

The Biochemical Discipline in the Study Plan of the Bachelor of Nutrition in Mexico

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A study of the curriculum of the nutrition careers of institutions attached to the National Council for the Quality of Educational Programs in Nutrition was carried out with the objective of examining the characteristics of biochemical education. The research was descriptive, and the methodology focused on the bibliographic review. It was identified that the graduation profiles generally do not mention training in biochemistry; however, 11.11% have only one subject, 77.78% (28) with two and 11.11% (4) three, addressing contents of structural and metabolic biochemistry. Although the objectives and contents are similar, the time devoted to teaching them varies greatly, so it is believed that this factor should be taken into account when evaluating the study plans of each educational institution in order to determine the appropriate time for teaching. of biochemistry.

Keywords: biochemistry, nutrition, university students, teaching

INTRODUCTION

The beginning of the teaching of nutrition in public institutions, occurs after the inauguration of the Children's Hospital of Mexico in 1943, being the first institution with a dietology service in which researchers and medical specialties were trained; In 1972, the first Nutrition study plan was established by the Universidad Iberoamericana as a Higher Education Institution (IES), a pioneer in training human resources capable of solving the main food and nutrition problems in Mexico. By the year 2010, 145 HEIs offered the bachelor's degree in nutrition and by 2019, 293 institutions had registered with the National Association of Universities and Institutions of Higher Education (ANUIES) (Coronel et al., 2019); in the year 2022 more than 400 study programs are offered in the country (ANUIES, 2022).

The association that brings together nutrition professionals from various universities is the Mexican Association of Members of Faculties and School of Nutrition (AMMFEN), which defines a Bachelor of Nutrition as a professional capable of applying food and nutritional science to promote nutrition and adequate health, underpinning the prevention and/or treatment of diseases, for the benefit of individuals and populations, governed by an ethical framework, applying the inter, multi and transdisciplinarity of nutrition. The exercise of discipline is structured into six professional fields determined by the AMMFEN (Table 1) (AMMFEN, 2021).

TABLE 1
DESCRIPTION OF THE PROFESSIONAL FIELDS OF NUTRITION

Professional field	General description
1) Food and nutrition in health and disease.	It includes the areas of clinical, population, life course and sport nutrition. The workspaces can be public and private institutions or organizations such as: institutions in the three orders of government, hospitals, health centers, geriatrics, child development instances, sports areas, companies, clinics, educational centers, outpatient care and counseling units, social rehabilitation centers, armed forces, rehabilitation centers, civil associations and NGOs.
2) Food and food industry.	Includes food services, production, transformation and regulation of food, quality, and food safety, as well as food consumption that affect food safety. The labor market includes public and private food producing and processing institutions and organizations, government institutions, associations, or public and private for-profit and non-profit organizations.
3) Teaching and research in food and nutrition.	It includes the training of human resources in nutrition at a technical, higher, and postgraduate level, as well as the generation of basic and applied knowledge in food and nutrition, educational and research management; likewise, the teaching of nutrition from the basic levels and in different modalities. The labor market for these areas includes universities, research institutes, public and private health institutions, educational centers, the pharmaceutical and food industry, educational platforms, and government agencies.
4) Information and communication on food and nutrition.	Includes dietary guidance, application of information technology and use of various media. The labor market for these areas includes public and private institutions such as: education at all levels, health, the food industry, pharmaceuticals, the communication and information industry, and care centers.
5) Culinary and pharmaceutical industry related to food and nutrition.	This professional field includes advice, consultancy, and supervision of the consumption of health supplies for special uses: food supplements, specialized enteral feeding formulas, sterile mixtures, likewise participates in the development and formulation of nutritional products combining the culinary art with the scientific kitchen. The labor market for these areas includes various pharmaceutical companies, health institutions, food laboratories, the food and beverage industry, research, and development centers.
6) Innovation and entrepreneurship in food and nutrition.	In this field, nutritionists apply knowledge to generate innovative products and services, through sustainable business models to meet needs and address health problems related to food and nutrition. The workplace is so varied depending on the products and services provided to consumers, industry, the media, as well as other businesses in each of the professional fields described.

From the beginning of nutrition as a university profession, the discipline of Biochemistry was included in the study plan as a basic area, since it is part of the biological sciences that studies the metabolic processes that occur in healthy individuals and with diseases associated with nutrition. malnutrition; diet-disease relationship; the quality of food and its affectation by technological processes; as well as nutritional supplements and their influence on health (Torres et al., 2021).

