Mathematics curriculum.



Source: own elaboration

Based on the relationship between the dimensions of the didactic problem of TAD, on the one hand, and the structural elements of the mathematics curriculum, for the subject Logic and Mathematics I, relationship values were assigned by comparing the arguments of the two variables. The following discrete values: 0.00 when the relationship is not relevant; 0.25 when the relationship is not very relevant; 0.50 when the relationship is moderately relevant; 0.75 when the relationship is relevant; and 1.00 when the relationship is highly relevant.

Figure 3:
Analysis diagrams and matrices.



Source: own elaboration

$$P\ [p_{11}\ p_{12}\ p_{13}\ p_{21}\ p_{22}\ p_{23}\ p_{31}\ p_{32}\ p_{33}\ ];$$

$$P\ [(T_1C_1)\ (T_1C_2)\ (T_1C_3)\ (T_2C_1)\ (T_2C_2)\ (T_2C_3)\ (T_3C_1)\ (T_3C_2)\ (T_3C_3)\ ];$$

$$P\ [1.00\ 0.75\ 0.50\ 0.75\ 1.00\ 1.00\ 0.00\ 0.50\ 0.75\ ]$$

Table 3:
Matrix of relevance relationship between TAD and the mathematics curriculum.

Estructura del currículo / Dimensiones de la TAD.	Modelo Epistemológico Dominante			SUM E.C.	% E.C.
	Macro-currículo	Meso-currículo	Micro-currículo		
Epistemológica	1.00	0.75	0.50	2.25	36 %
Económico-institucional	0.75	1.00	1.00	2.75	44 %
Ecológica.	0.00	0.50	0.75	1.25	20 %
SUM. Dim. de la TAD	1.75	2.25	2.25	6.25	
% Dimensiones de la TAD	28 %	36 %	36 %		

Source: own elaboration

The matrix is constructed from the elements belonging to the two sets and the relationships between them. The elements of analysis are the product of a comparison between the argument of the first variable of the set of the TAD with the argument of the first variable of the set of the Logic and Mathematics I curriculum; each of the intersections between rows and columns corresponds to a comparative analysis of the arguments of each variable.

p_11;(T_1 C_1). According to Gascón (2011), TAD defines a didactic problem from three dimensions that determine and constitute in the mathematical activity a way of doing, and establishes a condition to the teacher; to develop a MER of his own, from his particular activity, referred to the subject or specific area of mathematics that he works with the group, that is, the epistemological model articulates, from the transformation of mathematical knowledge, to the production of didactic mechanisms that facilitate the learning process and the teacher's work. In this sense, TAD assumes that there is a didactic problem, which to some extent comes from the disarticulation of the mathematics curriculum, and confronts it with a study process that integrates the teacher with the interests of the study group. TAD changes the paradigm of classical teaching pedagogy to that of student-centered learning.

The curriculum, on the other hand, at the macro level, defines the educational policies, integrated in the consistency of the curricular management with the institutional vision, in accordance with the student's aspirations and the needs of society. The curriculum of the Business Administration program belongs to that of the educational institution and obeys a program of subjects included in the academic curriculum in which excellence is pursued through curricular management. Within the curriculum of the professional career, the mathematics curriculum is established as a global link of competence. The subject Logic and Mathematics I has its own curriculum, which is established by means of the document "prope- duction of the subject" in which the objective and the processes to achieve it are described in general terms.

The relationship is of high relevance, 1.00, because the arguments of the two variables refer to the structural components of the relationship studied, i.e., the curriculum, which fails to develop the general purposes of education through the curricular grids and the student's plan, has a gap that it cannot correct. TAD proposes an epistemological model that is developed in the work group, against the dominant epistemological model of classical pedagogy.

p_12;(T_1 C_2). The epistemological dimension of the didactic problem of TAD proposes an epistemological mode constructed with the purpose of modifying mathematical knowledge for the purpose of didactic transposition, this work is of the teacher to then put it into play with the study group. The didactic problem is reduced to a way of doing that affects the curriculum because it transcends the order of the curriculum by incorporating, as an element of study, the opinions and contributions of the students, as well as their concerns and individual problems.

