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EDITOR'S LETTER

Dear readers, we are pleased to present the number 23, volume IX, of the scientific dissemination magazine *Espacio I+D. Innovación más Desarrollo*. This number is special for us as an editorial team because it was structured in the middle of the crucial moment that humanity is going through, the COVID-19 pandemic.

As our rector instructed us, the UNACH did not stop working; however, we conducted ourselves with total responsibility, and the issue was integrated thanks to a coordinated work, following the National Order of “Healthy Distance”. If anything has become clear to humanity these days, it is that Science is the answer, but if it is not at the service of society, it loses all meaning. The above has strengthened the reason of this journal, to link the knowledge of our university academics in terms of scientific popularization, with guaranteed quality through its strict system of peer evaluation and in full Open Access, which makes the results of research and teaching activities available to anyone.

This June-September issue contains multidisciplinary articles such as: Hotel growth analysis: case Guaranda, province of Bolivar-Ecuador; Impact of funding Ensenada’s environmental csos on their hiring schemes; Game as a teaching resource for science education: Math and Chemistry; Study of the risk of having an eating disorder in undergraduate and graduate students in Mexican institutions; The relation between Body Mass Index (BMI) and Waist Circumference (CC) with Glucose, Cholesterol, and Triglycerides in Medical Students; Approach to the concept of education from a contemporary native people community and Teaching prototype of a bi-directional vibrating table for the study of small-scale structural systems.

All of them coming from various universities in Ecuador, Baja California, Tabasco, Mexico City, and obviously from Chiapas, from universities such as UNICACH, UNICH, and UNACH. We also include academic documents, two reviews: Intelligent, Sustainable and Collaborative Cities and Emerging Problems in Security from a Foresight Perspective, and Observation and monitoring of gender-based political violence against women in the Southeast Region, this last one edited by the UNACH, and finally an analysis on the “Foundation and development of traditional political parties in Mexico. A critical approach.”
In the multimedia materials, we include a capsule that revolves around COVID-19 and the usual care that we must have; for this occasion and obvious reasons, this capsule substitutes the cultural report. As for the academic report, we present the work made by university students and producers of Copainalá through the Escuela de Estudios Agropecuarios Mezcalapa, with the experience of research professors and students, through the Design and implementation of natural resources conservation and restoration strategies. We hope that, in general, the whole community is well and that they continue making this university publication their own.

Enjoy this Space of Innovation!

"Por la conciencia de la necesidad de servir"
Universidad Autonoma de Chiapas

The editors
ARTICLES
HOTEL GROWTH ANALYSIS: CASE GUARANDA, PROVINCE OF BOLIVAR-ECUADOR

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— Abstract —

This research presents a comparative analysis of the growth of the hotel industry in the city of Guaranda, Bolivar Province - Ecuador during the period 2009-2017. The objective is to determine hotel growth and the impact it has generated on the percentage of occupancy of accommodation companies. The methodology used was qualitative-quantitative, field research was conducted to obtain information using surveys in existing hotel establishments in the city of Guaranda, and interviews were developed that were applied to their owners. It was determined that the city of Guaranda has had a growth in the number of establishments and places, which has resulted in the hotel occupancy rates being low compared to the installed capacity.

Keywords

Guaranda; hotel; hotel plant; occupancy percentage.
The city of Guaranda, located in the Province of Bolivar, Ecuador, in the south-central region of the inter-Andean, founded by the Spaniards in 1571, elevated to Villa Mayor on November 11, 1811. On November 9, 1820, it was the location of the Camino Real battle, where the troops of the crown were defeated, and Guaranda proclaimed its independence from the Spanish realm. It was declared Cultural Heritage of Ecuador on October 23, 1997 (Decentralized Autonomous Government of Guaranda, 2018).

**HISTORY OF THE HOTEL INDUSTRY IN THE CITY OF GUARANDA**

Guaranda was the passage between the coast and the mountains near the old Via Flores, and it was a thriving town. Some families lodged the travelers and merchants who went to Bodegas de Babahoyo, today a city, and other towns on the coast. They passed through with mule trains that brought ice from the snowy Chimborazo and products from the mountains; they spent the night in places known as Tambos.

According to the locals, the existing shelters were in strategic sites such as Las Herrerías, Vinchoa, San Lorenzo, Santiago, Bilován where the Tambo de Angas was located. The importance of this Tambo was confirmed by Don Pedro Vicente Maldonado in his letter (map) of the province of Quito, brought to light by order and at the expense of His Majesty Louis XV, in 1750.

In his book "To the Coast" the writer from Ambato, Luis A. Martínez, describes in great detail his passage through the Bolivarian landscapes, as follows: "Late in the afternoon, the traveler arrived in Balzapamba, the first town, or rather, a hamlet of hot land, on the road that goes from Guaranda to Babahoyo" he also narrates the place where he would spend the night to rest and eat, "the traveler dismounted in front of a small house wrongly called a hotel. The muleteer, who was carrying luggage on a thin, woolly horse, unloaded it and, climbing up a steep staircase, asked for a room and food for the skipper. A pale man, with an angry face, led the guest to a zaquizamí to store the baggage" (Martinez, 1969, pp. 146-147)

According to the people of the city of Guaranda, houses offered accommodation to travelers in the capital of the province. Some of those houses were Mr. Gregorio Coloma’s House Inn, whose existence dates from the nineteenth century, where Dr. Gabriel Garcia Moreno, ex-president of Ecuador, stayed. The year when the Inn stopped offering service of lodging is unknown.

Mr. Benjamín Lombeida’s House Inn, known as Tambo, offered to lodge and served to exchange products from the coast and mountains. Approximately in the year 1918, the house of Mrs. Joaquina Davila, located in the streets García Moreno and Convención de 1884, began to operate. Around 1938, the Central Inn of Mrs. Mercedes del Salto, located on Convención de 1884 Street, began to provide lodging services. Later, in 1938, the first
boarding house with the name "Ecuador" was installed in Guaranda. It was owned by Mrs. Rosa Espinoza de Vásconez, who provided lodging services in single, double, and triple rooms. In 1940 the Ramírez Hotel, located on Azuay and Sucre streets, opened its doors and ceased to operate in 1960.

Inns gradually disappeared due to the construction of the railway track, which united the mountain range with the coast, and which, for political and economic convenience, was laid out by areas such as Alausí, Sibambe, and La Nariz del Diablo, and not by the Kelly track in the Province of Bolívar. (Larrea, 1998)

In the year 1968, approximately, the Tequendama Guesthouse begins to operate. Other accommodations started working as the Cochabamba Hotel, it was open the year 1970, in the year 1986 it changes of administration, counting from its beginning with services of lodging and feeding.

In 1972 the Bolivar Hotel offered its clients rooms with private baths and food. In 1978 the construction of La Colina Hotel began, and it opened its doors in 1979 and offered services of accommodation, feeding, swimming pool, sauna, tennis courts, volleyball, bar, hall of events, and other complementary products.

A group of enthusiastic Bolivar people, together with the Provincial Council and the Municipality of Guaranda, observed that the province and the city had only one first-class hostel to accommodate national and foreign tourists. They undertook the construction of the Tambo el Libertador Hotel, which due to the lack of economic support to the touristic place was not completed and was abandoned for several years until 2002 when construction and equipment finalized, opening its doors to the public.

"Guaranda has an area of 1897.8 km², an altitude of 2,668 mamsl, and a mild climate that varies from cold mooland due to its proximity to the snowy Chimborazo, to a mild subtropical climate in the valley." (Guerrón & Terán, 2014) It has different natural and cultural tourist attractions as shown in Chart 1.
Chart 1
Attractions in Canton Guaranda

<table>
<thead>
<tr>
<th>NATURAL ATTRACTIONS</th>
<th>CULTURAL ATTRACTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Peñón and Complejo Camilo Montenegro</td>
<td>Guaranda’s Carnival</td>
</tr>
<tr>
<td>Natural Viewpoint Colina San Bartolo</td>
<td>Historic Center of Guaranda</td>
</tr>
<tr>
<td>Natural Viewpoint Colina Cruz Loma</td>
<td>Indio Guaranga Viewpoint and Cultural Center</td>
</tr>
<tr>
<td>Natural Viewpoint Colina San Jacinto</td>
<td>Pase del Niño in the city of Guaranda</td>
</tr>
<tr>
<td>Natural Viewpoint Colina Talilag</td>
<td>Fair and Markets of Guaranda</td>
</tr>
<tr>
<td>Natural Viewpoint Colina Tiliilag</td>
<td>Carnival Museum</td>
</tr>
<tr>
<td>Viewpoint Loma de Guaranda</td>
<td>Day of the Death</td>
</tr>
<tr>
<td>Natural Viewpoint Colina El Calvario</td>
<td>Festivals for Saint Peter and Saint Paul in the Guanojo parish</td>
</tr>
<tr>
<td>Polylepis Woods</td>
<td>Craftsmanship, Wool Weaving, Cheese, and other products in the Salinas parish</td>
</tr>
<tr>
<td>The Troje, Shores and the Salinas River Waterfall</td>
<td>Festival of the Holy Kings in the Salinas parish</td>
</tr>
<tr>
<td>Ishpingo Waterfall</td>
<td>Archaeological Ruins of Guanguilquin</td>
</tr>
<tr>
<td>Los Caseiches Ecological Complex</td>
<td>The Holy Father’s Grotto</td>
</tr>
<tr>
<td>El Arenal and Natural Landscape</td>
<td>Andinism at Chimborazo</td>
</tr>
<tr>
<td>Las Cochas Lagoon, (Puricocha and Patococha)</td>
<td>Archaeological Stones and Caves</td>
</tr>
<tr>
<td>Peña Blanca Woods</td>
<td>Craftsmanship, Making of various products</td>
</tr>
<tr>
<td>Chimborazo Faunistic Reserve</td>
<td>Game Bands, Music, Popular Games</td>
</tr>
<tr>
<td>Salt Mines</td>
<td></td>
</tr>
<tr>
<td>Cocha Colorada Lagoon</td>
<td></td>
</tr>
<tr>
<td>The Caseiches rapids</td>
<td></td>
</tr>
<tr>
<td>Tiagua Caves</td>
<td></td>
</tr>
<tr>
<td>Mining sites in the Salinas and Simiatug parishes</td>
<td></td>
</tr>
</tbody>
</table>

Source: Decentralized Autonomous Government of Guaranda. Own elaboration

The Carnival of Guaranda represents the biggest celebration of the city and with the Ministerial Agreement N° 4291 of the Minister of Education and Culture, Sports and Recreation of October 31, 2002, it was declared Intangible Cultural Heritage of the Ecuadorian State. It takes place between February and March of each year. This festivity turns Guaranda into one of the most visited cities by national and foreign tourists.

During May, tourists visit the city throughout the festivities of the province’s foundation, characterized by the realization of fairs and exhibitions that motivate tourists and traders to visit the city.
DEVELOPMENT

Hotel regulations in Ecuador

Government institutions such as the Ecuadorian Tourism Corporation and the Department of Tourism has been regulating the tourism and hotel sector in Ecuador. These entities have generated regulations that have allowed establishments to be classified according to their infrastructure, personnel, and the services they offer, among others:

- Regulation of Tourist Activities Official Registry No. 465 of March 24, 2015.

Chart 2 contains information related to the classification of hotel establishments. These categories allow the identification of the existing differences in the denomination of lodging establishments, which have categories according to the infrastructure, personnel, and other elements that they possess.
Chart 2
Classification of accommodation establishments

<table>
<thead>
<tr>
<th>Hotel Regulation 1978</th>
<th>Hotel Regulation 2002</th>
<th>Regulation of tourist activities 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hotel accommodations</td>
<td>Hotel accommodations</td>
<td></td>
</tr>
<tr>
<td>Hotels</td>
<td>Hotels</td>
<td>Hotel</td>
</tr>
<tr>
<td>Hotel Residence</td>
<td>Hotel Residence</td>
<td>Hostelry</td>
</tr>
<tr>
<td>Apartment hotel</td>
<td>Apartment hotel</td>
<td>Tourist Finance</td>
</tr>
<tr>
<td>Hostels and Guest Houses</td>
<td>Hostels and Guest Houses</td>
<td>Lodge</td>
</tr>
<tr>
<td>Hostels</td>
<td>Hostels</td>
<td>Resort</td>
</tr>
<tr>
<td>Guest House</td>
<td>Guest Houses</td>
<td>Shelter</td>
</tr>
<tr>
<td>Hostelry, motels, shelters, and cabins</td>
<td>Hostelry, motels, shelters, and cabins</td>
<td>Tourist Camping</td>
</tr>
<tr>
<td>Hostelry</td>
<td>Hostelry</td>
<td>Guesthouse</td>
</tr>
<tr>
<td>Motels</td>
<td>Motels</td>
<td></td>
</tr>
<tr>
<td>Shelters</td>
<td>Shelters</td>
<td></td>
</tr>
<tr>
<td>Cabins</td>
<td>Cabins</td>
<td></td>
</tr>
<tr>
<td>Non-Hotel Accommodations</td>
<td>Non-Hotel Accommodations</td>
<td></td>
</tr>
<tr>
<td>Vacation Cities</td>
<td>Holiday complexes</td>
<td></td>
</tr>
<tr>
<td>Camps</td>
<td>Camps</td>
<td></td>
</tr>
<tr>
<td>Apartments</td>
<td>Apartments</td>
<td></td>
</tr>
</tbody>
</table>

Source: Own elaboration

Analyzing the chart, we can see the differences in the lodging establishments classification between the 1978 and 2002 regulations of the hotel sector, even while having similar categories. The 2015 regulation shows crucial modifications. This regulation suspended the categorization of the hotel and non-hotel establishments, and others were named lodges, resorts, tourist farms, and guest houses, with motels disappearing, which are currently regulated by the Police Intendancies.

This research was carried out based on primary and secondary sources that allowed for the review and analysis. It is of a quantitative-qualitative type that allowed for data collection, analysis, and organization. The research has a descriptive scope since the information was collected concerning lodging establishments in the city of Guaranda. We interviewed residents who are familiar with the evolution of accommodation in Guaranda.
RESULTS AND DISCUSSION

Image 1 shows that the main reason for people to visit Guaranda is for business, followed by tourism and rest. According to information provided by the Tourism Directorate of the Decentralized Government of Guaranda County, the months of February, March, and April are the months with the highest number of tourists visiting the city.

In Image 2, we can see that the fifth and seventh years present a greater growth of establishments. Chart 3 shows the existing lodging establishments in the city of Guaranda between years 5 and 6, showing a decrease of -43.75% since the Regulation of Tourist Activities that enter into force in 2015 does not consider motels as part of the classification.
Chart 3

**Existing establishments in the city of Guaranda**

<table>
<thead>
<tr>
<th>Years</th>
<th>Number of DOT registered establishments</th>
<th>Percentage of Variation</th>
</tr>
</thead>
<tbody>
<tr>
<td>year 1</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>year 2</td>
<td>15</td>
<td>6.67</td>
</tr>
<tr>
<td>year 3</td>
<td>19</td>
<td>21.05</td>
</tr>
<tr>
<td>year 4</td>
<td>21</td>
<td>9.52</td>
</tr>
<tr>
<td>year 5</td>
<td>23</td>
<td>8.70</td>
</tr>
<tr>
<td>year 6</td>
<td>16</td>
<td>-43.75</td>
</tr>
<tr>
<td>year 7</td>
<td>20</td>
<td>20.00</td>
</tr>
<tr>
<td>year 8</td>
<td>16</td>
<td>-25.00</td>
</tr>
</tbody>
</table>


Chart 4 shows the installed capacity concerning the number of rooms in the accommodation establishments in the city of Guaranda.