There are innumerable studies and literature that support the inclusion of biochemistry in the study of nutrition (Coronel et al., 2019; López, M. (2020), since, thanks to this, where the influence of food is explained and nutrition at the biological, chemical and physical levels; understand the set of processes by which the living organism uses the different nutrients, for the release of energy, the development and maintenance of body structures; the regulation of metabolic processes in health and disease conditions and identify how these biomolecules are found in food and in humans (López, 2020).

However, it is necessary to carry out studies, regarding the training and professional practice of graduates (Torres et al., 2021), explain the problem of why carry out this study that is mentioned and the importance for the professional training of the nutritionist this job; The present study includes an analysis of the curricular design of 41 schools and faculties that offer the nutrition degree, with the purpose of characterizing the inclusion of biochemistry in the curricular designs.

MATERIALS AND METHODS

The research carried out is descriptive, the methodology focuses on the bibliographic review (documentary review / study plans) through the analysis of the syllabus, considering as a sample the biochemistry syllabus of nutrition study plans in Mexico. Learning units (AU) were included, according to the following considerations: 1) Be part of a Nutrition Degree program from a Higher Education Institution (IES), accredited by the National Council for the Quality of Educational Programs in Nutriology (CONCAPREN), 2) the syllabus must be available on the official website of the IES and include the biochemical name, school year where it is taught, theoretical hours and practical hours and independent study, credits and teacher profile. The excluded syllabuses were those that did not have the study variables and those that were offered in two different locations of the same IES were eliminated. The study variables are described in Table 2.

TABLE 2
DESCRIPTION OF THE STUDY VARIABLES

Variables	Description
Curriculum	There are different definitions of curriculum according to the vision that the authors have of the educational problem; In general, it is conceived as a list of certain objectives in the educational field, it is also a control system, from which the teachers responsible for teaching and the students are evaluated. The technological-instrumental attractiveness is high, especially when what is pursued is economic profitability, because of applying a technical rationalization to teaching. There is consensus that the components of the curricular design are the graduation profile, the study plan, and the syllabus.
Graduation profile	The IES define the graduation profile, declaring the knowledge, skills, attitudes, values, and attributes that the student must demonstrate at the end of the educational program; It is considered a benchmark for assessing the relevance of the study plan and marks the scope of the relationship with the productive sector, since it specifies the professional skills that graduates will possess for a responsible insertion in society. It is the beginning of the process of elaboration of the curriculum and therefore of all the planning of the educational process. In the graduation profiles, a content analysis was carried out on the knowledge that specifically refers to biochemical education.

Variables	Description
Study programs	Also known as syllabus, synthetic program, learning unit, etc., they are normative documents in which the educational purposes, methodological approaches, planning guidelines and evaluation criteria are established; They also express the contents that will be addressed, the learning that the students are expected to achieve. This should not be seen or used as a simple agenda, since it indicates for each course, the learning subsectors, subjects, and activities of a generic nature, indicating the respective weekly workload. They sequentially expose the objectives, the teaching contents and the activities that must be applied in accordance with the study plan. In relation to the selection of teaching-learning units, for the analysis of the study plans, those with the word “biochemistry” in the title were included or, where appropriate, when the study programs were available, they were also included. they considered other learning units that considered this theme. A content analysis was made based on the general objectives of each of the programs.
School cycle	It is the period in which students go to their educational centers. The Secretary of Public Education (SEP) in Mexico defines the school calendar, from which each public or private HEI adjusts the school year, which at the university level can be four-monthly or semester-long.
Teacher profile	Set of knowledge, abilities, and skills, necessary in a particular teacher to teach a study program, according to the sociocultural conditions of the context where he interacts.

Source: Jalixto et al., 2022; Torres et al., 2021; Barros-Morales et al., 2018; Torres-Zapata et al., 2020.

The results of the investigation will be presented according to the following procedure. First, the number of programs validated by the National Council for the Quality of Educational Programs in Nutrition (CONCAPREN) was identified, this being the accrediting body (OA), recognized by the Council for the Accreditation of Higher Education (COPAES).), as the body that carries out the accreditation processes of educational programs in nutrition in Mexico. This analysis made it possible to identify the programs that met certain quality standards; it was identified with the name of the HEI, type (public/private), location (state) and status (accredited/re-accredited).