The relationship is pertinent, 0.50, because the arguments of the two variables complement each other in support of the disaggregation of the curriculum, one of the causes of the disarticulation is precisely the difficulty that the educational system has in converting the general purposes of the curriculum into concrete educational actions.

p_13;(T_1 C_3). The atomization of mathematical knowledge is part of the classical way of teaching, the curriculum defines the location of the contents by blocks and by levels, dispersing in degrees of difficulty the sequencing of the same, this form, according to TAD, hinders the construction-reconstruction of complex concepts, it is the cause of the mathematical disarticulation that in turn produces the disarticulation of the mathematics curriculum. In this order of ideas, curricular dis-articulation is a phenomenon that has identified causes and produces evident effects.

The evaluation of the relationship is moderately pertinent, 0.25, because the arguments are contradictory, the micro-curriculum is the student's plan, and the epistemological model establishes a process of mathematical activity that starts from the motivations of the study group. This disconti- nuity between the individual and the study group represents the most acute difficulty of the process and has a negative impact on the attitudinal aspect.

p_21;(T_2 C_1). The institution freezes ways of doing and seeing mathematics, a mathematical knowledge determined from the discipline and another determined from the interaction with the pedagogical environment. In the connection of mathematical knowledge with the pedagogical environment, it must be recognized that students have their own forms of representation that must be connected with those proposed by the discipline. This coordination depends on more or less generalized didactic stakes. TAD proposes as a response a didactic sequence that brings together the aspects mentioned in the previous analyses to produce a specific type of mathematical activity in which students are involved.

The degree of relationship is pertinent, 0.75, due to the fact that it is the institution that determines the form, quantity and quality of teaching. It is in mathematics, due to its character as a university language, and which, according to Bartra, is located as a symbolic system of substitution, an "exo-brain", where a solid symbolic structure on which to support learning emerges.

p_22;(T_2 C_2). The curriculum does not respond quickly to feedback; the required changes take a long time to appear in teaching practice. There is evidence that the proposed curriculum is quite different from the one that is actually developed in the classroom and the one that is learned by students. This mismatch does not allow us to assess the effectiveness of the educational system, even though there is a structural mismatch, which manifests itself as a studyable phenomenon, the curricular disarticulation and the disarticulation in mathematics in symbiotic relation produce a state of affairs that are contrary to pedagogy.

The value judgment is of a highly pertinent relation, 1.00, because the mesocurriculum is the level where the map of the subjects with their respective sequences, coherences, relative importance of each subject with respect to the academic programs is made explicit, likewise, the TAD assumes that the economic dimension of a didactic problem contains the questions about "
How are and how do mathematical and didactic praxeologies behave in the institutional contingency? In doing so, it covers questions concerning the system of rules and principles (nomos) that regulate, in an institution, the organization and functioning of the mathematical praxeologies and didactic praxeologies involved in the didactic problem.

p_23;(T_2 C_3). Classical pedagogy determines a dominant epistemological model present in the teaching work. The mathematical objects that come into play during the process of didactic transposition are manipulable ostensive objects endowed with meaning, and non ostensive objects that are evocable, they are related by a complex network of signification, the translation between one and the other to formalize knowledge leads to gaps between what the curriculum pursues and what the student actually learns.

The valuation of the relationship is highly pertinent, 1.00, due to the fact that the student's plan, which is composed of standard exercises with predetermined answers, guided by classical pedagogy, in the dominant epistemological model, has as a weakness the non-questioning of the world. This is an important element in mathematical disarticulation and curricular disarticulation. These two arguments, that of T_2, and that of C_3 are contradictory and reinforce each other in their potential, by unloading the responsibility for learning on the student and on the IEP.

p_31;(T_3 C_1). In a simplified way, we say that the ecological dimension of a didactic problem contains the questions: why are mathematical and didactic praxeologies the way they are in the institutional contingency and what conditions would be required for them to be otherwise within the universe of the possible? At the macro level, the curriculum contains the ends of education, and its development through the meso- and micro-curriculum implies a transformation of knowledge to be learned by the study groups.

The degree of relationship is not pertinent, 0.00, because the transformation of thematic knowledge, which is the teacher's responsibility, within the didactic contract, is part of the purposes of education without a solution of continuity within the curriculum.

p_32;(T_3 C_2). The student's plan is blurred in the curriculum so that it is assumed that the structuring of knowledge is something that does not concern the teacher or the institution, in this sense, the subjects with their own curricula should have a degree of coherence and continuity; apparently this is determined in the curriculum.

