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A competency-based curricular framework for forestry professionals human development, and a sustainable environment

Un marco curricular por competencias para el desarrollo humano y profesional del forestal, y un ambiente sostenible

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Abstract

An alternative presented follows the studies derived from the Forum "Defining the profile of the forestry professional of the future" held on September 6, 2021, with the assistance of 160 experts selected by different institutions to carry out a joint analysis of the situation of Forestry Professionals in the new realities, supported by a Delphic Study where they reflected their experiences, opinions, and expectations, with this it was also possible to promote the rapprochement with its members, collect their perceptions and experiences, as well as clarify the new scenarios and collect proposals, transforming the proposal attitudes into elements of analysis with new orientations of the forestry work. The result of the study presented follows these findings and indicates six attributes required by the Curricular Framework and which are: 1. Promote Integral Human Development, 2. Self-manage Professional Development, 3. Development of Executive Functions and Higher Thinking Skills, 4. The impulse to Social Integration, 5. Fulfill the environmental agenda, and 6. Educate under the paradigm of Agrocultural Revitalization and also, norms for curriculum development.

Curricular framework, Curriculum design, Forestry

Resumen

Se presenta una alternativa que sigue a los estudios derivados del Foro “Definiendo el perfil del profesional forestal del futuro” efectuado el 6 de septiembre de 2021 con la asistencia de 160 participantes expertos seleccionados por diferentes instituciones para realizar un análisis conjunto de la situación de los Profesionales Forestales en las nuevas realidades, apoyados por un Estudio Délfico donde plasmaron sus experiencias, opiniones y expectativas, con ello también se pudo propiciar el acercamiento con sus agremiados, recabar sus percepciones y experiencias, así como clarificar los nuevos escenarios y recabar propuestas, transformando las actitudes propositivas en elementos de análisis con nuevas orientaciones del quehacer forestal. El resultado del estudio que se presenta sigue dichos hallazgos e indica seis atributos que requiere el Marco Curricular y que son: 1. Promover el Desarrollo Humano Integral, 2. Autogestionar el Desarrollo Profesional, 3. Desarrollo de las Funciones ejecutivas y las Habilidades superiores del Pensamiento, 4. Impulso a la Integración social, 5. Cumplir la agenda ambiental, y 6. Educar bajo el paradigma de la Revitalización Agrocultural y, además, con normas para el desarrollo curricular.

Marco curricular, Diseño curricular, Professional

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Introduction

In a global context characterized by increasingly broad and profound transformations, the Mexican forestry sector aims to create a prospective vision of the future of its members and the forestry sector as a whole to adjust the personal and professional training of its members to the new conditions of Mexico.

That is why in September 2021 the Mexican Association of Forestry Professionals convened a "Defining the Profile of the Forestry Professional of the future" with analysis and discussion with 160 expert participants in working groups to gather their perspectives on this topic, who contributed with their written contributions in a Delphic study. The result was an extensive database compiled and analyzed by a hermeneutic unit with the Atlas Ti software, which showed the personal dispositions that are necessary to form an integral forest and integrated into the social and environmental dynamics, as well as the labor relations with its activities.

In the resulting qualitative and quantitative analysis, the need for a competency-based curricular framework that supports the development of the multiple institutions that promote these careers was expressed, therefore, outside the aforementioned study, and as a necessary complement to it, the authors were asked to design an alternative that could correspond to the profiles of the graduate in the different educational programs in force or in the process of development.

The experiences gathered from the experts participating in the Forum, with the Delphic Study, culminate in a matrix model of competencies, which integrates the different Levels of Expert Knowledge and the Postulates of LEARNING of UNESCO. The importance of the study lies in the generation of a basic platform of Forestry Educational Institutions for the transformation of their Competency-based Curricula and Curricula, and training programs for professionals in service.