Next, the AUs were reviewed, locating the school year in which they are taught, theoretical hours (HT), practical hours (HP), independent hours (HI) and number of credits (C) that have been declared in the program. educational.

Subsequently, the documents of the HEIs were reviewed, to verify that there were accreditation opinions by CONCAPREN and the profiles of the educational programs that specifically mention knowledge of biochemistry were identified.

Step followed, the general objectives of each of the AU of biochemistry are analyzed. Finally, the desired characteristics to be possessed by the teacher who teaches the UA are reviewed.

The information search was carried out by the members of the Academic Body in Training (CAF) “Applied Nutrition and Education” independently during February - July 2022. The data was entered into an Excel spreadsheet designed for the study.

The research was submitted for evaluation by the ethics committee of the Faculty of Health Sciences, to which the CAF “Applied Nutrition and Education” is affiliated, obtaining a favorable opinion when conflicts of interest were ruled out (reference number 2571); under the task, according to the central objective, of integrating a national panorama of biochemical education in the Bachelor of Nutrition in Mexico, which, for ethical reasons, only the data collected in each educational institution, published in its official pages, is presented. therefore, the educational institution is not specified in the results, unless it is necessary according to the proposed objectives.

RESULTS AND DISCUSSION

The total number of study programs in Nutrition that have the distinction of CONCAPREN are 41, of which 53.66% (22) are accredited, that is, they obtained the opinion for the first time, while 46.34% (19) they have the status of “re-accredited”, because in at least two periods they maintain the distinction. 36.59% (15) are HEIs from the private sector and 63.41% (26) are public (Table 3). 12.20% (5) were excluded, since 2.44% (1) belonged to another country (Guatemala) and 9.76% (4) did not present the programs on their official page, which made their analysis impossible.

TABLE 3
GENERAL CHARACTERISTICS OF THE IES THAT HAVE ACCREDITED BACHELOR OF NUTRITION PROGRAMS

	Name of the Institution	Type	Location	status
1	Universidad Autónoma de Ciudad Juárez	Public	Chihuahua	Accredited
2	Universidad Intercontinental	Private	Ciudad de México	Accredited
3	Universidad del Valle de México	Private	Ciudad de México	Accredited
4	Universidad de Colima	Public	Colima	Accredited
5	Universidad Anahuac	Private	Estado de México	Accredited
6	Universidad Autónoma del Estado de México	Public	Estado de México	Accredited
7	Centro Universitario UTEG, A.C.	Private	Jalisco	Accredited
8	Universidad del Valle de Atemajac	Private	Jalisco	Accredited
9	Tecnológico de Monterrey	Private	Nuevo León	Accredited
10	Universidad Autónoma de Nuevo León	Public	Nuevo León	Accredited
11	Universidad Iberoamericana Puebla	Private	Puebla	Accredited
12	Universidad Popular del Estado de Puebla	Private	Puebla	Accredited
13	Universidad de las Américas Puebla	Private	Puebla	Accredited
14	Universidad Autónoma de Querétaro	Public	Querétaro	Accredited
15	Universidad Autónoma de San Luis Potosí	Public	San Luis Potosí	Accredited
16	Universidad Estatal de Sonora	Public	Sonora	Accredited
17	Universidad de Sonora	Public	Sonora	Accredited
18	Universidad Veracruzana	Public	Veracruz	Accredited
19	Universidad Marista de Mérida	Private	Yucatán	Accredited
20	Universidad Autónoma del Carmen	Public	Campeche	Reaccredited
21	Universidad de Ciencias y Artes de Chiapas	Public	Chiapas	Reaccredited
22	Universidad Autónoma de Chihuahua	Public	Chihuahua	Reaccredited
23	Escuela de Dietética y Nutrición ISSSTE	Private	Ciudad de México	Reaccredited
24	Universidad Iberoamericana Ciudad de México	Private	Ciudad de México	Reaccredited
25	Instituto Politécnico Nacional	Public	Ciudad de México	Reaccredited
26	Universidad Autónoma Metropolitana	Public	Ciudad de México	Reaccredited
27	Universidad Iberoamericana León	Private	Guanajuato	Reaccredited
28	Universidad Autónoma del Estado de Hidalgo	Public	Hidalgo	Reaccredited
29	Universidad de Guadalajara (CUALTOS)	Public	Jalisco	Reaccredited
30	Universidad de Guadalajara (CUCS)	Public	Jalisco	Reaccredited
31	Universidad de Morelos	Private	Nuevo León	Reaccredited
32	Universidad Juárez Autónoma de Tabasco	Public	Tabasco	Reaccredited
33	Universidad Autónoma de Tlaxcala	Public	Tlaxcala	Reaccredited
34	Universidad Veracruzana Región Xalapa	Public	Veracruz	Reaccredited
35	Universidad del Mayab, A. C.	Private	Yucatán	Reaccredited
36	Universidad Autónoma de Yucatán	Public	Yucatán	Reaccredited