Chart 4

**Existing rooms and spaces in the city of Guaranda**

<table>
<thead>
<tr>
<th>Years</th>
<th>Rooms (daily)</th>
<th>Spaces/ Rooms (daily)</th>
<th>Maximum installed capacity (pax per year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>year 1</td>
<td>172</td>
<td>319</td>
<td>116435</td>
</tr>
<tr>
<td>year 2</td>
<td>153</td>
<td>183</td>
<td>66795</td>
</tr>
<tr>
<td>year 3</td>
<td>342</td>
<td>754</td>
<td>275210</td>
</tr>
<tr>
<td>year 4</td>
<td>370</td>
<td>834</td>
<td>304410</td>
</tr>
<tr>
<td>year 5</td>
<td>330</td>
<td>718</td>
<td>262070</td>
</tr>
<tr>
<td>year 6</td>
<td>281</td>
<td>662</td>
<td>241630</td>
</tr>
<tr>
<td>year 7</td>
<td>329</td>
<td>732</td>
<td>267180</td>
</tr>
<tr>
<td>year 8</td>
<td>274</td>
<td>608</td>
<td>221920</td>
</tr>
</tbody>
</table>

Source: Own elaboration from tourist accommodation cadastres of the Department of Tourism

Thanks to the formula of Image 3, it was possible to determine that the annual growth of hotel establishments was 9.65%.

\[
TCA = \left( N-1 \frac{\sqrt{f}}{\sqrt{i}} - 1 \right) \cdot 100
\]

*Image 3. Accumulated growth rate*
According to statistics provided by the Decentralized Government of the Guaranda Canton, there was a growth of tourists in year 7, with 14,738 tourists (who stayed in accommodation establishments). If a comparison of the installed capacity in the same year is made, it could be determined that the occupation percentage is 5.51%. We applied the formula from Image 4 to obtain this data.

\[
P_O = \frac{\text{No. of \ spaces}}{\text{Maximum capacity}} \times 100
\]

*Image 4. Occupation percentage*

**CONCLUSIONS**

The city of Guaranda, despite having natural attractions it has tourism as a secondary activity. The existing hotel plant provides the opportunity to offer accommodation services. However, it is critical to generate a tourist promotion based on objective data, which encourages visiting the city.

In the city of Guaranda there is no statistical data that can contribute to generating tourist development plans. This data would allow us to determine where tourists come from, as well as to establish a project that would encourage the visit of both national and international tourists to this city.

There are lodging establishments in the city unregistered with the agencies in charge of regulating tourists. This means that the capacity, in terms of the number of rooms and space that can receive visitors is higher than estimated, which causes an oversupply, compared to the number of tourists and traders who visit the city of Guaranda. That is why it is necessary that institutions such as the Department of Tourism, the Decentralized Government of Guaranda County and the Provincial Chamber of Tourism of Bolivar, regulate the creation and operation of such establishments.
REFERENCES


IMPACT OF FUNDING ENSENADA’S ENVIRONMENTAL CSOS ON THEIR HIRING SCHEMES

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To quote this article:

— Abstract —

This research aimed to determine if there is a relationship between the sources of funding received by Civil Society Organizations (csos) and environmental activities in Ensenada, Baja California, and the employee hiring system. We gathered information based on a questionnaire with quantitative and descriptive analysis. The results indicate that the sources of financing received by csos are not a factor that influences the choice of the workers’ tax system. Likewise, we found that cso managers know the existing tax systems in Mexico well enough. Finally, we discovered that the most used tax system is that of wages and salaries. With the above, we concluded that managers of csos have the necessary knowledge to choose the hiring system.

Keywords

Funding, Civil Society Organizations, hiring.
Currently, citizens need to cover the social needs that the government does not address, giving rise to Civil Society Organizations (csos). These organizations have human and financial resources granted by donations or various funding sources either from international or national institutions, or citizens, for their operation.

Csos are non-profit, legally constituted groups that operate with contributors subject to various types of labor relations, including volunteers. The existing working relationship in csos represents a research opportunity due to:

1) lack of a specialized law regulating labor relationships in csos in Mexico;
2) csos’ leaders’ lack of knowledge and understanding of each of the hiring tax systems, according to the law, which may result in the inadequate hiring of personnel;
3) lack of signed contracts that protect the labor relationship and;
4) budgetary limitations for hiring workers that imply funding sources available to the cso.

Therefore, we ask the following research question: Is there a link between existing funding for csos operation and how they hire their contributors?

The initial hypothesis is that the lack of knowledge on the part of the csos directors with environmental activities about the diverse remuneration tax system means that there is no correct management of human resources and that, therefore, there is little labor formality when hiring personnel.

The basis of this study is csos can become a source of employment, as long as the social needs for which they were created are met. They sometimes help to become a way of self-employment and professionalization and can cover the specific demands of society to which they were intended to respond. However, these jobs are for a determined or undetermined time, sometimes poorly paid and without legal benefits.

This work describes the most common cso tax systems and sources of funding, hoping to help managers and directors know each one of these in detail. It will also help them understand the labor law clearly, when a person should be considered a worker according to the law and when not, even though in practice they are treated as such.
2. RELEVANT TERMS

2.1 Civil Society Organizations

csos are defined as free and voluntary citizen organizations that, based on the identification of specific fields of social life, carry out actions aimed at collective well-being, influencing public decisions and their regulation. They are stable, organized, and structured groups, operation rules, and objectives that tend to professionalize the actions they carry out, and in most cases have legal personality (Nava, 2016).

The government has implemented regulatory measures for both their organization and their administration, even giving them special tax treatment; these organizations represent a bridge between social and professional development, as well as an alternative for employment for all (De Nieto, 2009). In these organizations, various types of labor relations converge, such as employees (those who receive payment regardless of the system) and volunteers (those who do not receive economic compensation for their work), thus providing employees with technical skills and volunteers with more humanistic activities.

Remunerations granted to employees may be: a) Employees with social security for an indefinite time; b) Employees without social security benefits for projects, part-time employees; c) Fee system and consultancies, and d) Volunteering, related to those who support project activities without receiving payment.

Nature of the sources of funding with which csos operate can affect the payment of compensations to their workers, since the resource with which they operate does not cover the social security payment, but only contemplates the payment of the net to be received. The above results in two problems: on the one hand, in the omission of workers' social security payment, and, also, in the need for csos to correctly manage personnel with the resources they have, generally resulting in the contracting of some private health insurance by the workers.

2.2 Labor Relations and its tax systems

Köhler and Artiles (2007) define labor relations as those composed by the institution, rules, and norms that regulate social life in the institution and the general economy, in which individual actors (employer-employee) and collective actors (employer associations, trade unions with state intervention) interact.

Article 20 of the Federal Labor Law indicates that these relationships are subject to a contract. However, it also understands that an employment
A relationship exists when there is a person of lower rank who is obliged to provide a service and another one who has to pay a salary for the counter service received. This law allows different hiring types, such as: hiring for a definitive time, for a particular job, for an undetermined time, and for initial and probationary training. If it is not stipulated, it is understood that hiring is for an undetermined time.

Work relationships include the employer, a natural person who provides his or her services in exchange for a salary, and the employer, a natural or legal person who receives services and is obliged to pay a salary or wage, in addition to having legal power of authority and command.

Pérez and Fol (2017), consider subordination when: 1) the worker is given equipment or tools; 2) he is subject to a working day, rest days and holidays, as well as other benefits derived from a work contract; 3) there is employer supervision or, 4) there is an internal work regulation.

2.2.1 Employees

The Tax Administration Service (SAT, 2014), the governing body in tax hiring schemes in Mexico, defines employees as "a natural person who receives salaries and other benefits derived from subordinate personal work at the disposal of an employer, including profit sharing and severance payments."

This system grants social security rights and benefits to those who pay taxes as employees, to "improve workers' quality of life in their social-economic aspect" (Garduño, Hernández & Ramírez, 2012). For SAT, any natural person who provides a service available to an employer and with an established schedule is an employee.

2.2.2 Natural person with Professional Activity

In Mexico, this type of service is regulated by the Civil Law (LFT, Spanish acronym) and is concluded through a private contract, in which the professional provides his services to someone else in exchange for a payment denominated for this system as a fee (De Buen, 2005). In this system, there is no subordination, since it is intended for people who provide their professional services with an autonomy of knowledge and resources.

Article 100 of the Income Tax Law considers income from professional services: “remuneration derived from providing an independent personal service.”

Claudia de Buen (2005) points out that this contract is used by Mexican employers to avoid labor charges from "plant workers" such as paying for the Mexican Social Security Institute (IMSS, Spanish acronym), the National Workers' Housing Fund Institute (INFONAVIT, Spanish acronym), and other labor benefits. Likewise, through this scheme, the employer is freed from
the obligation of paying severance in case of dismissal or termination of labor relations, since it does not create seniority. Also known as a fee system, it was designed as a hiring option for a temporary project, or consulting service that requires professionals to fulfill; however, at present, this type of hiring has been devalued, since employees on permanent positions are hired under this system.

2.2.3 Fees assimilated to wages

Under this system, the professional services of those who express in writing their decision to pay taxes under the fees assimilated to wages system, which benefits the service provider because it does not generate tax burdens beyond income tax (ISR, Spanish acronym). In recent years this figure has begun to be used more to hire “trusted personnel”, senior officials, administrative staff, salesmen, among others, to avoid paying the high costs of social security benefits.

The income tax law makes no distinction between professional fees and salary-like fees.

3. SOURCES OF FUNDING

Sources of funding are those ways in which the cso obtains resources that allow it to meet its objectives (Mejía, 2016). Resources are all the means that the cso uses to achieve its social purposes; resources can be tangible and intangible. Within physical resources are financial resources, which are those that can become cash. (Gavilán, Iglesias, & Beitia, 2013). Csos obtain their resources through 1) management for their goods; 2) funding through public or private agreements; 3) contracts with ngos or international organizations.

Csos’ resources are referred to when they come from membership fees, donations, legacies from individuals, product sales, fundraising campaigns, etc. Csos can also be financed through agreements with public administrations, through tenders or collaborative projects (Gavilán, et al., 2013); in these, both parties negotiate and establish the requirements and scope necessary to meet needs, especially social needs.

Support and agreements exist with individuals when financing is granted to csos by companies that sponsor the social cause they defend (Gavilán, et al., 2013). These supports are generally non-refundable and sporadic.

Another form of financing is through agreements with other ngos or foundations, funding granted through contracts by which a foundation, whether national or international, gives funding or assigns a part of its
resources so that social projects can be developed. This source helps collaboration agreements grow (Gavilán, et al., 2013).

4. LEGAL FRAMEWORK

In Mexico, there is freedom of association, which means people can associate in fully constituted legal figures giving rise to Legal Person, which may be commercial or not. A non-profit organization can be either a Civil Association (ca), a Civil Society Organization, or a Non-Governmental Organization (ngo).

Civil Associations fall under the Federal Civil Code (ccf, Spanish acronym); article 2670 defines them as an association of two or more individuals, for an unlimited time, with a common purpose, and without economic character. They must be constituted in writing, through the Articles of Incorporation that must be registered in the Public Property Registry, thus giving them legal personality. Also within the ccf, the provision of professional services is regulated, a form of hiring most commonly used by people working in a ca in Mexico, under the Fee System scheme explained in numeral 2.2.2 of this document.

As mentioned, the lft regulates the labor relations derived from Article 123 of the Political Constitution of the United Mexican States (cpeum, Spanish acronym), indicating all the conditions, requirements and benefits existing in labor relations, as well as the need to formalize the hiring in writing and its forms of termination.

It establishes the rights and obligations of both employees and employers and, of particular importance for this work, the regulation of wages and salaries.

For its part, the Social Security Law (lss, Spanish acronym) states that employers must grant their workers the right to health, medical assistance, protection of the means of subsistence, necessary social services, and a retirement plan, rights that must be guaranteed by the State. The lss regulates the social security benefits to which all workers who pay taxes under the wage and salary system are entitled.

The purpose of the liss is to define who is obliged to pay taxes for the economic activity they carry out; it establishes that individuals with business and professional activities that are within the fee system are obliged to pay taxes.

5. METHODOLOGY

This study used a quantitative descriptive approach; we collected data by applying a questionnaire to cso managers and administrators. The research design used was descriptive transactional.
The population selected was made up of CSOs with environmental activities in Ensenada, B.C. People who made up the sample are the executive directors and administrative personnel who work in these CSOs, and the participants were decision-makers in the organizations. To obtain an overview as close to reality as possible, we sought the participation of at least one member of each CSO registered in the Federal Registration System of Civil Society Organizations (SIRFOSC, Spanish acronym).

It was a multiple-choice questionnaire, with dichotomous and open-ended questions. The instrument consisted of a semi-structured questionnaire applied to administrative and management personnel, which allowed us to analyze the knowledge of our variables and, at the same time, indicated some factors that influence the selection of the hiring system.

The instrument developed for this case study went through a judging process to determine that it met the clarity, consistency, relevance, and sufficiency criteria. We took into consideration work and academic experience, both concerning the subject of study and the development of scientific research, the academic level, and availability to support to select the judges.

5.1 Data gathering procedure

The final instrument was sent by email to the 21 CSOs with registered environmental activities. We obtained the emails from the SIRFOSC database, accompanied by an introductory letter, explaining the general objective and specifics of this case study, and the contact details of the person responsible for the research. We also gave them a deadline for response.

Each participant uses his or her computer, and answer a "Google Forms" to facilitate the development of the database.

For data collection, it was necessary, in some cases, to send reminders of the support request sent. We also contacted them through social media and phone calls. Once the deadline for responses had arrived, the questionnaire was closed, and we created a database in Excel.

6. RESULTS

Regarding whether CSO executives and managers correctly understand the contracting used in these organizations, 100% of the people surveyed know that the law that regulates labor relations is the Federal Labor Law.

As a general rule, there is good knowledge of each of the hiring tax systems by CSO executives and managers, since in the case of the salary and wage system, 89% of the respondents know and understand this system, and only 11% do not.
In the case of the professional fees hiring system, 94% of the respondents understand it and know it, while only 6% of them do not know it and do not understand it. Finally, we observe that in the fees similar to wages hiring system, 83% know and understand it, and only 17% do not know and do not understand it.

Chart 1 shows what the respondents think about labor relationships according to the different systems. In the answer given for the fees and salaries system, 72% of the people surveyed say that there is an employment relationship, 17% say that it does not exist, and only 11% do not know if it exists or not.

While for the professional fees hiring system, only 17% said that there is an employment relationship, 72% of the respondents say that it does not exist, and 11% do not know if it exists or not. Finally, for the fees assimilated to wages hiring system, 44% say that there is an employment relationship, and 56% of those surveyed say that it does not exist.

78% of those surveyed said they knew which law regulates labor relations under the wages and salaries system, while 22% said they did not. However, 33% of the respondents think that the professional fees system is regulated by the LFT, 39% know that the law that regulates the professional fees system is the LISR, 6% of the respondents think that these are regulated by the CCF, and 22% do not know which law regulates professional services.

Chart 2 shows how 44% of respondents say that according to their knowledge, the criteria used to hire by the professional fee system is when they do not require supervision, because there is no subordination and because it is for a specific project. 33% say that because it is a very specialized job and for the amount approved by the funding source. 6% think that because of the person’s qualification, another 6% say that the CSO always hires under this system. Finally, 11% say that they do not hire under this system.
Impact of funding Ensenada’s environmental CSOs on their hiring schemes

In chart 3, we can see that 33% of the respondents answered that in the csos in which they work, and according to the knowledge they have, the criteria used for hiring by the fees assimilated to the wages system depend on the technical need and the project. 5% answered that because the position for which they are hired is not in the organization chart. 17% answered that it is for a specific time or product. Another 5% claimed that it is recommended by the accountant or lawyer. 17% said that they do this because the service they want to hire is not professional. 6% say that it is because of eligibility and another 17% say that they do not hire under this system.
To establish whether there is a relationship between sources of funding and tax systems when CSOs with environmental activities in Ensenada, B.C choose a system, the answers were as follows:

17% of the respondents answered that in the CSO where they work they receive only one of the 4 sources of funding that were presented to them, 39% say that they receive 2 of the 4, 27% receive 3 of the 4, and another 17% say that they receive all 4 sources of financing.

44% of the respondents answered that the CSO they work for uses three tax systems, 22% say that they manage two, 6% that they manage only one, and 28% that they do not hire.

Chart 4 shows that 33% of the people surveyed answered that in the CSOs where they work, between 1% and 20% of their total resources are used to pay contributors, 33% answered that between 1% and 20% of the income from agreements with public administration is used for this item, and 28% answered that between 1% and 20% of the resources from agreements with CSOs or foundations are used to pay contributors.