Within the conceptualization, the Curriculum is considered as all the learning opportunities offered by the institution to students. The curriculum is a product of human and social history; therefore it changes as all social constructions and its definition also change and is transformed in response to historical circumstances, economic and political structures, and the personal and group interests of the sectors that elaborate the curriculum, in addition, refers to all the elements que that within the educational system participate directly or indirectly in the process of learning, and it happens to include the objectives of education, derived from one's own life. (Abarca V., 2010).

To operate the design of the curriculum, it must be aligned through its components called Curricular Paths, which are large areas or axes of coherent contents that constitute it, which are defined as interrelated sets of postgraduate curricular activities around a thematic axis that corresponds to the interests of professional practice and/or theoretical foundation, whose purpose is the updating, training, and improvement of high-level professionals. (Estudios de Posgrado en La Universidad Nacional de San Luis Argentina, 2002).

With them, the subjects of the Curriculum are derived, as a set of contents organized logically and psychologically in a temporal sequence, although they will have to be reviewed with other visions such as the paradigm of Agrocultural Revitalization (Muñoz López & Guajardo Espinoza, 2014).

Theoretical perspectives

However, there are some norms oriented to human development in the personal aspects and beyond the work skills during schooling, according to different self-styled Models, such as Executive Functions that are the mental routines responsible for the monitoring and regulation of cognitive processes during the performance of complex cognitive tasks (Zapata, 2009) and others based on neuropsychology (Bausela Herreras, 2014).

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This also implies the development of higher thinking skills as processes carried out by the subject when learning, organized and coordinated when processing information, which allow the development of intellectual, psychomotor and/or socio-affective capacities, as well as the solution of problems and decision making in the understanding and application of knowledge in specific situations (Sanz de Acedo Lizarraga, 2016).

A clearer understanding of this is provided by Margarita Amestoy, who considers that the application of these skills in learning problem solving and decision-making in a variety of situations and environments are important to develop the skills of logical-critical and creative thinking, reasoning, and carrying out the transfer of these skills to learning and life. (Amestoy de Sánchez, 2002).

This involves extending the study and understanding of some processes of the human mind such as perception, knowledge representation, cognitive modifiability, the construction of psychological models of information processing concomitant with the Skills for logical, critical, creative and emotionally balanced thinking.

This thought in a second moment the person, applies these skills to acquire knowledge in different disciplines or environments, to transfer the knowledge acquired to new areas, to create knowledge and generate products, to establish generalizations and to develop the attitudes and values that correspond (Amestoy de Sánchez, 2002).

Additionally, he states Eugenia Laisequilla, that Education should lead students to develop higher thinking skills. Reflective thinking makes students reason in a superior way managing to apply their knowledge, improving their school performance and their level, according to PISA (Rodríguez Laisequilla, 2018).

Other sources of conceptual elements for the design of a curricular framework related to the acquisition of knowledge throughout life may include the Thinking-Based Learning of Teachers Collegue Press (Satrústegui, 2009) (Swartz et al., 2008) or the so-called HyFlex Model as a combination of online and face-to-face elements of hybrid learning of the Dr. Brian Beatty (Beatty, 2019).

With this background we have the general regulations for the Curricular Framework, which reinforces the idea of maintaining the Curricular Alignment, as a methodology to develop curricular frameworks with coherent, congruent, pertinent curricula and subjects, which have as a consequence a more efficient learning, and with cognitive dispersion reduced to a minimum. (MUÑOZ-LÓPEZ et al., 2019).

One cannot lose sight of the fact that finally Education is the harmonious and integral development of all human potentialities.

We can arrive at the goal of curricular design considering the multiplicity of elements previously enunciated to crystallize the Graduate Profile, which defines what has to be achieved in a specific educational process, that is, its most general objectives, by which the most important decisions are made as transcendent, in the sense of doing everything that is necessary to do and in the appropriate order to form it, so it systematically defines the direction that the graduate must follow, his "so that". (Arnaz, 1981).