Source: self-made

In relation to the study plan, there are different forms of organization and structure, in table 4, this characteristic can be glimpsed.

TABLE 4
ORGANIZATION AND STRUCTURE OF STUDY PLANS

Curriculum plan	<i>f</i>	%
Linear	29	31.78
Modular	2	4.78
Mixed	5	7.78

Source: self-made

Obviously, the type of study plans that stand out is the linear one, which is made up of a set of learning units that are studied during a series of school cycles with horizontal and vertical organization of the teaching-learning content (Fernández, 2017). About the school periods, 100% of the public HEI programs are organized in semesters, in private HEI programs, they are 75% of the semester type and 25% quarterly.

In relation to the duration of the programs, there are twenty-nine of five 5 years; three 3 of 4 four and a half years; 3 of 4 four years three programs. All include social service, according to the Inter-Institutional Commission for the Training of Human Resources for Health (CIFRHS), as a requirement to obtain the Technical-Academic Opinion, an essential element for CONCAPREN.

Table 5 shows the AUs with biochemical content that are studied at each institution, the school period in which they are offered, and the number of theoretical, practical, and independent hours and credits in nutrition degree programs.

TABLE 5
LEARNING UNITS WITH BIOCHEMICAL CONTENT IN THE STUDY PLANS

#IES	school cycle	Learning unit	HT	HP	HI	TH	C
1	2	General biochemistry	96	80	64	240	15
	3	Applied biochemistry	96	80	64	240	15
2	2	Biochemistry	32	16	16	64	4
	3	Physiology and Biochemistry of Nutrition I	32	48	0	80	5
	4	Physiology and Biochemistry of Nutrition II	32	48	0	80	5
3	2	Biochemistry	64	32	0	96	6
	3	Biochemistry of nutrition	96	32	16	144	9
4	2	Nutrient metabolism	96	16	0	112	7
5	2	Biochemistry	64	16	16	96	6
	3	Biochemistry of nutrition	96	32	16	144	9
6	2	Biochemistry I	64	64	16	144	9
	3	Biochemistry II	64	64	16	144	9
7	1	Human biochemistry	32	16	16	64	4
	2	Food biochemistry	64	32	0	96	6
8	2	Biochemistry	32	16	16	64	4
	3	Biochemistry of nutrition	32	48	0	80	5
9	1	Energy control	32	32	0	64	4
	1	Metabolism and energy	64	16	16	96	6
10	1	Structural Biochemistry	32	16	0	48	3
	4	Metabolic biochemistry	64	32	0	96	6