The evaluation of the relationship is moderately pertinent, 0.25, due to the fact that the incidence of the lack of articulation is more evident when reviewing the curriculum and its respective propaedeutics. In the case of algebra, with the use of variables conceived as elements that can take different values. Not as an element that is used to store and refer to another value. This difference in conception creates difficulties in the learning process.

p_33;(T_3 C_3). The praxeologies that mobilize the student's cognitive resources appear out of context and are limited to solving standard problems, with a predetermined answer; in classical pedagogy the student does not have an opinion, does not ask, does not question, this situation indicates that the possibility of altering the didactic contract from the teaching practice is a possible solution.

The degree of relationship is moderately pertinent, 0.50, because in the comparison of the two arguments it is found that the curriculum, from the dominant pedagogical model, resists making changes. This teaching practice guided by a dispersed curriculum produces effects of curricular dispersion and disarticulation.

Conclusions

Based on the relevance relations between the dimensions of the didactic problem of TAD and the hierarchical structures of the university curriculum of the subject Logic and Mathematics I, oriented in the Business Administration Program of the Faculty of Economic and Administrative Sciences of the University of Guajira, it is concluded that:

The economic-institutional dimension has a high incidence in the problem of curricular disarticulation, according to TAD, in this dimension of the didactic problem, mathematical disarticulation is studied as the origin of the disarticulation of the mathematics curriculum. According to the analysis data, the institutionalization of mathematical knowledge is a factor that delimits and imposes, unintentionally, a certain way of transmitting this knowledge. This implies the use of subtle variants of mathematics didactics adopted in response to a dominant culture in the institution. The variants of mathematical knowledge that are born and developed in the institutions are particular ways of seeing and feeling and do not communicate with other institutional forms; this lack of communication is evident in the first courses of university mathematics. The difficulties in the area of mathematics of elementary or university students come from dominant epistemological models that conflict with the curriculum of the professional academic program.

The micro-curriculum, or student curriculum, is decontextualized by the lack of questioning of the world. Mathematics textbooks contain the knowledge, the wisdom, and the instructions to transpose it into learned knowledge. The achievement of mathematical competencies, developed through didactic and pedagogical sequences, is the ultimate goal of education. The pedagogical sequences are based on the mathematics curriculum, on the curricular guidelines, and are composed of a reference program, that is, on a systematic learning model, to develop skills and abilities in students, following a scheme formed by levels and goals.

The curriculum does not manage to disaggregate the goals of education in the micro-curriculum. This difficulty is the ultimate expression of curricular disarticulation. This problematic situation has its causes identified. In the mathematical disarticulation, the disarticulation of the mathematics curriculum and the disarticulation of the academic program curriculum, the effects are also evident, the lack of competence of the graduates of the program, the difficulty for the new professionals to get a job, the difficulty to generate their own income with entrepreneurship, the low quality of life in general of the Colombian society. The Study and Research Trails (REI) provide a referential connection that articulates the processes with the concepts with which contextualized learning is affected and which depends on the consensus of the study group.

The findings of the model also show that the disarticulation of the university curriculum in logic and mathematics I is the result of the existence of irrelevant relationships between the curriculum and the ecological dimension of TAD. In this sense, the way it should be does not fit the dominant model. The ecological dimension of TAD has an irrelevant relationship with the macro-curriculum.

These findings demonstrate the need to rethink the university curriculum in Logic and Mathematics I, starting with the implementation of the TAD guidelines in the continuing education process of teachers who teach this discipline. All this, in order to form integral professionals with competencies to build and apply mathematical logical knowledge in the administrative and financial field, as well as to live in society.

TAD confronts the phenomenon of curricular disarticulation through the transformation of mathematical knowledge in order to put it into play with the study group. On the other hand, it proposes to confront the referred phenomenon of curricular disarticulation with a change of paradigm, that of questioning the world, where the curriculum is composed of a set of questions and issues (Q), which the student and the teacher investigate in order to provide some answer to the generative question (Q). The paradigm of questioning the world conflicts with the unidisciplinary, hierarchical curricular structure of the contents, since developing the new paradigm requires multiple, interdisciplinary views, where each generating question (Q) is posed around situations of the social environment.

The proposal of TAD, to the problem of finding answers to the questions (Q), consists of putting into play a new type of didactic organization, thus emerging the notion of the Study and Research Path (REI) as a generic model for functional study processes (Chevallard, 2004).

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