Thus, the Profession as a socially useful activity carried out by a person, holds the person who exercises it responsible for responding both to the demands of their own work, and to the social needs related to their field of action. Other authors show the importance of self-management as a competence that has been emphasized under a process of autonomy in learning for the personal and academic project. The involvement and commitment of students is essential in the acquisition of knowledge through the allocation of resources available in the university environment. The background that self-management will provide provides a prior preparation for the transition to the world of work (Lugo Muñoz & Alcántara Rubio, 2017).

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A Curricular Framework, according to the above concepts, outlines the criteria and norms to which the curricular design must be subject, to avoid misaligned curricular products and high cognitive dispersion. Precisely higher education, even if it is of the basic profile, must incorporate elements that allow the graduate to adapt to various situations and work contexts (Hawes B. & Corvalán V., 2005).

Thus, the Curricular Framework is a normative statute that regulates the design or transformation of educational programs through the establishment of limits and conceptual parameters, thematic axes, perspectives, methods and criteria that are considered valid in an academic community and, which describes the fundamental features that the formative process of the graduate of an Educational Program must possess.

The curricular framework is based on the previous formulation of the definition of terminal performances of the graduate and the professional that are eventually shared between educational institutions, either informally, or by agreement between the parties, which may be organized based on competences.

Since the promulgation of the ACUERDO number 444 the definition of the Curricular Framework of education in its different levels and types has emerged as a necessity in Mexican education ("Acuerdo Número 444 Por El Que Se Establecen Las Competencias Que Constituyen El Marco Curricular Común Del Sistema Nacional de Bachillerato," 2008).

The Curricular Framework seeks to respond to the challenges of a world in constant transformation, which is why it rearranges and articulates contents, formulates the individual qualities, those of an ethical nature, of the academic, professional and social profile that every graduate must gather.

Methodology

Given that the Curricular Framework seeks to respond to the challenges of a world in constant transformation, it rearranges and articulates contents, formulates the individual qualities, those of an ethical nature, those of the academic, professional and social profile that every graduate must gather.

To this end, the database created by the analysis of texts generated by 160 experts through a Delphic Study was used as a source of information for a hermeneutic unit with 149 Codes that refer to the professional dispositions (Knowledge, Values, Habits, Attitudes and Aptitudes) that are characteristics of the Forest Professional Profile, analyzed quantitatively in a Matrix of 1,405 co-occurrences between variables, with statistically significant values for their relevance in mentions >5.72, with which they were mapped in Cmap Tools forming a figure that shows a constellation of variables that highlights those that have the highest number of relationships and a higher coefficient of co-occurrences in them.

To determine the meaning of the variables resulting from the study, the criteria that the Forest Profile must contain are selected and shown following a methodological syncretism (an obligatory and indispensable unit in its inclusion by the methodology under development) to denote the Functional Attributes (the What) and the Operational Attributes (the How).

Finally, the criteria necessary to design the forest profile and the structure of a matrix model are elucidated, as an example for a curriculum.

Results

A complex of relationships between the different types of dispositions was obtained, where the most significant dispositions are highlighted for their higher value of relationships above normality to a sigma, as well as the relationships that evidence the underlying structure of the Profile of the Forestry Professional according to the 160 experts participating in the Delphic study. The Central Results of the Forest Profile denote an underlying structure of variables that are the most relevant in the discourse of the experts, where the environmentalist, social commitment, entrepreneurial and innovation attitudes stand out as the core of support for the profile; Skills include the ability to be a Teacher, the Management of Tools, the Management of specialized software and the aptitude for FieldWork; the above related to having the Technical Knowledge and Forest Management, integrated all with social responsibility See Table 1, Figure 1 and Figure 2.

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The functional attributes required by the Forest Curriculum Framework are:

1. Promote Integral Human Development.
2. Self-manage Professional Development.
3. Development of Executive Functions and Higher Thinking Skills.
4. Promotion of Integration and Social Inclusion.
5. Meeting the environmental agenda.
6. Educate under the paradigm of Agrocultural Revitalization.