#IES	school cycle	Learning unit	HT	HP	HI	TH	C
11	2	Biochemical processes of nutrition	64	48	16	128	8
	3	Clinical Biochemistry	64	16	16	96	6
12	3	Nutrient metabolism	64	32	16	112	7
13	3	Biochemistry I	32	16	48	96	6
	4	Biochemistry II	32	16	48	96	6
	5	Biochemistry and nutritional physiology	32	16	48	96	6
14	2	Biochemistry	48	32	32	112	7
	3	Metabolic biochemistry	48	32	32	112	7
15	1	Chemistry and biomolecules	64	0	64	128	8
	2	Biochemistry	80	48	80	208	13
16	1	Chemistry for nutrition	64	32	9	105	6,56
	2	Biochemistry for nutrition	64	32	9	105	6,56
17	2	Biochemistry I	80	32	16	128	8
	3	Biochemistry II	80	32	16	128	8
18	2	Structural Biochemistry	48	48	48	144	9
	3	Metabolic biochemistry	48	48	48	144	9
19	3	Biochemistry I	64	32	0	96	6
	4	Biochemistry II	64	32	0	96	6
20	2	Basic biochemistry	80	0	16	96	6
	3	Nutrition and metabolism	64	16	16	96	6
21	2	Molecular basis of biochemistry	32	16	16	64	4
	3	Biochemistry of food	48	16	0	64	4
	6	Clinical Biochemistry	48	16	0	64	4
22	2	Chemical processes of life	48	32	0	80	5
	3	Biochemistry of life cycles	64	48	16	128	8
23	3	Biochemistry of nutrition and laboratory	64	32	48	144	9
	4	Molecular nutrition and laboratory	64	32	48	144	9
24	3	General biochemistry	48	16	0	64	4
	4	Metabolic biochemistry	48	16	0	64	4
25	2	Biochemistry	80	48	32	160	10
26	2	Energy and consumption of fundamental substances	96	64	0	160	10
27	3	Food biochemistry and laboratory	64	32	0	96	6
	4	Metabolic biochemistry	48	16	0	64	4
28	2	Metabolism of Biomolecules I	48	16	0	64	4
	3	Metabolism of Biomolecules II	48	16	0	64	4
	4	Bases of Molecular Nutrition	48	16	0	64	4
29	1	Biochemistry	78	42	94	214	13,4
	2	Biochemistry of food	40	40	48	128	8
30	1	Human biochemistry	80	16	96	192	12
	2	Biochemistry of food	34	34	44	112	7
31	1	Cellular and molecular biology	48	16	0	64	4
	3	Biochemistry of nutrition	64	32	0	96	6
32	5	Structural Biochemistry	32	48	0	80	5
	6	Metabolic biochemistry	32	48	0	80	5

#IES	school cycle	Learning unit	HT	HP	HI	TH	C
33	1	Biochemistry	48	48	0	96	6
	2	Food biochemistry	48	48	0	96	6
34	2	Structural Biochemistry	48	48	48	144	9
	3	Metabolic biochemistry	48	48	48	144	9
35	2	General biochemistry	48	16	0	64	4
	3	Biochemistry of nutrition	64	32	0	96	6
36	2	Human metabolism	64	0	48	112	7
	3	Biochemistry of nutrition	32	0	32	64	4

Source: self-made

The analysis of the study plans and the learning units classify three general blocks: 1) AU of generic competences (CG), 2) AU of interdisciplinary competences (CI) and 3) AU of specific competences (CE), determining the AU of general biochemistry as an interdisciplinary competition and another specific AU.

The block of the CG is constituted by two institutional programs, curricular learning units and compulsory extracurricular learning unit and other learning activities, where students can study from the moment they enter the professional study, in an effort to develop generic skills and obviously These activities go beyond a school year and transcend the entire degree (Crespí and García-Ramos, 2021).

The CI block contains the learning units and learning activities that students enrolled in the educational programs of the same Faculty must take; these learning units form a common trunk and contribute to the development of interdisciplinary skills (Villa and Mendoza, 2020).

The EC block integrates the learning units and activities of the discipline, these are classified at the same time basic AU of the career, professionalizing and mandatory and optional terminals.

In Mexico, the structuring of the study programs is aligned with the nutritionist training areas defined by the AMMFEN, 1) Clinical nutrition, 2) Population nutrition, 3) Food science and technology, 4) Food services and 5) Food fields. cross-cutting (until 2021): however, the recent updates in this categorization must land in the update processes according to the relevance and feasibility analyzes (AMMFEN, 2021).

Based on the AU of biochemistry, it is possible to observe that 11.11% (4) have only one, 77.78% (28) with two and 11.11% (4) three, addressing contents of structural and metabolic biochemistry. Regarding the credits of the biochemical UA, the average is 13.5 ± 4.71 , distributed in TH of 210.44 ± 82.91 , HT of 113.11 ± 28.47 , HP of 67.22 ± 30.12 , HI 48.78 ± 48.95 . 94.44% of the UA are taught from the first to the fourth cycle, starting with contents of structure, conformation, composition, characteristics, classification, and function of biomolecules, in a second moment, generally, the contents of absorption, transformation, path are observed, excretion and elimination.

Regarding laboratory work, 4.55% (1 of 72) of the AUs do not declare practical teaching and 26.55% (22 of 72), use 16 laboratory hours during the school year, which can be considered as a deficiency, because according to the criteria of accreditation of programs of the Degree in Nutrition, the biochemistry laboratory is located as essential.