In the case of agreements with public administration, we can see that 39% of the people surveyed answered that in the CSOs where they work, they allocate an average of between 21% and 40% of the income received to pay contributors and that 28% of the respondents stated that of the resources obtained through agreements with other CSOs or foundations, they allocate between 21% and 40% to pay contributors.

Of the respondents, only 5% said that between 41% and 60% of their resources generated are used to pay their contributors; for agreements with public administration, 6% said that between 41% and 60% is used, and only 11% of the respondents answered that between 41% and 60% of the resources obtained through agreements with other CSOs or foundations are used to pay their contributors.

5% of the respondents said that in the CSO where they work, between 61% and 80% of the resources obtained from agreements with other CSOs or foundations are used to pay contributors.

They were also given the option of not answering either because they do not receive any of these sources of funding or because they preferred not to answer because they considered the information sensitive. Of the funding sources that obtained the most abstentions, 33% were from their resources, while resources made with public administration and agreements with other CSOs or foundations had an abstention of 17%, respectively, who decided not to answer.
In Chart 5 we can see that 44% of the CSOs establish the hiring system according to the approved budget, 39% according to the sources of funding, 6% of the people said that establishing a hiring system depended on the amount of taxes to be paid.

To know which tax system is the most used in CSOs with environmental activities in Ensenada, B.C., the results were the following:

50% of the respondents answered that in their CSO the most used hiring system is wages and salary, followed by professional fees with 22%. 17% of the respondents stated that the system they use most is fees assimilated to wages, and only 11% preferred not to answer.

When asked why they opt for this system, 39% of the respondents answered that the system they use most is wages and salaries because they
want to give greater job security to the worker and the cso, also to comply with the law, and because there is subordination between the cso and the worker. 17% answered that the professional fees and assimilated fees systems because they do not have a secure income, and everything depends on the approved projects. Another 17% indicated that they do not hire under any system. 5% answered that the most used system is that of fees assimilated to wages, because casual workers are constantly hired, and finally, 22% reserved their answer.

33% of the respondents stated that they have between 1 and 5 contributors, regardless of the hiring system. 22% said they have between 6 and 10 contributors, 11% between 11 and 15, 6% between 16 and 20 contributors, and 28% more than 21. However, 63% of the respondents said that they signed contracts at the cso where they work, 28% said that they do not have a contract, and 11% said that only a few signed.

7. CONCLUSIONS AND RECOMMENDATIONS

We found that the managers and administrators in charge of making decisions on the selection of the hiring system have adequate basic knowledge in two of the three systems proposed in this study, which are the wages and salaries system and the professional fees system.

On the other hand, when asked about the system of fees assimilated to wages, we found that it is confusing to them. Most of the administrators did not know how to distinguish whether or not an employment relationship exists at the time of hiring an employee under this system. This can be because this way of hiring is not clearly defined in any law. As was shown in the theoretical framework of this study, and according to Chávez (2017), this system is regulated in the Income Tax Law but only in regards to the income tax payment. We learned that there is no clear explanation by the sat authorities specifying under what conditions it can be used, who falls under this system, and what obligations are contracted when hiring through this system for both workers and employers.

According to the above, we can say that this creates confusion among managers and administrators. When we asked them how many tax systems the sat handles, 28% said three, 33% said two and 22% did not know, because it is not clear whether it is a tax system or not for the sat.

The wage and salary system should be used when a person is hired to be part of the organizational structure, that is to say, they have a fixed position within the organization chart and from which there is economic certainty to cover their salary. They will be subject to the subordination of a boss, with stipulated office hours. They will be entitled to all the benefits of the law, and there will be an employment relationship. But if the hiring
of the employee is conditioned to a specific project for a determined time the safest option will be the professional fees system.

The main disadvantage of the wages and salaries system is the high payment of taxes. The cost increases between 40 and 50%, in addition to the amount received by the worker, the remuneration of employer’s contributions to the IMSS, the income tax payment (federal tax), and payroll tax (state tax) must be taken into account.

As for the professional fees system, we can conclude that it can be used when there is a need to cover a specific objective or activity of an organization’s project. For these reasons, a natural person with a professional degree must be hired to provide a specialized service for a given period or product.

The fees assimilated to wages system is a choice that is considered risky because the IMSS does not acknowledge this system. According to the IMSS a subordination and payment of remuneration are enough to prove that an employment relationship exists. An employee hired under the fees assimilated to wages system can demand to be insured by his employer.

The employee can sue his employer for not being inscribed to the IMSS, only when there is evidence of subordination and labor relationship according to the IMSS article 18.

Although the percentages are not very representative in comparison with the total population, these data are highly significant. They are an indicator of the existence of CSOs that receive only one source of funding and have the capacity to handle all fiscal systems, which is a step forward for CSOs in the formalization of the working area.

According to the data collected in this research, it is important to point out that 28% of the respondents said that the CSO where they work do not hire under any of the systems mentioned. Instead, they do volunteer work, which is handled as a legal figure without economic compensation and not as a tax system. This could be a line of research to find out if volunteering is a trend in other CSOs or only in those with environmental activities, as well as to find out the current conditions of volunteering in CSOs.

Another aspect that can be considered, to support that the sources of funding are not a factor that influences when selecting the hiring system, is that few CSOs with a single source of funding put aside between 81% and 100% to pay their contributors. This funding comes from their own resources, which are not conditioned by a third party to be exercised under certain rules, such as in the case of the funds received from a public administration or NGOs or foundations, who condition the money to the execution of a project and the monitoring of a budget. For this, we can say that CSOs use more than two funding sources to pay their contributors.

50% of the respondents answered that the most used system in these CSOs is that of salaries and wages, confirming that environmental CSOs in
Ensenada are seeking to be a more formal and fairer source of employment. When asked why the salary and wage system is the most used, 39% answered that it is to give greater security to workers and to comply with labor laws, which speaks of the fact that the directors of these csos are seeking to grant formal employment and security to their workers. When we asked them which factors they considered when choosing a hiring system, 17% said that their income was not constant and changing, which was a limitation to ensure the continuity of a contract for an indefinite period. 5% said that they hired more “casual workers” because they do not have an ensured income.

Similarly, this study indicates that 61% of the respondents have signed contracts with their contributors, noting that the environmental csos in Ensenada is in the process of becoming fully formalized.

We can see that the most used contracts in environmental csos in Ensenada, B.C. are still for an indefinite time (33%). But we also found that 27% of the respondents said that they have a contract for a limited time or product, 18% for professional fees, and 22% for fees similar to wages, which shows that the csos are making use of the three tax systems addressed in this study.

Most Mexican csos have sources of funding from third parties (projects), which means that the hiring, source of employment, or the csos itself, are subjected to the availability of the resource. Ideally, the most important and representative source of funding for csos would be the production of their own resources.

In this work, we asked participants if they considered the laws regulating the different tax systems to be adequate, and 50% of them answered no, which can be considered an indicator of this need.

As already mentioned, this sector of social organizations provides an opportunity to generate new research to help understand their strategies designed to provide greater job security, considering their limited resources and dependence on external sources of funding. It would be interesting to know what the work climate is like in these types of organizations, what their leaders do since despite having limited resources, people continue to be motivated to work in csos.
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Impact of funding Ensenada’s environmental CSOs on their hiring schemes


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GAME AS A TEACHING RESOURCE FOR SCIENCE EDUCATION: MATH AND CHEMISTRY

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— Abstract —

The purpose of this work is to advocate for games as a supporting resource in science education, based on documentary research. We present the games’ advantages, characteristics, and typologies. Subsequently, we show charts and examples of proposals implemented to prove the potential of some games in the teaching of Math and Chemistry, at different educational levels. We conclude that in science education, playing games is an important resource, even necessary, although underappreciated by teachers.

Keywords

Games; educational resources; science education.
Games are associated with fun and pleasure (Bernabeu & Goldstein, 2008; Chacón, 2008), although they are also described as a "recreational exercise or a rules-based competition, in which you either win or lose" (Sánchez, 2016, p.18). However, according to Melo and Hernández (2014), games are not just a free, casual activity, but they are rather subjected to rules that the participants accept and obey voluntarily, making the activity enjoyable. Games represent a form of enjoyment or hobby, it plays an essential role in the development of the individual since it allows him to discover and explore the world around him, as well as to establish relationships with his environment and with his peers.

Gallardo (2018) believes that the functions of learning and socialization are intrinsic to the game; their role is meaningful to human progress.

In the history of humankind, games were a form of leisure, not much related to work or knowledge. However, in recent years authors like Melo and Hernandez (2014), Plutin and García (2016), Muñiz and Rodriguez (2014) have suggested it as an effective strategy in learning, mainly for children and young people. In addition to the intellectual and socio-affective development that it may have, playing games strengthen physical and psychomotor development, as it is an implicit driving force in the child’s daily practice (Molina, 2016 cited by Morales & Urrego, 2017).

Following the above, the objective of this work is to present the game as a possibility or teaching resource to support education. Games are used in various disciplines to stimulate learning, but the biggest difficulty for elementary and middle-level teachers is science education, especially in subjects such as Math and Chemistry. Solbes Lozano and García claim that students consider scientific topics as the most boring ones, which "can discourage students, and it is clear that motivation is one of the most important pillars of education. Without motivation, there is no effective learning" (2008, p.65).

Therefore, this work focuses on the experiences developed in some Ibero-American countries, where games have encouraged students in these subjects, to inspire other teachers in their classrooms.

The content analysis methodology was used, through Google Academic search engine, as well as the database query, ebsco, and Redalyc. The keywords used were: games, teaching strategy, and science. We looked for related academic publications and selected those with the following criteria:

a) The publication date of not over 10 years.
b) Based on different Spanish speaking countries.
c) Describe the experience in playing games as part of science education.
Articles that spoke of particular experiences, as well as those that contributed concepts per the purpose of this work.

**GAME AS A TEACHING RESOURCE**

The effectiveness of games lies in the fact that it is an activity inherent to the human being, linked to joy, pleasure, and fun. Melo and Hernandez (2014) affirm that it is part of the human manifestations in all stages of life and that it should be thought of as a resource that allows the construction of knowledge. Playing games is an activity initially conceived as entertainment. In recent years it has been considered as a teaching resource for classrooms, where students are allowed to play, to promote their learning. Teachers have discovered its benefits in the classroom. According to the literature read, we highlight the following benefits:

a) It enables human conduct. Authors like Ruiz (2017), think of games as something more than a simple activity, they think of it as something necessary for personal development, not only for kids but also for adults. Brousseau (1997, cited by González, Molina & Sánchez, 2014) defines games as physical or intellectual activities, whose main objective is enjoyment. Playing allows rehearsal of behaviors that are later extrapolated to the social domain and is useful for the development of motor, cognitive, and affective skills (Pacheco, 2011).

b) It provides joy. Games are a recreational activity that provide joy and happiness, and we can play them at any age (Melo & Hernández, 2014; Gallardo, 2018). Games can also be an emotional activity that everyone can enjoy. Pacheco (2011) highlights that they are pleasant and fun. “They have a developmental and learning enhancing function: through games, and because of their characteristics, it becomes an ideal medium for learning, since with it people find a motivation to learn...” (p.15). Thanks to playing games in the classroom, students become more relaxed and confident; they change their behavior and are willing to learn (Castrillón, 2017).


d) They are motivating because playing is a rewarding activity that provokes a satisfying feeling to those playing. Games also boost the
imagination while playing mental processes allows us to experience or act on images on a real plane.
e) It helps in the development of skills and competences. As a learning activity, games are a booster of cognitive, affective, and communicative development, elements that make up the social construction of knowledge (Melo & Hernández, 2014). Besides, recreational activity represents one of the most effective mechanisms for learning new skills, abilities, experiences, and concepts (Dominguez, 2015). Several skills can be stimulated in students through games, including communication skills (Palacino, 2007).

There are different classifications of games as a teaching resource. The most accepted was created by Piaget, who studied child development and learning and the implications of games on children. According to Piaget (cited by Cruz, 2013), there are a) practical games, which consist of the repetition of well-established sequences of actions, without any purpose. b) symbolic, in which the child enjoys imitating everyday actions and c) rules, which is a more collective form of play and is made up of established or spontaneously determined guidelines, carried out with two or more people.

Another classification is presented by Groos (1902, cited by Cruz, 2013), who classified games in two groups: a) those of experimentation or general functions, which include sensory, motor and intellectual games and b) those of affection or exercise of the will, which is games of special functions, which include those of pursuit, fighting, hiding, hunting, imitation, family and social activities.

Another proposal is that of Gairín (1990), who classified games into two groups: a) knowledge, which is categorized into pre-instructional (they familiarize the student with a concept), co-instructional (added to the teaching activities), post-instructional (useful for consolidating learning), and b) strategy, which may be solitary or multi-personal.

Aizencang (cited by Melo & Hernandez, 2014) divides games into the following types: a) Agon or competition games, where there is a power struggle in which the same space is shared; b) Alea or risk games, in which divination and prophecy are used; c) Mimesis or imitation games, in which the arts and theater are commonly practiced. Such games “represent the child’s first taste of learning, imitating professions or trades that he or she will later assume to be real” (p. 51); d) Ilinx or vertigo games, related to sports activities. It is useful to know what kind of games can be implemented according to the objective we want to achieve, and the subjects to be supported.

Although games have been studied as a learning stimulus, it has not been given that value as such. However, in recent years a methodology has
emerged that considers games as an excellent tool to increase concentration, effort, and motivation, based on recognition, competence, collaboration and other educational potentialities (Sánchez & Francesc, 2015) which is called gamification or ludification. This methodology, which is also considered a technique, method or strategy; according to Hierro (2014) is a "procedure that relocates to a traditional system of learning knowledge, which aims to obtain satisfactory results by students in the educational area, through purely academic games, which support learning" (Rengel, 2018, p.3). All this in a non-game context, it is not the end but the means, since the end in this concept is learning, especially collaborative.

This trend emerges in the business field and is associated with the use of technology for educational purposes, especially video games (Marín, 2015), and is used more in adult learning. It is used in business and university environments since it encourages competitiveness. It is questioned whether gamifying a learning activity in the classroom makes it recreational, since it is just another learning activity, only with design particularities whose pedagogical purpose goes beyond motivating (Foncubierta & Rodríguez, 2014).

This method requires deep knowledge of the methodology since the game’s main objective is learning, which means teachers cannot improvise to have active participation of the players. The resources that can be used, which are commonly technological, can represent an obstacle in places where technology has not made much of an appearance, as is the case in Latin American countries. However, for the present research, we talk about games in a conventional sense, not in the one that refers to gamification, the most important resource used by teachers is their imagination.

MATH AND CHEMISTRY EDUCATION THROUGH GAMES

Among the traditionally most complex and difficult subjects for most students at any level of education are the so-called exact or experimental sciences such as Math or Chemistry. Games are important while teaching these kinds of subjects, it becomes an appropriate resource to learn. There are several games to learn mathematical subjects, such as basic operations, fractions, prime and composite numbers, even and odd numbers, lines, segments, rays, and angles easier.

Chart 1 shows examples of games played related to Math, as well as the population to which they were applied and their references. This chart can be helpful for teachers interested in a more recreational education for their students.
Chart 1
Games to teach Mathematical subjects

<table>
<thead>
<tr>
<th>Subjects</th>
<th>Games played</th>
<th>Population</th>
<th>References</th>
</tr>
</thead>
</table>

Source: Own elaboration

Chemistry is also a subject whose teaching represents a challenge for teachers, so strategies are implemented to facilitate the transfer of its topics among students. Montiano (2010) brings together a series of recreational alternatives to stimulate the learning of Chemistry and the development of basic skills. Franco-Mariscal et al. (2012) offer a range of playful strategies to learn the chemical elements. In this sense, there are different investigations where several games were used to contribute and entertainingly motivate students to learn, as shown below (Chart 2).
Chart 2

Games to teach Chemistry subjects

<table>
<thead>
<tr>
<th>SUBJECTS</th>
<th>GAMES PLAYED</th>
<th>POPULATION</th>
<th>REFERENCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concepts and application of chemical nomenclatures</td>
<td>Memorandum, checkerboard, and alphabet soup, dominoes, periodic table recitation, oxide race, chemical models</td>
<td>Ninth grade students, Sucre, Venezuela</td>
<td>Valero, P. y Mayora, F., (2009)</td>
</tr>
<tr>
<td>Chemistry and Biology subjects</td>
<td>Board games, challenging games</td>
<td>Estudiantes de educación básica y media vocacional, Colombia.</td>
<td>Melo, M. y Hernández, R. (2014)</td>
</tr>
<tr>
<td>Chemistry subjects</td>
<td>Six board games and seven computer games with the JClic program. Games and sceneries were used.</td>
<td>Eighth-grade students in Santiago, Cuba.</td>
<td>Plutin –Pacheco y García – López (2016)</td>
</tr>
<tr>
<td>Chemistry subjects</td>
<td>Traditional games (lottery, memory game, snakes and ladders, etc.)</td>
<td>High school students in Salvatierra, Guanajuato, Mexico.</td>
<td>López, L. y Caballero, G. (2017)</td>
</tr>
</tbody>
</table>

Source: Own elaboration

Although the subject of Chemistry is difficult and represents displeasure for students and a challenge for teachers, it is also feasible to model it with playful strategies that stimulate children's participation, and consequently, their learning. Teachers who are committed to their students' learning will seek a variety of strategies to facilitate the study of the subjects that have been difficult for them.