And operational attributes comprise:

- Intensive use of computer technology
- Social commitment and community forestry
- Active learning methodologies in the field and classrooms.

The description of the requirements raised by the experts includes what has to be included additionally and as part of the Standards for Curriculum Design, including:

- Promote Curricular Alignment from the Profile and objectives, to the content of the subjects.
- Maintain a coherent Curriculum focused on Human Development, the Environment and Digital Education.
- Use educational methods based on meaningful learning, constructivism and metacognition.
- Starting from practice with technological application and building scientific explanations with it.
- Orient the contents to a scientific vision (objectivity, rationality and truth) and technological development.
- Develop the Curricula with subjects from the simple to the complex and from the general to the particular.
- Include the cross-cutting themes in each subject of the subjects integrated into the class contents (e.g., gender equity, Development of moral judgment, Inclusion, etc.).
- That each subject contains only what is pertinent, convenient, necessary and appropriate to the natural and cultural characteristics of its area of influence.
- Create an academic audit department that oversees the proper application of the curriculum.
- Permanently update the curriculum.

A Matrix Design of competencies

As an exercise to define possible competences derived from the curricular framework, now based on competences, here a competence is considered as: the mobilization of an articulated set of personal dispositions (knowledge, values, habits, attitudes and aptitudes), manifested in a performance (knowing, being, knowing, doing) previously defined, in a specified context and with expected levels of execution (Muñoz López et al., 2011).

Taking as components of the Dimensions of Performance according to the four postulates of UNESCO on learning in the headers of the matrix (Delors et al., 1996), and in the first column the seven Levels of Performance of Expert Knowledge (Muñoz López et al., 2016), we have the competences that will give the focus to the learning of the contents, as observed in the Tabla 2.

Conclusions

To explain more clearly the results obtained and the possibilities of improvement for the construction of a Forest Curricular Framework, we can recommend that the most relevant topics be followed, such as the attributes analyzed, considering the following:

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1. Promote Integral Human Development. Since to educate is not only to tame the anthropoid but to let it live through a refinement of its existence and the careful and learned extraction of potentialities that go beyond adrenal emotion, the patient conduction of affectivity, and the elaborate constructive complexity of its rationality.(Fullat i Genis, 1982).

2. Self-manage Professional Development. Self-management allows us to process and guide our actions guided by the will, in such a way that we achieve fulfillment by directing motivation and concentration. Self-management as a personal and academic competence is essential in the acquisition of knowledge in your professional life. The baggage that will provide them with self-management at the end of the instructive path, provides a previous preparation for the transition to the world of work. A series of tools is proposed under training actions to face the business environment autonomously.

3. Development of Executive Functions and Higher Thinking Skills.

The mental routines responsible for the monitoring and regulation of cognitive processes, in the performance of complex cognitive tasks during initial and professional training, has an effect on the development of higher thinking skills permanently throughout life.

4. Promotion of Integration and social inclusion.

It is necessary to open mentalities in social aspects from a cultural perspective of integration, towards one of social and professional inclusion. This highlights an extremely positive conceptual evolution in the university environment to articulate new discourses and professional practices that project and illuminate the idea of a formative process.

5. Comply with the environmental agenda. The achievement of the 17 major goals and sustainable development goals, especially, but not exclusively, Goal 15, Protect, restore and promote the sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification and halt and reverse land degradation, and halt the loss of biological diversity.

6. Educate under the paradigm of Agrocultural Revitalization. This implies including the components of Protect, Produce and Restore, considering that man is part of nature, he is one more strand of its fabric and not the owner of it and its resources, that to maintain it in this delicate balance we need to know and regulate the impact of our interventions, particularly on the forest resource that is strategic for social development.

And the operational attributes demanded by experts who comprise:

1. Intensive use of Artificial Intelligence, which incorporates computer technology, the use of remote sensors, simulation programs for resource management and software for resource evaluation.