The review of public information makes it possible to identify that most institutions include two biochemistry subjects in their curriculum, addressing, in the first instance, the structure and function of biomolecules. In a second moment, it is common to call it "Biochemistry of nutrition", whose study objective is generally metabolism, which is referred to in different ways: human biochemistry, energy control, nutrition and metabolism, metabolic biochemistry, nutritional biochemistry and physiology, metabolism of biomolecules, human metabolism, among others.

Regarding the graduation profiles, only these are specifically described at the Universidad Autónoma de Nuevo León, Universidad Popular del Estado de Puebla, Universidad de Sonora, Universidad Autónoma del Carmen, Universidad Iberoamericana León y Universidad Autónoma de Tlaxcala (Table 6).

TABLE 6
IES THAT SPECIFY BIOCHEMISTRY IN THE GRADUATION PROFILES

IES	Objectives
10	Evaluate the nutritional status of people with pathologies, to identify risks through the interpretation of anthropometric, biochemical, clinical, and dietary indicators and economic situation.
12	Distinguish dietary assessment instruments, biochemical tests, and anthropometric data.
17	Train professionals with a comprehensive vision of nutrition, particularly in the relationship between Nutrition and Public Health. Therefore, their training integrates knowledge of biochemical, food and social sciences that allows them to develop a multidisciplinary approach in addressing the needs of the population, both individually and at the community level.
18	Relate the levels of chemical, biological, physical, and ecological organization of living systems, through the application of the scientific method and collaborative work to influence social problems, within a framework of responsibility, honesty and respect for the environment, the cultural diversity and gender equity.
20	Provide students with the necessary knowledge in the development of skills, attitudes, and social relationship capacity, to generate and disseminate metabolic studies, diagnostics of the state of nutrition in specific and high-risk groups; as well as those related to food
27	Apply the anatomical, physiological, and biochemical bases and foundations of the nutrition process in both health and disease conditions.
33	Establish an individualized nutritional intervention for healthy, at-risk, ambulatory and/or hospitalized patients at all stages of life, based on the understanding of basic concepts in nutrition, integration of the evaluation of nutritional status, structure (biochemistry) and function human.

Source: self-made

Regarding the graduation profiles, only seven statements made a specific mention of biochemistry. In most of the manifestos, emphasis is placed on aspects related to the six basic professional fields of the nutritionist, however, the statement on the training of basic sciences is somewhat neglected, it is convenient that this be taken into account in subsequent curricular updates.

The teacher, as he is the agent responsible for guiding and coordinating the teaching-learning process (appointment), therefore needs to have a profile clearly defined by the educational program; that is to say, that the professional training corresponds to the level, the discipline and the other tasks that the teacher is going to carry out in the educational program and in the case of the minimum characteristics determined in the teacher who teaches the UA; 9 were identified, which can be seen in Table 7. It should be noted that only 17 programs identified this information on the institution's official website. Characteristics 1, 2, 3, 4 and 5 could be repeated in the same AU, since they gave ranges of possibilities.

Clearly locating the characteristics of the teachers implies the approach of a multidimensional construct, because the teacher, more than teaching the subject, must enhance the skills of the students that allow the construction of knowledge; In addition, teachers characterized by a high degree of cognitive independence are needed in the teaching-learning process. In this regard, the desirable characteristics for the professor who teaches this discipline in nutrition programs in Mexico, mostly refer to qualification with postgraduate degrees in related areas and both teaching and disciplinary experience.

Teaching biochemistry in nutrition undergraduate programs requires students to understand the basic principles of the chemistry of life, to study the molecular structure of the human body, and the metabolic pathways of molecules that interact to ensure the proper functioning of the body (Ñique, 2020). Teaching is one that promotes student learning; therefore, the quality of teaching will be observed if it is perceived in the commitment of teachers in the development of their work, based on the roles that directly affect the demands that arise. as a result of the statements of the instruction (Ramos et al., 2003). These demands

require, in turn, the development of new tools for teaching and learning, such as the use of new technologies, learning management, tutoring and attention to individual differences, among others.