DISCUSSION

Furió (1994) pointed out more than two decades ago that the teaching-learning paradigm of sciences (based on the transmission of scientific knowledge) was finished, and the emerging paradigm of the constructivist theory, but he warned that teaching practice was still far from assuming this change. With this context, we can talk about science pedagogy. Its origin is traced by Ariza (1998) to the 1950s, and its development gives place to teaching science (especially experimental science); furthermore, it is considered as an emerging practical discipline that is included in a wider field of learning sciences, by its educational interest.

One of the stakes of science pedagogy is applying games while solving learning activities, which represents an innovative alternative for experimental curricula. Knowledge construction and meaningful learning, both
individual and collective is encouraged through games (Torres & Torres, 2007). This thought comes to mitigate the academic and instructivist approach of the school tradition, which prevents seeing the recreational potential in teaching subjects as complicated as Math since the idea of games still exists as something trivial and without relevance for educational use (Camargo, 2014).

Despite not using games as a didactic strategy, many teachers take advantage of its possibilities, as can be seen in the examples in the presented charts, in which we found very different proposals. Most of the games designed and implemented are based on some traditional ones (lottery, memory game, snakes and ladders). So it is only necessary to adapt them to stimulate the student's interest and thus become a tool that facilitates the apprehension of content that in the traditional method is often so complicated.

The experiences referred to in the examples show positive implications for the work done in classrooms, among which we can highlight:

1. They motivate students to learn about science (Solbes, Lozano & García, 2008; Melo & Hernández, 2014; Plutin-Pacheco & García-López, 2016; Aristizábal, Colorado & Gutiérrez, 2016)
2. They can be easily transferred to various learning units (Muñiz, Alonso & Rodríguez, 2014; Zaragoza, et al., 2016)
3. They facilitate the understanding and meaning of subjects (Valero & Mayora, 2009; Muñiz, Alonso & Rodríguez, 2014; Zaragoza, et al., 2016; Rodrigo, 2017)
4. They stimulate thinking abilities (Melo & Hernández, 2014; Rodrigo, 2017)
5. They improve the production of scientific knowledge (Melo & Hernández, 2014; López & Caballero, 2017)
6. They help establish more favorable environments and decrease boredom (Valero & Mayora, 2009; Cruz, 2013; López & Caballero, 2017)
7. They promote values such as competitiveness and teamwork (Camargo, 2014; Aristizábal, Colorado & Gutiérrez, 2016)

Games previously described in the experiences correspond, in Piaget’s classification, to the rules type, as they are played in a more collaborative rather than individualized way, and are defined by the rules assumed by the players. In Groos’, they are grouped in experimentation or general functions type, where the senses are involved, since the individual is present in the experience. In Gairín’s classification, they would be the strategic type, which entails a series of reclassifications, according to those that can be used in the classroom for teaching purposes. Finally, in Aizencang’s pro-
positional, they correspond to those of mimesis or imitation games, given that the child emulates what he or she perceives from a grown-up context.

CONCLUSIONS

We can interpret the results obtained in the presented experiences, where games were used as a teaching resource for science education as an effective way of learning. However, during the process, some factors influenced other aspects of the players such as emotions, which allows us to increase the motivation, and obtained a greater willingness to learn. It also represents an opportunity to have more entertaining classes, make teaching sequences more dynamic, and facilitate the production and transfer of scientific knowledge, among other benefits. There has been a positive effect of teaching through games in different school subjects, however, in Math and Chemistry it has not managed to be generalized as a resource or strategy that favors and motivates student learning. There are just a few teachers who implement games in the classroom. Franco-Mariscal, Oliva-Martínez, and Bernal-Márquez (2012) point out that within the limits known to them, they do not know of any other in-depth study that would allow them to contrast the usefulness of these resources (games) as educational tools.

Therefore, it is important to carry out studies on the effectiveness of games as an element to stimulate learning. Research-innovation is a binomial frequently referenced by science education literature. On the other hand, Furió (1994) points out that both in the training of future teachers and in the retraining of active teachers, one should consider the preparation of educational research and innovation as a major coaching need among teachers at all levels of education.
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STUDY OF THE RISK OF HAVING AN EATING DISORDER IN UNDERGRADUATE AND GRADUATE STUDENTS IN MEXICAN INSTITUTIONS

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— Abstract —

The scope of this work is to study the risk of having eating disorders (ED) in graduate and postgraduate students in two Mexican institutions. To develop this work, we performed a study of ED prevalence on 90 graduate students and 20 postgraduate students, using the EAT-16 test. ED represents a primary health problem in the population, being responsible for its medical and psychosocial complications. According to the results, after doing data analysis, 8.2% of the graduate population presented the risk of having or suffering ED. No risk for postgraduate students was detected. We highly recommend programs to prevent ED in medical institutions.

Keywords

Eating disorders, Bulimia, Anorexia, Dieting.
Eating disorders are a complex mental health condition, primarily affecting adolescents and young women. The Diagnostic and Statistical Manual of Mental Disorders, fifth edition (DSM-5), describes ED and food intake as a persistent disorder in eating or food-related behavior that results in altered consumption and causes significant deterioration in physical health or psychosocial functioning (APA, 2015). ED are more prevalent in young women than in young men, at a 10:1 ratio (Lopez & Treasure, 2011). Young people (especially women) are the most vulnerable to have dissatisfaction with their body image. In a recently published epidemiological meta-analysis study on ED in Latin America reported a prevalence of 0.1% for anorexia nervosa, 1.16% for bulimia nervosa, and 3.53% for binge eating disorder (Kolar, Mejia, Mebarak & Hoek, 2016).

The etiology of this type of disorder is multifactorial. Among these factors, we can mention concern for the figure, perception of one’s own body, low self-esteem, the prevailing ideal of thinness, following slimming diets, among others. Likewise, genetic factors (Culbert, Racine & Klump, 2016; Grzelak, Dutkiewics, Paszynska, Dmitrzak-Weglarz, Slopien & Tyszkiewicz-Nwafor, 2017) and psychological factors (Geller, Iyar, Kelly & Srikameswaran, 2019) have been reported. In university students, Davila and collaborators stated that ED are affected by psychological problems such as low self-esteem, anxiety, depression, inter-family problems, school workload among the most representative (2014). Ruggiero and collaborators refer that, in the case of health sciences students, there are stressful situations that trigger ED such as pathological perfectionism (concern for mistakes), body dissatisfaction, motivation for thinness, and increased academic pressures to achieve a good grade or to pass the subjects (2008).

The excess of publicity in the media has had an impact on the image that everyone should follow, what clothing we should wear, and how we should behave to be fashionable. Kelly Rae Chi, in her article published in Nature magazine, mentions that “the mainstream media exerts a powerful influence on body-image perception.” Chi concludes, “there’s a whole industry out there that does not want you to feel good about yourself.” (2015)

There are several reports on the prevalence of ED in Mexico. In a study carried out by Unikel-Santoncini et al., they evaluated 4,358 women from different states in Mexico (Aguascalientes, Colima, Chiapas, Chihuahua, Federal District, Durango, State of Mexico, Guanajuato, Guerrero, Hidalgo, Jalisco, Michoacán, Nayarit, Nuevo León, Tamaulipas, Oaxaca, and Veracruz), finding a total prevalence of moderate risk of 14.2%, and a high risk of 60.8%, of presenting an ED (2010). In a study conducted in Tijuana, from a sample of 2,322 people, it was reported that the prevalence due to weight concerns was 69.2%; due to dieting, 24.8%, and 2% had a prevalence of ED (Bojorquez, Bustos, Valdez & Unikel, 2018). In medical
students (Morán, Cruz & Iñárritu) reported that the student population of the Bachelor of Medical Surgery of the National Autonomous University of Mexico (UNAM) present a prevalence of risk behaviors of 5.8%. Among the behaviors noted, 9.7% of students presented events of binge eating, 5.6% vomiting, and 5.6% use of laxatives (2009).

The different symptomatology and behavior of patients undergoing ED make it difficult to have a timely diagnosis for immediate intervention. That is why, in recent decades, instruments have been created to perform this task. The primary equipment that helps evaluate ED are self-administered questionnaires and structured interviews. Self-administered questionnaires include EAT 40 and 26 (Garner & Garfinkel, 1979), CHeAT-26 (Maloney et al., 1989), EDE-Q (Fairburn & Beglin, 1994), EDI (Garnes et al., 1983), BULIT (Thelen et al., 1991), BITE (Henderson & Freeman, 1987), QEWP-r (Spitzer et al., 1992), and SCOFF (Morgan, Reid & Lacey, 1999). Although they help to report risk behaviors for ED, none of them provide a specific diagnosis, so it is necessary that, when a patient obtains a score that indicates risk, he or she undergoes a structured interview guided by a professional expert in treatment management.

Based on the above, the purpose of this paper is to apply the EAT-26, to identify the risk of presenting ED in undergraduate and graduate students. In particular, we selected a group of medical students (90) and a group of graduate students (20). Both study groups are from Mexico City. The importance of this work lies in recognizing the population at risk to channel it to the corresponding area of the University, to establish the intervention strategies.

METHOD

Participants

We carried out a non-probabilistic type of sampling selected by opportunity. For the sample, 90 first and third-semester students from the School of Medicine of the Justo Sierra University participated, along with 20 postgraduate students of the Physics Department of the Research and Advanced Studies Center of the National Polytechnic Institute (Cinvestav-IPN).

Instrument

The instrument used in this work was the EAT-26. Internationally, the EAT-26 has been validated to estimate the population at risk of presenting ED, such as anorexia nervosa, bulimia nervosa, and binge eating at different ages, being used mainly in the adolescent population (Lazo, Quenaya & Mayta-Tristan; Wong, Lin & Chang, 2014). It has also been applied, with good
results, in a population over 20 years old as shown in the study conducted by Harris et al. In the case of Mexico, the EAT-26 was translated, validated, and applied to a young population, detecting a percentage of the population vulnerable to developing ED (Camarillo et al., 2013; Gayou- Esteva & Ribeiro-Toral, 2014; Morán et al., 2009; Ochoa, 2011). In a study by Álvarez- Rayón et al., they found an adequate level of internal consistency of EAT-26 (α de Cronbach = 0.93) (2004). For this reason, this instrument was chosen and used for this research.

The EAT-26 is a self-administered questionnaire with 26 questions. Each one of them is answered with a Linkert-type scale, which goes from always to never. All questions, except question 25, have the following score: 0 points on the answers never, rarely, and sometimes; 1 point on quite a few times, 2 points on almost always, and 3 points on the answer always. On question 25, the score on the answers always, almost always, and quite often have a value of 0; sometimes 1 point, rarely 2 points, and never 3 points. The total points of the questionnaire can range from 0 to 66 points. If the score obtained is equal to or greater than 20, it means that the respondent is predisposed to having an ED (Jones, Bennett, Olmsted, Lawson & Rodin, 2001). We analyzed the results of the surveys through a database created in the statistical program SPSS (Statistical Package for the Social Sciences).

**Ethical considerations**

Students who participated in this work signed an informed consent form. It ensures that their participation will comply with the guidelines of the Declaration of Helsinki and Article 100 of the General Health Law (Government of Mexico, 2012) on research. In this way, the principles of protection of privacy, voluntariness, and dignity are respected.

**RESULTS**

As a first step, we carried out a socio-demographic study of the surveyed students. Of the total sample of 110 students from both institutions, 33.6% were male and 66.4% female (Image 1A). The average age for undergraduate students was 20 years (80%) and for postgraduate students 28 years (20%). 81.8% were studying for a Bachelor's Degree in Medical Surgery, 6.4% for a Master's Degree in Physics, and 11.8% for a Doctorate Degree in physics (Image 1B).
The second step was to calculate the average of the scores obtained from the questionnaires, which turned out to be 11.304, with a standard deviation of 7.187. It can be observed that the scores are very dispersed, which is associated with the heterogeneity of the study group.

We structured the EAT–26 questions in three factors: 1, dieting; 2, bulimia and food preoccupation; 3, oral control. According to the answers obtained, 91.8% had a percentage lower than 20, that is, they do not present risks associated with risky eating attitudes and behaviors. 8.2% of the students obtained a score greater than 20 that is, their responses are associated with risky eating attitudes and behaviors. In terms of the scores obtained for the three factors mentioned above, we found that: 20.8% of the respondents got factor 1 (13.8% women and 7% men); 7.2% chose factor 2 (4.8% women and 2.4% men), and finally, 12.3% of the participants’ responses was factor 3 (8.2% women and 4.1% men); see Image 2.
8.2% of the students who presented the risk of having an **ED** belong to the Bachelor of Medicine, 6.4% are women, and 1.8% are men (Image 3). 66.6% obtained higher scores in the **dieting** factor; 11.2% in factor 2, **bulimia**; and 22.2% in factor 3 that corresponds to **oral control**.

Of the postgraduate students, we found that 25.76% of their answers correspond to factor 1, **dieting**; 5.8% of their answers agree with factor 2, **bulimia**, and **food preoccupation**; finally, 13.0% of their answers are in factor 3, **oral control**. Although these results have the same behavior as those obtained by the undergraduate students, there were no cases of **ED**.

**DISCUSSION**

The final result of this work was that 8.2% of the population studied is at risk of an **ED**. This result is similar to the meta-analysis reported by Jahrami, Sater, Abdulla, Faris & AlAnsari, who found a 10.4% risk of **ED**, ranging from 2.2 to 29.1% (2019) in the medical student communities. In another study by Jahrami, Saif, Faris & Levine, one over ten medical students is at risk of having an **ED** (2019). This percentage is of severity, as reported by Keski-Rahkonen & Mustelin, 80% of people with this disorder would be at risk for psychiatric conditions such as anxiety disorder (<50%), affective disorder (>40%), and substance use (>10%) (2016).

It has been found that the medical student population is more likely to develop an **ED**. Because they are constantly exposed to academic stress, time burden, need for continuous learning, exposure to illness, and death during medical education (Rotenstein *et al.*, 2016; Puthran, Zhang, Tam Ho,
Academic stress presented by medical students is reported as an uneasiness produced by physical or emotional factors, which exert significant pressure, affecting their academic performance and their meta-cognitive ability to solve problems. The academic demands that generate stress are homework and lack of time for completion, academic overload, exposure to classwork, and test-taking (Zárate et al., 2017; Román & Hernández, 2011).

On the other hand, authors such as Dahlin and collaborators (2005), as well as Uzun and collaborators (2006), consider that factors such as low grades in their exams, restrictions in social activities, sedentary behavior, among others, are triggers for the development of an ED. All these factors contribute to this population acquiring terrible eating habits such as skipping some meals or, during exam season, having a high caloric intake of poorly nutritious food. However, one of the factors that will continue to influence these disorders is undoubtedly age, since it is in the middle and late adolescence when ED is most prevalent. We know that in mid-adolescence there are physical, mental, emotional, and sexual changes, and late adolescence is the period of physical, mental, and emotional growth. In these stages, it is known that 13% of young people experience at least one ED, such as mainly anorexia and bulimia. This same phenomenon is reported at age 20, 15-47% (Stice, Martí & Rohde, 2013; Culbert, Racine & Klump, 2016). The age in the population studied was 20 years, that is, they are in late adolescence and are susceptible to pressure from thinness, either because of the influence of the media or because they idealize a slender complexion. On the other hand, in the group of 20 graduate students, both masters and doctoral students for this study, they had an average age of 28 years, and are already considered adults (young adult), so the age factor influences that they are not at risk of having an ED. Although this sample of 20 students is not significant, it helped us get a clearer picture of the behavior at that age of presenting with an ED.