2. Social commitment and community forestry that refers to the local problems faced by the owners and possessors of the resource with their different forms of organization, as well as the legal relations they establish between them and the policies that regulate them, in accordance with current legislation.

3. Active learning methodologies in the field and classrooms. Principle that obliges a practical education, as a resource that will necessarily rise to higher levels of abstraction of expert knowledge (Theory, Methods, Methodology, Strategies, Logistics, Operationalization and Instrumentation).

These attributes are the Curriculum Framework Standards that guide curriculum design, and they have to work for:

1. Define the curricular paths the courses of the Curriculum.

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2. Design competencies.

3. Specify the expected learnings.

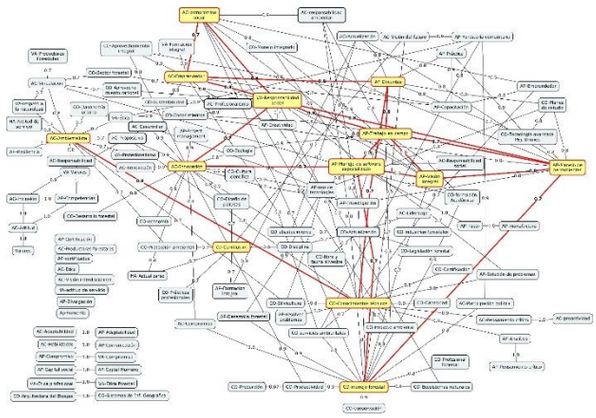

Figure 1 Complex of relationships between the different types of dispositions, where both the most significant dispositions stand out in another color for their higher value of relationships above normality to a sigma, and the relationships that evidence the underlying structure of the Profile of the Forestry Professional according to the experts participating in the study

Variable	Relationships in the Core	Relationships in the overall structure
VA-Social responsibility	5	7
AP-Field work	4	11
AP-Tool handling	3	10
AC-Entrepreneur	3	9
AP-Teachers	3	8
AP-Specialised software management	3	8
CO-Forestry management	2	19
CO-Technical skills	2	18
AC-Innovation	2	17
BC-Social commitment	2	9
AC-Environmentalist	1	12

Table 1 Where the central variables of the structure of the Forest Profile of the study are shown, their relationships in this nucleus and with the total structure

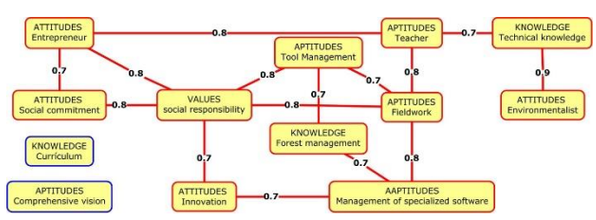

Figure 2 Underlying structure extracted from the figure of all the provisions and all the significant relationships, which the experts consider to be part of the Forestry Professional Profile

Performance Dimensions/ Performance levels	Axis of knowledge	Axis of Being	Axis of to Know	Axis of doing
Theory	Grounding with scientific/philosophical bases	Analyze the Ethical Models of Being	Search with critical scientific thinking	Argue logically and creatively
Methods	Elucidate the methods involved	Systematically explore personal identity	Using method perspectives	Design methods
Methodology	Identify the participating Processes	Develop the imago (internal image)	Update in specific procedures	Design procedures
Strategies	Analyze the different existing strategies	Establish the basic sites of conduct	Research new strategies	Strategies Design
Logistics	Have knowledge of project organization	Have a life plan	Have or make a plan to know	Design projects with diagrams and monitoring
Operationalization	Know How	Teamwork	Development and monitoring of manuals	Instruct in sequence of steps
Instrumentation	Develop manual processes (create)	Entrepreneurial attitude	Project monitoring	Run Hard and Soft Technology

Table 2 Example of Matrix Design of the Competency-based Curriculum Framework, considering the dimensions of performance according to UNESCO's learning postulates and the Levels of Performance of Expert Knowledge

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