TABLE 7
TEACHER PROFILE

Characteristics	f	%
1. Bachelor's level	6	35.29
2. Graduate level (master's or doctorate)	16	94.12
3. Nutritionist by profession	9	52.94
4. Doctor by profession	12	70.59
5. Other professions (QFB, chemists, nurses, etc.)	14	82.35
6. 1 to 2 years of experience in the area	2	11.76
7. > 2 years of experience in the area	15	88.24
8. 1 to 2 years of teaching experience	6	35.29
9. > 2 years of teaching experience	11	64.71

Source: self-made

It is more than clear how important the study of biochemistry is in the training of professionals in the health area; the importance lies in the fact that it is the science that studies the molecular bases of life; that is, the chemical composition of living matter, the structure-function relationship of the characteristic molecules of living beings, the chemical transformations that take place in said organisms and the molecular mechanisms that intervene in their regulation. The nutrition professional, without a doubt, requires knowledge of biochemistry for professional practice, this leads to strengthening training programs in the six professional fields described by AMMFEN, in the case of Mexico.

As a mechanism to ensure the quality of the study programs, evaluation processes are carried out, which implies the identification of areas of opportunity that guide the strategic planning of the educational institution (Rodríguez et al., 2018). The accreditation specifically promotes the improvement of academic programs by addressing the recommendations of the accrediting bodies, this allows the programs subject to these processes to receive public recognition as institutions of academic prestige and access to support programs that contribute to the integral improvement of its human capital, equipment and infrastructure. However, the most important improvement is that, in the institution, a system is integrated that allows the identification, organization and attention to objectives oriented towards continuous improvement (López, 2019). According to CONCAPREN, until 2022 of the 400 programs in the area of nutrition registered with the Secretary of Public Education, in Mexico, only 10.25% (41) of these have this current distinction, with the majority being public HEIs (CONCAPREN, 2022). The interest of HEIs in participating in these processes has increased in recent years, either through evaluation or accreditation, showing the consolidation of the culture of quality, validated by external agents (such as COPAES and the Inter-institutional Committees for the Evaluation of Higher Education (CIEES)), which reflects the openness of the HEIs, given the commitment and search for the legitimization of quality (Jiménez, 2019).

Said consolidation process has not been immediate, much less easy; It has been achieved thanks to the close relationship with budget elements. In this regard, according to data from the World Bank, one of the reasons why higher education was considered to have poor quality was inadequate and insufficient spending (Pérez, 2013). For this reason, streamlining academic processes and promoting evaluation and accreditation have been promoted in order to achieve quality. This policy led to the implementation of evaluation and accreditation through agencies external to the institutions (Jiménez, 2019).

The benefits that the processes of evaluation and accreditation of university programs are above the mere concept of quality that underlies the policy that founded its implementation in the Higher Education System, since it implies updating the study plans. of educational programs, promotion of student mobility, renovation of infrastructure, constant updating of the bibliographic heritage and the development of

research is encouraged (Pérez, 2023). However, it is necessary to point out that the method has been strongly questioned, since it has put aside the autonomy of the HEIs, since many of the policies and improvement actions are guided by the standards and indicators defined by external instances (Jimenez 2019).

CONCLUSION

The curricular proposals of 36 programs accredited by CONCAPREN were analyzed; In most of the graduate profiles of these programs, the knowledge of biochemistry that is intended to be consolidated is not specifically mentioned. For this reason, it is convenient to suggest that these pillars be projected in the curricular redesigns, essential for the training of the biochemistry professional. The nutrition. On the other hand, the revised study plans generally offer two biochemistry subjects, these are located at the beginning of the degree. The first, in most curricula, addresses the structure and function of carbohydrates, proteins, lipids, vitamins, and inorganic nutrients. The second section deals with metabolism; therefore, it can be presumed of a certain homogeneity in the general objectives of the subjects.

The most important difference is found in the time allotted to biochemistry education; between 48 and 240 hours are dedicated to the degree, with an average of 108.11 ± 41.82 hours; Given this, homogeneity could be recommended in this sense, likewise, that biochemistry subjects have a minimum duration of 4 hours per week and laboratory work, this will allow greater integration of knowledge.

Finally, an essential actor in this process is the teacher, therefore, it is necessary that, within the collegiate work of each IES, the teacher training of teachers who teach basic sciences be reviewed, emphasizing biochemistry, allowing the socialization of good practices, establish ideal time and type of dedication, in an effort to achieve the professional objectives set for the training of nutritionists in Mexico.

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