It is advisable that educational institutions that detect ED in their student conduct intervention programs aimed at preventing these disorders. For example, social skills workshops, workshops on how to make balanced and economic menus, the importance of breakfast in the diet, cognitive behavioral workshops for stress management, among others. About the cognitive-behavioral workshops, some studies have reported the decrease of stress and increase in academic performance in students who attended voluntarily (Bisson, Ehlers, Matthews, Pilling, Richards & Turner, 2007; Muñoz & Pérez, 1997; Richardson & Rothstein, 2008). Soon, it is intended to correlate stressors in medical students as a cause of ED.

The present study was limited to a relatively small number of participants. In the first case, being a private-sector school of medicine, the
population was not as large as normally exists in other public institutions. In the second case, the population was even smaller since we know that there are few students, unlike the national population who are doing graduate work in different scientific areas. In the future, it is expected that this study will be extended and applied to a larger public, covering other factors such as those mentioned above.

CONCLUSIONS

This study found the risk of having an ED in medical students and found no risk in the postgraduate population. According to the literature consulted, which supports the results obtained, we believe that early detection of ED is important. To act immediately to avoid chronicity and unfortunate consequences, and for the good bio-psychosocial development of the individual, in particular, the population at risk of ED in this study, we gave the appropriate accompaniment by sending the affected students to the corresponding area within the institution to evaluate and establish the presence or lack of any condition.

Acknowledgments

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THE RELATION BETWEEN BODY MASS INDEX (BMI) AND WAIST CIRCUMFERENCE (CC) WITH GLUCOSE, CHOLESTEROL, AND TRIGLYCERIDES IN MEDICAL STUDENTS

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To quote this article:

— Abstract —

We conducted a study to find the relation between the body mass index (BMI) and waist circumference (WC) with glucose, cholesterol, and triglycerides in 294 students with an average of 20 years old, who are enrolled in the Degree in Surgery of a private school in Tuxtla Gutiérrez Chiapas in 2018. We found that 36.4% of students were overweight and 12.9 with type I obesity. There was no statistically significant difference between these variables. However, we observed a tendency to overweight in students who had average values of glucose (34%), cholesterol (45%), triglycerides (36%), and high values of these parameters 70%, 48%, and 50% respectively. For WC, there was also no significant difference between these variables, however, we found a high health risk for cardiovascular diseases in students with hyperglycemia (10%), hypercholesterolemia (16%), and with moderate risk with hypertriglyceridemia (40%).

Keywords

Hypercholesterolemia; hyperglycemia; hypertriglyceridemia; obesity; overweight.
Anthropometric indicators such as Body Mass Index (BMI) and Waist Circumference Index (WC) are increased with the prevalence of overweight or obesity. They provide the most useful measure for determining these variables in the population, as it is the same for both sexes and adults of all ages.

Overweight and obesity are major risk factors for death, with a mortality of about 3 million adults per year. According to the World Health Organization (WHO), obesity is a chronic disease, characterized by increased body fat, associated with increased health risk. In 2018, more than 1.9 billion adults aged 18 or older were overweight, of which more than 650 million were obese (WHO, 2018).

According to the Pan American Health Organization (PAHO), overweight and obesity go hand in hand with various chronic and disabling diseases. The most notable of which are cardiovascular disease, high blood pressure, non-insulin-dependent diabetes mellitus, osteoporosis, and various types of malignant neoplasms (Parreño & Gutiérrez, 2010).

Glucose is known to be a necessary nutrient for the body, but the progressive increase in glucose can lead to diabetes. Diabetes is becoming a global epidemic and is associated with rapid increases in overweight, obesity, and physical inactivity. Worldwide, an estimated 422 million adults had diabetes by 2014. Diabetes caused 1.5 million deaths in 2012, and elevations in blood glucose levels above ideal caused an additional 2.2 million deaths due to increased risk of cardiovascular and other diseases (WHO, 2016).

Cholesterol and triglycerides are essential lipid substances in our body. But, in recent years, there has been a global increase in people who have these high values, which can cause various non-communicable diseases such as obesity, cardiovascular disease, high blood pressure, diabetes mellitus, etc... Also, these high values may reflect low physical activity or poor eating habits (Parreño & Gutiérrez, 2010).

Likewise, it is known that there is a significant correlation between cholesterol levels and coronary disease morbidity and mortality, particularly from 200 mg/dl of total cholesterol. Elevated triglyceride levels are not a cardiovascular risk factor, but are a marker of vascular risk when associated with another major, emerging, lifestyle-related risk factors (Pan American Health Organization. The situation of non-communicable diseases in Peru. Ministry of Health; Lima, 2003 in Parreño & Gutiérrez, 2010).

In Mexico, currently, about seven out of 10 adults and one out of three children aged 5 to 19 are overweight (overweight or obese), and diabetes is becoming a global epidemic related to the rapid increase in overweight, obesity, and physical inactivity. There are more than 347 million people with diabetes worldwide (Rivera et al., 2013).
In Chiapas, the problem of obesity and overweight is no different from that of the country. In the National Health and Nutrition Survey (2018), overweight and obesity in children under 5 years of age registered prevalence of 47.1% in the state, 28% in urban areas, and 19.1% in rural areas. Likewise, studies carried out by the Secretary of Health of the State of Chiapas registered that adolescents between the ages of 12 and 19 years old presented a percentage of overweight and obesity of 28.9%, and for adults over 20 years old it was 70.9% for men, and 60.6% for women (National Institute of Public Health, 2013).

A study conducted among university students in 2015 reported a prevalence of 15% overweight and 2.3% obesity. Students belonging to the male group, over 23 years old, and those who currently smoke, presented the highest values of overweight and obesity prevalence (22.0%; 23.7%; 25.5%) respectively. Also, in terms of health, students between 18 and 25 years of age presented a body mass index greater than 25 kg/m², and that it is the male sex that is associated as a predisposing factor for showing overweight or obesity (Tuta-García et al., 2015).

Considering the above, the main objective of this research work is to relate the body mass index and waist circumference with glucose, cholesterol, and triglycerides in medicine university students. Since studies carried out by the Secretary of Health of the State of Chiapas registered that adolescents from 12 to 19 years of age present a percentage of overweight and obesity of 28.9%, and for adults over 20 years of age it was 70.9% for men and 60.6% for women. The trend of this prevalence is not very encouraging, as it is increasing with age (National Institute of Public Health, 2013).

MATERIALS AND METHODOLOGIES

In the present study, we worked with a total population of 294 students (175 women and 119 men). This is because, according to (Núñez, 2014), it is the "set of all the elements that are part of the territorial space to which the research problem belongs." In this case, the set of all the students enrolled from the first to the eighth semester of the Degree in Surgery from a private sector school and who agreed to be part of the study employing written informed consent, following the provisions of the General Health Law and the Helsinki Act for medical research on human beings, as well as good clinical practice.

The data collection techniques that were applied in the research are as follows: To evaluate the Body Mass Index (BMI) in students the current classification proposed by the World Health Organization (WHO, 2018) to determine obesity (Table 1) was used, which corresponds to the relationship between weight expressed in kilos and the square of the height, expressed...
in meters. To determine the body mass index all participants were measured for weight and height.

**Table 1**

*Classification of obesity according to the WHO 2018*

<table>
<thead>
<tr>
<th>Classification</th>
<th>People under 65 years of age BMI kg/m²</th>
<th>People older 65 years of age BMI kg/m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard weight</td>
<td>18.5-24.9</td>
<td>21-22.9</td>
</tr>
<tr>
<td>Overweight</td>
<td>25-29.9</td>
<td>23-28</td>
</tr>
<tr>
<td>Obesity type I</td>
<td>30-34.9</td>
<td>28.1-29.9</td>
</tr>
<tr>
<td>Obesity type II</td>
<td>35-39.9</td>
<td>30-31.9</td>
</tr>
<tr>
<td>Obesity type III</td>
<td>≥40</td>
<td>≥32</td>
</tr>
</tbody>
</table>

Like waist circumference (Table 2), all anthropometric measurements were made taking into account the considerations of the WHO guide for physical surveillance measurements.

**Table 2**

*WHO 2018 classification of cardiovascular health risk by waist circumference*

<table>
<thead>
<tr>
<th></th>
<th>Low risk</th>
<th>Moderate risk</th>
<th>High risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men Waist</td>
<td>≤94 cm</td>
<td>94-102 cm</td>
<td>≥102</td>
</tr>
<tr>
<td>Women Waist</td>
<td>≤80 cm</td>
<td>80-88 cm</td>
<td>≥88 cm</td>
</tr>
</tbody>
</table>

To determine the biochemical parameters of glucose, cholesterol, and triglycerides, we performed enzymatic methods according to the instructions contained in the kit of each reagent. We considered standard fasting glucose values less than 100.0 mg/dl, and abnormal values greater than or equal to 111.0 mg/dl. As for cholesterol, a concentration greater than or equal to 200.0 was considered hypercholesterolemia, and lower values were considered normal. We contemplated as triglycerides, a concentration lower than 150.0 mg/dl, and higher than 200.0 mg/dl normal as hypertriglyceridemia.

For the statistical processing of the data, we used SPSS Statistical Software in its recent version and Microsoft Excel Windows. We made frequency tables expressed in quantities, and statistics (arithmetic mean and standard deviation, minimum and maximum values) of each interval, taking into account that we worked with a confidence interval for the mean of 95%. Also, it was applied the Chiquadrada test to relate the independent variables with the dependent ones, considering as significant a p<0.05.
RESULTS

Of the 294 students, 107 were overweight (36%), and 38 (13%) were obese type I (Chart 1). A study carried out in Spain by Arroyo et al., (2006) on university students reported prevalence of overweight and obesity of 17.5% (25% in men and 13.9% in women). Similarly, a more recent study by Zayas et al. (2014) of university students in the medical school in Paraguay recorded a prevalence of overweight and obesity of 38.2%. In Chiapas, studies conducted by the Secretary of Health of the State recorded that adolescents between the ages of 12 and 19 years presented a percentage of overweight and obesity of 28.9%, and for adults, over 20 years of age it was 70.9% for men and 60.6% for women (National Institute of Public Health, 2013), which is consistent with our study.

Concerning the risk for cardiovascular disease, the distribution of waist circumference was 85 students (29%) at moderate risk, and 39 (13%) at high risk (Chart 2), with a trend toward greater health risk in women, compared to men (Chart 3). As stated by Sánchez et al. (2012), women tend to have higher wc, which is consistent with our results.
When analyzing the BMI and the biochemical parameter glucose, we found no association between these variables \( p=0.477 \). However, we observed a trend in 93 students (35%) with average glucose values tending to overweight (Chart 4). Gutiérrez (2009), in a study of BMI and its relationship with cholesterol and triglycerides, found no association between BMI and glucose, which is consistent with our results. This is probably because the students are very young. However, the relationship between these variables should be taken into account, since, as Argote et al. (2010) state, disorders of carbohydrate metabolism in obese adolescents, obesity, and hyperglycemia are relevant associated risk factors.
Concerning BMI and cholesterol, we found no significant statistical difference between these variables (p = 0.313). However, we observed a trend in 99 students (37%) with average values and only 32% of cases with high cholesterol values that tend to overweight (Chart 5). Our numbers agree with a study conducted by Jimenez (2011). He found that 35.2% of the people who are overweight have hypercholesterolemia. And only 27.8% of the people with obesity also have it, showing that more people with overweight suffer from hypercholesterolemia. Similarly, Sam (2011), recorded that 32% of people who came to the laboratory of Pharmaceutical Sciences had high BMI and hypercholesterolemia. Likewise, it can be extrapolated with the data found by Angulo et al. (2009), where he noted that 35.9% of children with obesity have hypercholesterolemia.

Likewise, with the BMI and triglycerides, no relationship was found between the two variables (p = 0.945) but, we observed a trend in 102 students (36%) with average values of this parameter, and in 50% of the cases with high levels
The relation between Body Mass Index (BMI) and Waist Circumference (WC) with Glucose, Cholesterol, and Triglycerides in Medical Students

towards overweight (Chart 6). This is consistent with what was recorded by Jimenez (2011), in which the highest percentage of hypertriglyceridemia 81.7% are in overweight people.

Similarly, we found no relationship between WC and glucose (p=0.059), but there is a high health risk in 37 students (14%) with normal glucose levels and only 10% of the cases with high glucose (Chart 7). This differs from Maceda (2012) in the Basal Glycemic Risk Factor Assessment, that waist circumference is a risk factor for elevated glycemia and cerebral vascular events. Likewise, Pérez and Díaz (2011) state that individuals with a larger waist circumference have higher blood glucose levels; they specify that this is due to insulin resistance. However, it is worth mentioning that the possible difference may be because these individuals did not suffer from insulin resistance. After all, they did not have such high glycemic values.

Regarding WC and cholesterol, although no statistically significant difference was found (p=0.817), a high health risk was observed in 35 students (13%) with normal cholesterol levels, and in 16% of the cases with high cholesterol.
(Chart 8). Studies carried out by Rosas et al., Martinez et al., and Pajuelo et al., on the Metabolic Syndrome in overweight and obese adolescents mention the relationship between increased waist circumference and hypercholesterolemia, bringing with it in recent years the risk of cardiovascular diseases and metabolic syndrome.

Finally, we found no correlation between wc variables and triglycerides (p=0.402). But we observed a high health risk in 39 students (13%) with normal levels of this biochemical parameter (Chart 9), which should be taken into account, since Pérez (2011) and Pajuelo et al., mention that individuals with greater waist circumference present higher levels of triglycerides. Likewise, Sanchez et al. mention that triglycerides and waist circumference are parameters with greater precision to determine the Metabolic Syndrome, therefore, we could deduce that a large percentage of this population is at risk of suffering this metabolic disorder.
CONCLUSIONS

In the research on the relation between body mass index (BMI) and waist circumference (WC) with glucose, cholesterol, and triglycerides in university students, we reached the following conclusions:

1. Of the 294 students, 107 were overweight (36%), and 38 (13%) were obese type I.
2. About the risk for cardiovascular diseases, the distribution of waist circumference was 85 students (29%) with moderate risk, and 39 (13%) presented a high risk, with a trend toward higher health risk in women, compared to men.
3. We found no relation between BMI and biochemical parameters glucose, cholesterol, and triglycerides.
4. We found no relation between WC and the biochemical parameters glucose, cholesterol, and triglycerides.

RECOMMENDATIONS

Although there were no statistically significant results between the BMI and WC variables with the biochemical parameters glucose, cholesterol, and triglycerides, early detection using indicators (such as BMI) is necessary as a preventive measure for diseases such as diabetes mellitus. Since the prevalence of diabetes by previous medical diagnoses in people 20 years or older in Chiapas was 5.6%, similar to that reported in the National Health and Nutrition Survey (2012). The prevalence of diabetes was slightly higher in women (6.3%) than in men (4.8%), with a female-to-male ratio of 1:3 (National Institute of Public Health, 2013).
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APPROACH TO THE CONCEPT OF EDUCATION FROM A CONTEMPORARY NATIVE PEOPLE COMMUNITY

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— Abstract —

The vertiginous changes in the processes of formation and transformation of the individuals are disrupted by multiple ways of conceiving life and the context in which they develop. That is why education as a transformative process of people has faced generational changes that, in many cases, blur "other" ways of educating the subject. That is, on the one hand, we have formal education as an agent of transformation and change in these from various ideological mechanisms. And on the other, community education is maintained in resistance, understood as the set of elements of a culture, which favor the construction of individuals with ethical and moral references proper to the context in which they operate. Therefore, the present article of field research carried out in Tzeltal-speaking communities in the Chiapas region V Altos Tzotsil-Tzeltal addresses an approach to the conception of education from an approach to the interpretation and translation of this concept into the language of these contemporary indigenous people. The article presents a detailed analysis of the ways of naming and conceiving the educational process, also seen as a contextualized process that is part of the individuals’ cultural knowledge, and therefore of their status as collective individuals. Because education is framed according to what is done and is in community, in society. This is why native peoples have been able to identify up to six ways of conceiving education with their respective particularities in each of them.

Keywords

Education, collective individuals, indigenous peoples, Tzeltal, knowledge.
Education has been conceived, by many scholars, as a process of transformation of the subject both in formal and non-formal environments, that is, individuals learn from diverse contexts and life situations. Therefore, formal contexts are associated with the degrees and levels officially recognized by the state, while non-formal environments show the importance of the educational process from two criteria: one structural and another methodological. However, it is worth reflecting that education as a human and highly complex process shows that "it is necessary to consider the condition and nature of man and culture as a whole, so that each particularity makes sense because of its linkage and interdependence with others and with the whole" (León, 2007: 596), since too often it is spoken of a distance between the formal educational process and life (Rigo, 2006), that is, education as an institution through schools or colleges, marks a gap between what is taught and learned with life, contrary to what happens in the formative or educational community processes inscribed in a different ontology as an act of education from the own experiential contexts.

In this way, "being in itself" and "being for something" marks an important differentiation around how educational or formative processes for life are generated. The central axis must be that of constructing from and in one's culture structures, forms, and contents that must make an education contextualized to the cultural forms in which the subjects develop. Therefore, the concept of interculturality must make possible two important elements as expressed by Comboni (2009):

1. Universal contents that pass through information, media, national plan and program, knowledge, and common languages.

In this way, it is crucial to specify what Moreira (1994) mentions the content to be learned, which should be related to or incorporated into the cognitive structures of subjects. This is why the relevance of community education is significant, as well as it is necessary to understand the dynamics in the educational environment from the perspective of the native peoples in all Mexico. Here lies the importance of the present article: the premise found throughout the research is that, in the formation process, ethical and moral principles play a preponderant role in the construction of the individual and his involvement in educational areas.

The perspective of community education from the experience of the Tzeltal people highlights the imperative need to make visible one's knowledge in the face of knowledge that is foreign or external to his culture. In this rela-
tion, it is crucial to understand that while we understand the socio-cultural and historical dynamics of the peoples, in this case Tzeltal people, will allow the construction of processes of education or formation with contextualized perspective and whose learnings must become significant and for life.

APPROACH AND METHODOLOGY

The presented approach is part of a partial cut of a broader study concerning rural contexts and their forms of cultural appropriation. It is based on a qualitative approach because of its interpretative and ethnographic character, whose purpose is to give importance to the context in which the research project is developed and particularly to the actors who participate. Therefore, the ethnographic research starts from the "cannot be programmed, that its practice is replete with the unexpected" (Hammersley & Atkinson, 1994: 39). It becomes exploratory and, at the same time, descriptive study since it focuses its attention on identifying the various categories from which education is constructed in the Tzeltal context and which are used and lived among inhabitants of these communities. The intention is to approach the concept of education, the multiple spaces in which they are developed, and how subjects appropriate these categories, which are part of their daily lives.

On the other hand, as it is known, Chiapas occupies the second place with the largest population speaking an indigenous language from 5 years on (see graph 1). It constitutes approximately 1,141,499 people, which shows us the need to understand other ontologies and epistemologies in the construction of knowledge and consequently in processes of formation of individuals. From there, the contribution proposed by original peoples, in this particular case the Tzeltal localities, where the study was carried out, are generating to be included in a new agenda of construction of knowledge.
Therefore, we first approach the municipalities of San Juan Cancuc, Huixtán, and Ocosingo in the state of Chiapas, all speakers of the Tzeltal language. Tzeltals are one of the contemporary Mayan peoples, with a considerable presence in the state of Chiapas, their roots dating back perhaps to 500-700 BC when they began to settle in the highlands of Chiapas. Tzeltal people "define themselves as those of the original word, batzil ko’op" (Gomez, 2008:6), that is, those who have been heirs of a tradition that evokes a memory of the Mayan roots, those who recreate various manifestations of their customs and way of life of this people. Hence, the Tzeltas’ "way" of being has been determined by the historical place, which shaped their resistance and survival. The climate and landscape also influence the character of the people from the mountains. Those from the mountains with their distrustful manners, while those from the jungle are much more communicative" (8).
While Tzeltals along with the Tsotsil people have become peoples whose cultural and linguistic vitality has been maintained despite the onslaught of modernity, we can locate the presence of this people in at least three major important regions in Chiapas and with different characteristics: “1) Northern Zone: Sitalá, Yajalón, Chilón, Bachajón, Ocósingo; 2) Central Zone: Chanal, Oxchuc, Tenejapa, Cancuc, Altamirano, Abasolo and 3) Southern Zone: Teopisca, Amatenango del Valle, Aguacatenango, Pinola and Socotenango” (Gómez, 2008: 40), in addition to the fact that “Tzeltal is a language with moderate dialectal variation: it presents unquestionable differences from one municipality to another, so it is made up of a certain number of what we call "geolects", that is, varieties with their linguistic features, linked to some particular geographical areas” (Pollian, 2015: 4).

Semi-structured interviews were carried out to key actors, particularly adults and elderly (women and men), with whom we reflected on the approach to translating education from their mother tongue and their experience. Afterward, we categorized multiple forms to understand this concept and its function in the localities and places in which it is taught and learned. Based on these reflections, it was possible to systematize the interviews. We were able to analyze the participants’ discourse and identify the categories and their most relevant elements, which make it possible to describe the meaning of each of the concepts verbalized by the interlocutors. All this, thanks to the use of an ethnographic research method, as well as collaborative participation that allows a transformative action on the subjects.

RESULTS

Reflecting on the multiple methods of education through diversity contexts highlights the urgent need to understand these other types of education as a source of knowledge. They foster reflective capacity and allow us to question the ways of understanding a traditional, hegemonic concept of education whose relations are unilateral. For this reason, the notion of teaching from a contemporary indigenous people in Chiapas makes it possible to think and rethink a horizontal perspective of knowledge based on contemporary peoples’ conceptions.

In this way, we have notions about the concept of authorized education from the Tzeltal language, taking up again the elderly’s perception of the localities where the research project was developed. Official education in their mother tongue, Tzeltal, is kantol its translation means to study, and kantoletik students. However, this term is not familiar to the younger generations, since it was the first translation that was made towards school education when it arrived at the research locations. There is a lack of knowledge of the semantic derivation of the word among the inhabitants. Elders are the
only ones who use this term. On the other hand, young people and adults call official education *nopjun*, which means "to learn book" whose figurative meaning is "to study" and *nopjunetik* students or the one who studies with the book and goes to school.

![Diagram 1. Structure of the term nopjun. Source: Collective elaboration, 2019.](image)

*Nopjun*, from the community point of view, is a process in which an individual acquires knowledge from a foreign culture (although mathematical, philosophical, linguistic, behavioral, knowledge is present in one's cultural environment). The person constructs new wisdom that has to be useful within and outside of his socio-cultural environment.

The conception of *nopjun* is related to the abilities of someone who trained in the pedagogical field and who shares his knowledge, which is the teacher-*nojpteswane*. Desire, concentration, and *orail*-destination are also factors related to the educational progress and future of a student. This comes from the idea that the original man is destined to take care of his land and to maintain his own culture, elements that must be transformed through the formal education taught in classrooms. A perspective has been constructed that is alien to the culture of the subjects themselves since it is considered that study will make possible respect, honor, values and good living in the future, because *nopjun* makes the individual intelligent in school skills. This is the first disjunctive between formal education and education from and with the native people localities. On the other hand, it is important to emphasize that there are references that form part of their community education, generated from the space and times in which the subjects develop, for example, the arrival of the *ch’ulel* in a subject, which from the Tzeltal conception would seem then, as Geertz has pointed out, that:
"The concept of person is... a magnificent tool to investigate the problem of how to delve into other people's changes of mind... looking for and analyzing the symbolic forms - words, images, institutions, behaviors - in terms of which, in each place, people represent themselves, in front of themselves and their peers" (1991: 104)

Then the arrival of the ch’ulel from the Tzeltal cosmovision indicates a process of maturity and knowledge in the individual. It comes from the root word ch’ul that translates to "holy" or sacred. According to Pitarch "the ch’ulel, also lodges in the heart and is necessary for life, but also, it intervenes in the individual characterization of each person, in the ch’ulel resides the memory, feelings, and emotions, it is responsible for dreams and in it language is originated. The nature of each ch’ulel is what gives each human being a unique "temperament." Those who describe its appearance agree that its profile is that of a human body and, some agree that it has the same silhouette of the body of its host, but "without flesh and bones", a dark spot, a thick shadow" (1996: 35). This means that when the ch’ulel arrives at the individual, he will act under its energy and knowledge, for this reason, it is said that it is better to educate the individual from childhood, before the arrival of his ch’ulel since it will particularly mark his temperament.

THE P’IJTESEL OR TRANSMISSION OF KNOWLEDGE

P’ijtesel is the first reference that shapes the community education, granted by the elders, which consists of transmitting knowledge to the individual from their cultural environment to create his vision of life. It is the one that allows the follow-up of a whole system of traditional knowledge, which makes the individual wise in his language and culture. That is to say, allows the individual to elaborate on his own ideological and cosmogonic system from the place and space where he lives.
The person who receives the *p’ijtesel* acquires knowledge, transmitted particularly from the elderly. Most of the time, this act happens at night, in the kitchens, around the stove. This place is the central point of family meetings. It is also considered an “important essence in the learning process of dialogue, history, and life, because it is there where activities are planned, in the morning, where the family and the community gather to organize a set of activities that allow the subsistence.” (Micanquer, 2007:92). It can also be transmitted at work when the child wants to know the meaning of a certain action or process. Grandparents’ knowledge is built by the experience they have had throughout their lives.

Who has acquired the *p’ijtesel* implies that he knows how to listen, understand and reflect on the knowledge acquired to become a *lekil bats’il winik* (a correct, conscious individual) hence the importance of the *p’ijtesel*. In the case of children and young people (who have not yet received or have not yet reached the *ch’ulel*) knowledge transmission is mainly in charge of grandparents and parents. On special occasions, the one in charge might be some old counselor of the community, considered a wise person with a moral character as a guide in the conformation of the subjects as conscious persons.

**NOJPTESEL AND TEACHING IN COMMUNITY EDUCATION**

The concept of *nojptesel* refers to the teaching of “how is it done?”, which means teaching strategies and methodologies of daily work in the field.
(mainly farming activities), in domestic chores, and in a particular activity which is the art of making embroidery. *Nojptesel* is different for each sex, this is due to the gender role that men and women must learn in the development of their role within the home, work, and society itself throughout their life stages, determined by the cultural environment.

Parents and grandparents are responsible for *nojptesel* (teaching) since this process implies that the person receiving the teaching must put it into practice, find value in what he or she has learned, and share it. *Nojptesel* is an accumulation of knowledge that allows the individual to live meaningfully every day in the community. We could understand this as cultural knowledge, as stated by Limón (2009) when he mentioned that the community way of living, is a meaningful way that makes people's knowledge relevant for the individuals' existence.

The teacher’s character is also a factor that will affect a student’s life. The student will acquire a similar personality according to the way he is treated, which is why they believe that the *k'ajk'al o'tanil* –strong character– is genetically transmitted, as well as the gift of knowledge. These will be the characteristics that when the student matures, he will have the capacity to transmit the knowledge learned.

**TAK’UYEL AS AN ETHICAL PRINCIPLE IN COMMUNITY EDUCATION**

*Tak’uyel* means giving principles to improve a person’s way of life, so this category of education applies mainly to newlyweds or those who have decided to start a family. In particular, they are instructed in values, principles of self-improvement based on the experiences of those who give the *tak’uyel* so that they can have a full life. There can be a difference between the *tak’uyel* given to a woman and that given to a man since the old women instruct the woman and the old men instruct the man.

*Tak’uyel* in the analytical sense is a norm that is subject to the actions of the individuals, that is, it is about the construction of the human being in society. On the other hand, *Tak’uyel* is not only found at the family level but also we can find it at a more collective level as are the community assemblies in which principles of dialogue, consensus, and inter-subjective relations are exercised (Lenkersdorf, 1996)

**THE SHAPING OF TOJOBTESEL IN COMMUNITY EDUCATION**

On the other hand, a fourth category present in community education is *Tojobtesel*, which is understood as the guidance or advice that an individual receives to behave fully towards himself and others. It is also a corrective measure that can be used as a warning call to those who have made a
mistake, unbalancing the personal, familiar, or community environment. Remedy his errors will make him reflect on it and may amend it according to the principles of the worldview of the Tzeltal people.

The me’iltatiletik try to give advice, particularly to children before the arrival of their ch’ulel, because when the ch’ulel arrives he won’t pay attention nor implement in his mind and heart the principles of conduct given to him, because he will act according to his thought. The arrival of the mch’ulel implies a process for the individual full consciousness and holistic maturity as previously reflected.

**TSITSEL AND ITS CORRECTIVE FUNCTION**

Lastly, Tsitsel is a term that refers to the act of calling attention to the disobedience of family or social rules, that is to say, to encourage behaviors that upset the balance of forces that make up the person or the community. This category has an application mainly to children and young people, who are in a process of forming their personality to become subjects that achieve the conception of lekil ants-winik (real men and women).

The perspective maintained by the native peoples concerning the forms in which the educational process can be understood is rather a process of formation as subjects that integrate the community and that in this action they unquestionably need principles that are acquired from the heart of the family and community. It should be the task of formal education to teach these ethical and moral principles based on the forms in which they are proposed. That is, a perspective guided towards the contextualization of education in cultural and linguistic terms. Both elements will make possible an education that is pertinent to the real situations in which subjects develop and construct "another" education that fosters social learning and builds knowledge based on the dialogue of learning as a transforming proposal.

**GENERAL CONCLUSIONS**

If we start from the conception of education from the Freirian perspective, then we are starting from the construction of a transformative process as a practice of freedom in a broad sense. In this way, education cannot be seen as an isolated experience, but rather as an imbricated relationship with the context in which the educational process takes place, that is, the very culture of the students, of the educator, and of those who make up the educational process. Faced with this situation, the teacher’s perspective must become a subject of continuous learning. Freire rightly states that "the teacher is no longer only the one who teaches, but the one who, insofar as he teaches, is taught through dialogue with the student, who,
in being educated, also educates. Thus, both transformed into subjects of the process in which they grow together. In this process, the arguments of the authority no longer govern. (1987: 86)

The role that education plays in native peoples’ lives makes visible other ways of conceiving this transforming process in human beings, since it is not a unidirectional process in which the teacher is the one who knows and provides knowledge to those who lack it. But rather, the educational process passes through various times, places, and interlocutors that play a crucial role in the making of individuals committed to the ethical and moral principles that mark the context in which they develop. This will also allow the development of a full life even with its present tensions and conflicts as part of everyday life and the historical moment in which they find themselves.

Thus, it is necessary to present Diagram 3, which synthesizes in some way the concepts of education from a Tzeltal perspective:

![Diagram 3. Tzeltal categories interrelation around education. Source: Collective elaboration, 2019](image)

There is an ontological and epistemic rupture between what is perceived as community education and formal education approaches. It is of great importance "to take into account elders' history and footprint, as trainers of the community and to observe what differentiates us from the external societies and to recognize how our wisdom has allowed the existence of our peoples in time and history." (Micanquer, 2007:92)

Without a doubt, this exploratory study allows us to reflect on the multiple edges, which are important to recognize as cultural and social forms. They are recognized in educational terms and of individuals' training, joined to these ethical and moral principles, two categories of extreme importance are interrelated: time and space concepts from a personal perspective. This must lead us to identify multiple actors that make us reflect, in the middle of the XXI century, about our indigenous people's wisdom.
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TEACHING PROTOTYPE OF A BI-DIRECTIONAL VIBRATING TABLE FOR THE STUDY OF SMALL-SCALE STRUCTURAL SYSTEMS

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In this paper, we present the design, construction, programming, and startup of a bidirectional shaking table prototype for the study of small-scale structural systems. The shaking table represents part of the complementary teaching tools in the Civil Engineering degree program (CE) of the Faculty of Engineering (FE) of the Universidad Autónoma de Chiapas. As within the basic and relevant knowledge for the training process of a civil engineer is the study and understanding of the structural behavior of different systems subject to different actions. Students are also considered to put into play the cultural capital inherent in them developed from previous academic trajectories, as well as the transit in the FE when they built a prototype to incorporate it as a teaching tool to the CE.

Keywords

Bidirectional shaking table; Arduino; stepper engines; small-scale simulation; seismic engineering.
As Godínez et al. (2019) comment, the Mexican Republic is located between five tectonic plates, which means that it is continuously exposed to important seismic actions. It affects not only the epicentral regions but also urban areas that can be found at considerable distances, as in the case of the earthquakes that are generated on the coasts of Guerrero and can affect the central zone of the country. For this reason, several regions of Mexico are located in areas of high seismic risk. Such is the case of the states of Chiapas and Oaxaca, two of the most seismically active states in the country, where historically significant damage has occurred to infrastructure due to medium and large scale seismic actions (Nuñez-Cornú & Ponce 1989, González et al. 2013, González et al. 2014, Godínez et al. 2019).

As a result, in Mexico, events of great importance have been recorded, for example, the Manzanillo earthquake on October 9, 1995 (Mw=8.0), the Michoacán earthquake on September 19, 1985 (Mw=8.1), the Tecomán earthquake on January 21, 2003 (Mw=7.4), and the recent Tehuantepec earthquake on September 7, 2017 (Mw=8.2), causing significant material and human losses. In all cases, there was serious damage to different structural systems (ssn 2019, Godínez 2019).

The high seismicity of Chiapas and Oaxaca is generally known and can be verified through the information provided on the National Seismological Service (ssn, 2019) website, where 38,886 earthquakes were reported from 01-01-2018 to 12-08-2019, with variable magnitudes. A total of 6,668 earthquakes were recorded in Chiapas and 32,218 in Oaxaca.

As Godínez (2019) comments, the antecedents for international level (for example the 1989 El Centro earthquake in Southern California (usa), the 1995 Kobe earthquake in Japan, the 1999 Kocaeli earthquake in Turkey, the 2010 Chile earthquake, among others), national level (the 1985 Michoacán earthquake, the 2017 Tehuantepec earthquake, and the 2017 Axochiapan earthquake), and state level (the 1995 Villaflores earthquake and the 2011 Las Choapas earthquake) have strengthened engineering, especially seismic and structural engineering since new knowledge and technologies are being developed. Within the experimental field, efforts are focused on observing, analyzing, and interpreting the effects of seismic movements (or any other type of action) on real elements and/or structures and at scale to have a better understanding of structural behavior. A topic that is becoming increasingly interesting, due to the great economic and life losses recorded in past earthquakes, lies in the analytical and/or experimental study of seismic response control devices for the original design and rehabilitation of structures (Soong & Spencer 2002, Tena 2003 & 2004). With all this, we hope to improve the structural designs of seismic-resistant buildings and to safeguard the life of their occupants and their heritage.
Currently, the study of structural systems in vibrating tables capable of reproducing seismic movements has allowed the development and understanding of new anti-seismic technologies. It also provides a better understanding of traditional systems, which together with practical experience, has allowed the evolution and improvement of design regulations, as well as the design and construction practices of different structural systems.

Thirty-four years after the 1985 earthquake that devastated Mexico City ("ICA Foundation" 1988), there has been an evolution of building regulations and their respective complementary technical standards (Tena-Colunga et al. 2009). However, much work remains to be done, as evidenced by the severe effects both in Mexico City and in several states of the country (Chiapas, Oaxaca, Morelos), resulting from the earthquakes of September 7 and 19, 2017 (Tehuantepec and Axochiapan earthquakes). The development of experimental projects helps advance the normative field in Mexico. A task in which the vibrating table of the Laboratory of the Institute of Engineering of the National Autonomous University of Mexico (UNAM), the laboratory equipment of the National Center for the Prevention of Disasters (Cenapred, Spanish acronym), as well as equipment in different universities of the country, such as those of the Autonomous Metropolitan University (UAM) or the Autonomous University of Yucatan (UADY), to name a few, have contributed. In the particular case of the vibrating tables, they make it possible to simulate seismic movements of different characteristics, to analyze and understand in detail the behavior of the structures under study, and in this way, to make designs that guarantee an adequate level of safety in the face of intense simian actions. On the other hand, nowadays, there are few reports of articles that reference seismic simulators for small-scale structural models, since these can only be acquired, at high costs, with specialized companies dedicated to the development of this type of equipment (Coral et al. 2010).

The Faculty of Engineering (FE) of the Universidad Autónoma de Chiapas (UNACH) does not have a specialized team to teach essential subjects to students majoring in civil engineering. Subjects as isostatic structures, structural design, seismic engineering. Or at a post-graduate level, such as seismic response control systems, special structures and, structural dynamics. Through the equipment, it is possible to illustrate the effect of different types of input signals. It is also possible to see the results on the configuration of the structures in plan and/or elevation (the effect of irregularities in the structural response).

Therefore, this article presents the relevant aspects of the design, construction, programming, and commissioning of a prototype of a bi-directional vibrating table for the study of small-scale structural systems. This will allow the evaluation of the structural behavior under the action
of different types of agitation. It is crucial to mention that, at the present stage, only periodic signals can be simulated, but the final objective is that registered or artificially generated earthquakes can be reproduced.

As mentioned, the vibrating table would also help in the training of students in the field of dynamic and seismic behavior of structures, as well as in complementary areas that are of great importance in control processes, such as electronics and programming. This does not mean that we are overlooking the human part in the construction of teaching prototypes, since it is considered a tool for the reconfiguration of cultural capital by students in their journey through the social spaces of the College of Civil Engineers of Chiapas, trying to show, in a very simple way, the difference in the structural response as the lateral rigidity of the systems under study varies. We placed vertical elements of the same material in the device, and on each element of different height, we set a cylinder of the same dimension and mass. Due to the variation of height in each model, the rigidity is variable, with the systems of lower height being the most rigid, and the higher ones the most flexible. This illustrates the difference between the vibration periods of each system.

![Image 1. Vibrating table relying on human agitation (design and construction by M.I. Guillermo Sánchez Trujillo)](image1.jpg)

Therefore, this project aims to design, build, program, and implement a prototype of a bi-directional vibrating table for the study of small-scale structural models. To this end, we considered the following stages:

1. Conceptualize and design a bi-directional vibrating table prototype
2. Construction of the prototype (at a lower cost than a professional commercial team).
4. Carrying out of calibration tests by the students of the Civil Engineering Degree (CE), where, besides, the effects of vibrations on small-scale structures are illustrated.

METHODOLOGY AND MATERIALS

According to Hernández et al. (2010), “experiments are called intervention studies because a researcher generates a situation to try to explain how it affects those who participate in it compared to those who do not.” Hernández et al. (2010) indicate that it is possible to experiment with human beings, living beings, and certain objects. Experiments manipulate treatments, stimuli, influences, or interventions (called independent variables) to observe their effects on other variables (the dependent ones) in a control situation. According to the cited authors, this occurs as illustrated in image 2.

![Image 2. Examples of variables (Hernández et al. 2010)](image)

In this sense, the design, construction, and implementation of a bi-directional vibrating table, as a teaching prototype, contributes to the study and understanding of the effects of vibrations in small-scale structures in a controlled environment. Civil Engineering degree students can practice other skills and knowledge, such as math, programming, electronics, and engineering concepts by using prototypes incorporating Arduino, actuators such as direct current engines or stepper engines, and sensors like the accelerograph. The construction of a teaching prototype for vibration simulation and the knowledge of its impact on small-scale structures will also improve the students' knowledge in engineering.

For the design and construction of the teaching prototype, we used the materials and equipment indicated in table 1.
Table 1
Materials used in the construction of the vibrating table

<table>
<thead>
<tr>
<th>Material and equipment</th>
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<tbody>
<tr>
<td>1. Arduino y Arduino one</td>
<td>12. Caution</td>
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<tr>
<td>2. Acrylic</td>
<td>13. Tin</td>
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<tr>
<td>3. NEMA 17 stepper engines</td>
<td>14. Driver A4988</td>
</tr>
<tr>
<td>4. Strip</td>
<td>15. Washer</td>
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<tr>
<td>5. Tubulars</td>
<td>16. Screws</td>
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<tr>
<td>6. Bearing</td>
<td>17. Power source</td>
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<tr>
<td>7. Plywood</td>
<td>18. Plastic holders</td>
</tr>
<tr>
<td>8. Cables</td>
<td>19. Toothed pulley</td>
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<tr>
<td>9. Resistors</td>
<td>20. Toothed strip</td>
</tr>
<tr>
<td>11. Extension slide</td>
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</table>

DESIGN AND CONSTRUCTION OF THE VIBRATING TABLE

We made two sketches for the construction of the vibrating table: one for the base (on which Engine 1 is placed, image 3) and another for the structure where Engine 2 will be placed. A small wooden platform will be fixed to the structure of Engine 2, to settle the scale structures on it.

For the base of the table, we carried out the following procedure:

1. We cut each one of the tubes with the measures specified by the dimensions of the stepper engine and the 35 cm rails.
2. We welded each of the tubes according to the sketch made.
3. We printed the base to prevent corrosion and provide better aesthetics.

Image 3. Engine 1 base
In the case of the structure of the second stepper engine, we sketched the stepper engines and rails dimensions. We also took into account the dimensions of the toothed pulleys and the position of the rails. With the dimensions and position of the plate, we made a model with locking fording paper to get an idea of it (image 4).

Having the table base as a reference, and the model with bockingford paper, we designed the base for engine 2, considering that it should make an orthogonal movement concerning the one made by engine 1 (image 5).

We configured the structure using acrylic, to have a light structure, and thus avoid that one of the engines is forced too much.

Finally, the integral assembly of each of the parts that make up the bidirectional vibrating table was carried out. Image 6 shows a photograph of the assembly, where the different integrated components can be seen: engines, toothed belt, screws, nuts, bearings (where the toothed pulley is attached).
Once the construction of the vibrating table was done, we proceeded to develop the programming of an Arduino, through which the rotation of two stepper engines is controlled, using the A4988 interface. The interface used is a Driver that allows making independent the low power used by the Arduino with the high power of the engines, and a phenolic plate for other devices, such as resistors and capacitors that avoid noise in the power supply of the switchboard (image 7). Annex A of this article shows the code developed for the stepper engine programming with the Keypad.

Finally, the finished prototype of the bidirectional vibrating table for the study of small-scale structural systems is shown in image 8.
SIMULATION PROCESS

Systems in which the output does not affect the control action coming from the system input are called open-loop control systems (Ogata, 1998). As Ortega (1998) comments: "In an open-loop control system the output is neither measured nor fed back to compare it with the input. A practical example is a washing machine. Soaking, washing, and rinsing in the washing machine operate on a time basis. The machine does not measure the output signal, which is the cleaning of the clothes. In any open-loop control system, the output is not compared to the reference input. Therefore, each reference input has a fixed operating condition; as a result, the accuracy of the system depends on calibration.

For this purpose, the vibrating table would be considered as an open-loop system, since its behavior will depend only on the input signal. A block diagram for such a system could be shown in Image 9.

Input signal

Arduino

Stepper engine

Built structures

Real output signal

The real output signal is the one that will affect small-scale structural systems. It simulates vibration behavior and provides the opportunity to visualize, among other things, differences in dynamic properties as a function of the lateral stiffness of the system under consideration or areas where there is
the possibility of structural damage associated with irregularities in elevation. Simulation is a theoretical contribution that is considered in this proposal, since, as other authors have mentioned (Coral et al. 2010), at present, vibration tables are the most natural approach to seismic movements (when they have such capabilities). Obviously, given the limitations of the vibrating table discussed in this study, the equipment has purely academic purposes, and its main objective is to serve as a complementary teaching tool. Image 10 shows a flow chart for the implementation of a simulation model for the vibrating table.

![Image](image10.png)

*Image 10. Steps in a simulation study (Banks & Carson, 2001)*
PROGRESS AND/OR RESULTS

The first phase was completed, the objective of which was to build a bidirectional vibrating table for the study of small-scale structural systems, as shown in image 8. We also programmed an Arduino (image 7), through which the stepper engine switch can be controlled. At this stage, the table can be manipulated in the X and Y directions, i.e. in the plane. Not so in the Z-axis direction (parallel to the height of the models), an action that can be implemented in the future by applying servo engines.

Likewise, the speed may be controlled by programming in Arduino, since in this case, it is possible to enter the number of steps to be performed by the engine.

With the built prototype it is possible to reproduce the effects of vibrations on scale structures. Later on, the possibility of emulating the movements originated by an earthquake is considered, a task that is currently under development.

As a second phase, we carried out small-scale model tests. Initially, we did a simple test using models of systems with a degree of freedom (image 10a). Subsequently, we performed some tests using a Mola structural kit (image 10b), using the structural system of a building resolved based on frames (with or without upwind) that can be represented. In both tests, structural characteristics of interest to the Civil Engineering Major students of the UNACH’s Faculty of Engineering were illustrated, such as differences in vibration periods as a function of lateral stiffness, the upwind effect, and consequences associated with changes in elevation stiffness. During the tests, we explained the design, construction, and programming processes for the vibrating table, which is of great interest to the students.

We overcome a few issues while working on the construction of the table during the first stage, such as handling of the stepper engines, the table base settings, and the structure of the engines.

Image 10. a) Exposing the prototype and carrying out a test using wood masses at different heights, b) test carried out with the MolaR structural kit
The vibrating table represents a valuable complementary teaching tool for teachers and students of the Faculty of Engineering of the Universidad Autónoma de Chiapas for the teaching and learning of some key subjects, such as isostatic structures, structural design, seismic engineering; or post-graduate level, such as seismic response control systems, special structures and, structural dynamics. Through the equipment, it is possible to illustrate, in a simple way, the effect of different types of input signals, as well as the effect of the level settings and/or the structures’ elevation (for example effect of irregularities in the structural response). We also considered that students risk the provided cultural capital developed from previous academic trajectories in the Faculty of Engineering. When they build a prototype to incorporate it as a teaching tool to the Civil Engineering Major, they are also sharing habits and objects used in the constructive process of the prototype.

The prototype continues in constant development, reason why we expect to improve it so that this one is always of great utility for the teachers and students of the Faculty of Engineering.

ACKNOWLEDGEMENTS

We would like to express our gratitude to the students of the Civil Engineering Major, who collaborated in the construction of the prototype: Rigoberto Castellanos Martínez, Erwin Hernández Avendaño, Lucrecia Lisseth Hernández Mendoza, Alexis Sánchez Gutiérrez Alberth. We also thank Gerdau Corsa for the donation of the Mola structural kit.
REFERENCES


ANNEX A

#include <LiquidCrystal_I2C.h>
#include <Wire.h>
#include <Keypad.h>
#define VELOCIDAD1 2000 //engine rotation speed, the lower the value more speed
#define VELOCIDAD2 2300
#define VELOCIDAD3 1400
#define VELOCIDAD4 900
#define VELOCIDAD5 900

LiquidCrystal_I2C lcd (0x27, 16, 2);

//motor 1
int direccion1 = 22; // we define as “integer” digital pin 9 to give rotation direction
int pasos1 = 24; //we define as “integer” digital pin 13 to take the steps to the servo
int reset1 = 26; //we define as “integer” digital pin 10 to enable the engine
int tiempo1 = 0;

//motor 2
int direccion2 = 23; //we define as “integer” digital pin 9 to give rotation direction
int pasos2 = 25; // we define as digital “integer” pin 13 to take the steps to the servo
int reset2 = 27;
int tiempo2 = 0;

//text cycle variable
int u=1;
int E=1;

//movement cycles
int a=10;
int totalpasos1 = 100; // we define as “integer” total steps to complete a progress
int totalpasos2 = 100;
int totalpasos3 = 150;

//the code needed for keypad starts
const byte filas = 4;
const byte columnas = 4;
byte pinsfilas[filas] = {47, 49, 51, 53}; //connect to the row pinouts of the keypad
byte pinscolumnas[columnas] = {39, 41, 43, 45}; //connect to the column pinouts of the keypad

textfile("Teaching prototype of a bi-directional vibrating table for the study of small-scale structural systems

char teclas[filas][columnas] = {
    {'1','2','3','A'},
    {'4','5','6','B'},
    {'7','8','9','C'},
    {'E','0','F','D'}
};

//the code needed for keypad starts

Keypad teclado = Keypad( makeKeymap(teclas), pinsfilas, pinscolumnas, filas, columnas);

textfile("char tecla;
    //int numero;

    void setup(){
        Wire.begin();
        lcd.begin(16, 2);
        lcd.backlight();
        lcd.clear();
        lcd.setCursor(0, 0);
        lcd.print("MESA SISMICA");

        pinMode(pasos1, OUTPUT); //we define “pasos” as digital output
        pinMode(direccion1, OUTPUT); //we define “dirección” as digital output
        pinMode(reset1, OUTPUT); //we define reset as digital output

        pinMode(pasos2, OUTPUT); //we define “pasos” as digital output
        pinMode(direccion2, OUTPUT); // we define “dirección” as digital output

        pinMode(reset2, OUTPUT);
    }

    textfile(""
void m1() {
    digitalWrite(pasos1, HIGH);  // we put high “pasos”
    digitalWrite(pasos1, LOW);    // we put low “pasos”
    delayMicroseconds(VELOCIDAD1);  // we read the speed reference
}

void m2() {
    digitalWrite(pasos2, HIGH);
    digitalWrite(pasos2, LOW);
    delayMicroseconds(VELOCIDAD2);
}

void m11(){
    digitalWrite(pasos1, LOW);
    digitalWrite(pasos1, HIGH);
    delayMicroseconds(VELOCIDAD1);
}

void m22(){
    digitalWrite(pasos2, LOW);
    digitalWrite(pasos2, HIGH);
    delayMicroseconds(VELOCIDAD2);
}

void m3() {
    digitalWrite(pasos1, HIGH);
    digitalWrite(pasos1, LOW);
    delayMicroseconds(VELOCIDAD3);
}

void m33() {
    digitalWrite(pasos1, LOW);
    digitalWrite(pasos1, HIGH);
    delayMicroseconds(VELOCIDAD3);
}

void m4() {
    digitalWrite(pasos2, HIGH);
    digitalWrite(pasos2, LOW);
    delayMicroseconds(VELOCIDAD2);
}
void m44()
{
    digitalWrite(pasos2, LOW);
    digitalWrite(pasos2, HIGH);
    delayMicroseconds(VELOCIDAD2);
}

void horario1()
{                          // commands for starting and turning
    //digitalWrite(reset1, LOW);    // While resetting to LOW, the
    //digitalWrite(reset1, HIGH);   // engine remains off
    digitalWrite(reset1, HIGH);   // When resetting to HIGH the engine
    digitalWrite(direccion1, HIGH); // starts    digitalWrite(direccion1, LOW); // we send address to the servo
}

void antihorario1()
{                          // commands for starting and turning the engine
    digitalWrite(reset1, LOW);    // While resetting to LOW, the
    digitalWrite(reset1, HIGH);   // engine remains off
    digitalWrite(reset1, HIGH);   // When resetting to HIGH the engine
    digitalWrite(reset2, HIGH);   // starts      digitalWrite(reset2, LOW);      // arranca
    digitalWrite(direccion2, LOW); // we send address to the servo
}

void horario2()
{                          // commands for starting and turning the engine
    digitalWrite(reset1, LOW);    // While resetting to LOW, the engine
    digitalWrite(reset1, HIGH);   // remains off
    digitalWrite(reset2, HIGH);   // When resetting to HIGH the engine
    digitalWrite(direccion2, HIGH); // starts
    digitalWrite(direccion2, LOW); // we send address to the servo
}

void antihorario2()
{                          // commands for starting and turning the engine
    digitalWrite(reset1, LOW);    // While resetting to LOW, the engine
    digitalWrite(reset1, HIGH);   // remains off
    digitalWrite(reset2, HIGH);   // When resetting to HIGH the engine
    digitalWrite(reset2, LOW);    // arranca
    digitalWrite(direccion2, LOW); // we send address to the servo
}

void loop();
tecla = teclado.getKey();

if (tecla != NO_KEY ){  //== for condition if equal and != if different
//numero = tecla - 48;

switch(tecla){
    case '1':
        lcd.clear();
lcd.setCursor(0, 0);
lcd.print("Mov. en Eje X ");
        for (int i = 0; i<a; i++){
            horario1();
        }
        for (int i = 0; i<totalpasos1; i++){
            m1();
        }  // Equals the number of turns (200 steps are 360 degrees of servo )
        //————————— Change of direction of rotation ——————————–
        antihorario1();
        for (int i = 0; i<totalpasos1; i++){
            m11();
        }  // Equals the number of turns (200 steps are 360 degrees of servo )
        digitalWrite(reset1, LOW);
        break;

    case '2':
        lcd.clear();
lcd.setCursor(0, 0);
lcd.print("Mov. en Eje Y ");
        for (int i = 0; i<a; i++){
            horario2();
        }
        for (int i = 0; i<totalpasos2; i++){
            m2();
        }  // Equals the number of turns (200 steps are 360 degrees of servo )
        //————————— Change of direction of rotation ——————————–
        antihorario2();    // we send address to the servo
        for (int i = 0; i<totalpasos2; i++){
            m22();
        }  // Equals the number of turns (200 steps are 360 degrees of servo )
        digitalWrite(reset1, LOW);
        break;

    case 'F':
        lcd.clear();
lcd.setCursor(0, 0);
lcd.print("Mov. combinado ");
        break;
    }
for (int i = 0; i<a; i++) { // Equals the number of turns (200 steps are 360 degrees of servo)
    horario1();
    horario2();
    for (int i = 0; i<totalpasos1; i++) { // Equals the number of turns (200 steps are 360 degrees of servo)
        m1();
        m2();
    }
}

//—— Change of direction of rotation ———

antihorario1();
antihorario2();
for (int i = 0; i<totalpasos1; i++) { // Equals the number of turns (200 steps are 360 degrees of servo)
    m11();
    m22();
}
digitalWrite(reset1, LOW);
break;

case 'A':
    lcd.clear();
    lcd.setCursor(0, 0);
    lcd.print("Mov. en Eje X + ");
    horario1();
    for (int i = 0; i<totalpasos1; i++) {m1();} // Equals the number of turns (200 steps are 360 degrees of servo)
    digitalWrite(reset1, LOW);
    break;

case 'B':
    lcd.clear();
    lcd.setCursor(0, 0);
    lcd.print("Mov. en Eje X - ");
    antihorario1();
    for (int i = 0; i<totalpasos1; i++) {m11();} // Equals the number of turns (200 steps are 360 degrees of servo)
    digitalWrite(reset1, LOW);
    break;

case 'C':
    lcd.clear();
    lcd.setCursor(0, 0);
    lcd.print("Mov. en Eje Y + ");
horario2();
    for (int i = 0; i<totalpasos1; i++) {m22();} // Equals the number of turns (200 steps are 360 degrees of servo)
    digitalWrite(reset2, LOW);
    break;

    case 'D':
        lcd.clear();
        lcd.setCursor(0, 0);
        lcd.print("Mov. en Eje Y - ");
        antihorario2();
        for (int i = 0; i<totalpasos1; i++) {m22();} // Equals the number of turns (200 steps are 360 degrees of servo)
        digitalWrite(reset2, LOW);
        break;

    case '4':
        lcd.clear();
        lcd.setCursor(0, 0);
        lcd.print("Mov. en Eje X ");
        lcd.setCursor(0, 1);
        lcd.print("Lento ");
        for (int i = 0; i<a; i++){
            horario1();
            for (int i = 0; i<totalpasos3; i++) {m3();}//Equals the number of turns (200 steps are 360 degrees of servo)
            antihorario1();
            for (int i = 0; i<totalpasos3; i++) {m33();}
        }
        digitalWrite(reset1, LOW);
        break;

    case '5':
        lcd.clear();
        lcd.setCursor(0, 0);
        lcd.print("Mov. en Eje Y");
        lcd.setCursor(0, 1);
        lcd.print("Lento ");
        for (int i = 0; i<a; i++){
            horario2();
            for (int i = 0; i<totalpasos3; i++) {m4();} // Equals the number of turns (200 steps are 360 degrees of servo)
            antihorario2();
        }
for (int i = 0; i<totalpasos3; i++) {m44();}
digitalWrite(reset1, LOW);
break;

case '0':
lcd.clear();
lcd.setCursor(0, 0);
lcd.print(" ");
lcd.print(" ");
break;

}}

}}
BOOK REVIEW

CIUDADES INTELIGENTES, SOSTENIBLES, COLABORATIVAS Y PROBLEMAS EMERGENTES EN SEGURIDAD DESDE LA PROSPECTIVA

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The book *Ciudades Inteligentes, Sostenibles, Colaborativas y Problemas Emergentes en Seguridad desde la Prospectiva* (2018) by José Domínguez León and José Domínguez Hacha contains three chapters focused on foresight applied to intelligent cities, local development, and corporate financial reports. The first chapter presents the central theme where the topic of intelligent, sustainable, and collaborative cities and the emerging security problems that these must face from a foresight viewpoint are addressed. It clarifies that the analysis focuses on small and medium urban centers, mainly dedicated to agriculture, agricultural production, and small industry.

The objective of the work is based on the premise that an intelligent, collaborative, and sustainable city is a space to generate opportunities, both for its inhabitants and for outsiders, who maintain high living standards and a high potential for development. Therefore, it establishes that “an intelligent city is safe, and in it, citizens perceive security as one of the main assets they enjoy.” Therefore, security is one of the most important variables to be taken care of by these types of cities. It points out that a city must take care of security both in terms of infrastructure and material, as well as the welfare of its population. The topic of foresight enters the study affirming that the discipline allows designing and defining the future for diverse communities, therefore it is not predictive but it orients to define what is desired.

In intelligent cities, Information Technology (IT) plays a leading role, and it is key to maintaining their high standards of living, which is why cybersecurity is an inevitable imperative to maintain and perpetuate their status quo. The main threat to cybersecurity is cybercriminals, people who act outside the law and are attracted to these spaces by the high levels of comfort and the high concentration of people that provides them with a greater capacity to commit crimes.

In these situations, intelligent cities must be resilient; in other words, they must adapt to potential threats, and to achieve this they must use foresight as a proactive tool. To achieve this, security analysts must think like their antagonists (criminals and criminal networks) and anticipate the future that they may generate. The exercise allows us to anticipate a potential *modus operandi*. The text proposes the formation of a so-called prevention policy, which follows the rules of foresight and seeks to address future
scenarios in terms of security, risks, and threats. The inclusion of foresight in the planning of cities and towns, and above all, in matters of security, is imminent because by forming a solid institutional framework, it allows the desired to be achieved through design, construction, and execution.

Historically, the application of foresight in security has been very limited in small and medium-sized urban areas for three main reasons. Firstly, because of the lack of specialists, theoreticians, and researchers in these towns; secondly, because of the difficulties small towns have in prioritizing their work, most of which are urgent and short-term needs that must be covered; finally, because of the limited economic capacity of these towns.

The document proposes five stages to be followed to make an intelligent city a foresighted one. The process is: first, to assimilate an existing example of an intelligent city; second, to promote basic training in foresight for local leaders and citizens; third, to establish formal institutions dedicated to the foresight cause; fourth, to share experiences and promote thinking at a regional level; fifth, to consolidate an intelligent, sustainable, and collaborative city as a lighthouse city or a city center for the surrounding cities. In addition to the so-called prevention police, the text proposes the creation of a foresight observatory focused on security. The objective of this observatory is to be a collection center where leaders and residents can collaborate with ideas. By including all types of people from the social spectrum, foresight is democratized. The variety of ideas and the diversity of the collaborators are an unquantifiable contribution since they, being members of the community, are the main connoisseurs of their environment.

The contributions that can be collected at the observatories are diverse, some of which are mentioned in the text: risks and threats to the city, the possible actions to neutralize them, contribution and opportunities offered by intelligent cities, risks and threats anchored to rrs, strengths in cybersecurity, the capacity to cooperate with other cities or institutions with whom common objectives are maintained, among others. Once the contributions are collected, the second task of the observatory is to transform them into technical-academic contributions so that the problems and solutions have a technical-scientific endorsement.

The second chapter is entitled "Foresight as a tool for local development. Beyond budgets and strategic plans". it establishes that planning for development, in the short and medium-term, is inefficient in a world of accelerated change. Given this situation, it proposes the "PORSINNOVATIVA" foresight methodology, a tool that allows the construction of long-term scenarios.

The topic is introduced based on a historical analysis of societies. The text establishes that societies have changed according to their main commodity (agricultural products, industrial products, and information).
It states that throughout history, societies have gone through three stages or eras; first, the local-agricultural era, where most people work in food production. A second era, the national-industrial era, which began approximately 500 years ago and continues to the present day, is established as a period in which the main products are those of the industrial generation. The third era is the global-informational one, which is considered to be the coming era, where agricultural and industrial logics are displaced by information systems.

This coming era brings with it difficulties for the business sector development, mainly questioning the accelerated speed of change caused by the inclusion of technology. By maintaining a greater amount of change and in reduced periods, the business sector faces the inconvenience that tools such as strategic plans and short and medium-term forecasts are not efficient in meeting business aspirations. Foresight is presented as a viable option that allows the analysis of a greater number of variables, to generate a specialized analysis, and based on that, raise scenarios in periods of more than five years.

The text argues that business foresight practice should be transmitted to local development, seeking to cover not only the urgent but also the important, to improve the long term and design public policies that ensure efficient development. Under this ideal, the text proposes the PROSINNOVATIVA methodology, developed to carry out analyses over horizons of 10 years or more.

The methodology presents an added value to the Delphi methodology, with a focus on group decisions, which orients institutions to foreseeable changes and consequently facilitates the work of companies and institutions immersed in a globalized world. The methodology follows four steps: first, an exploratory analysis focused on current trends; second, the application of the methodology that begins with a three-phase Delphi study involving the designated experts, then proceeds to elaborate scenarios (of shock, wild cards, and black swans) with the assistance of techniques such as structural development, strategic maps, relevance trees, among others; third, orient the temporal approach (for example to 2030 or 2040); fourth, write and disseminate the results.

The third chapter is entitled, “Some considerations on prospective financial information. The management report and other reports”, it deals with various types of corporate financial reports and argues that foresight could contribute to more in-depth analysis and usefulness for managers and shareholders.

To include the prospective view in financial reports, it proposes a review of the evolution of identity, business performance, and risks and opportunities involved in its field of work. All of this from a holistic vision focused on the social, commercial, and environmental context. The usefulness of
this look in the reports facilitates business decisions based on the mission, vision, and business objectives. Concerning the risks studied, it is established that various aspects must be analyzed, such as operational, regulatory, financial, market, credit, and liquidity risks, among others. The text focuses on cybernetic risk and catalogs it as of contemporary importance, especially for those service companies, specifically telecommunications companies, which are more vulnerable due to the nature of their activity.

The book is a compilation of expert research on security, intelligent cities, local development, finance, and foresight. The chapters deal with a specific topic, starting from problems generated in each of the branches, continuing with a brief introduction to foresight, to finally include the concept as the basis for a cutting-edge solution.

The first chapter concludes that an intelligent, collaborative and sustainable city is a space that needs to be secure to become attractive to inhabitants and outsiders who wish to become involved in investing, doing business, obtaining profitability, and contributing in general. Security foresight favors the achievement of this objective. From the second chapter, it can be deduced that prospective thinking is necessary for an environment of accelerated and radical changes. Foresight allows us to reach the desired future and the prosinnovative methodology is the practical way that allows institutions linked to development to be prepared for abrupt transformations. From the final chapter, we conclude that the complexity of modernity makes evident the information gaps in financial documents and that the viable solution is to generate longer analytical reports, concerning the political environment and with foresight ideals.

The text provides a high level of theoretical knowledge regarding the issues of safety foresight in intelligent cities and economic development. However, the development of the chapter on financial reports leaves many doubts and several gaps that could be better filled regarding the content of the reports and the practical inclusion that would keep foresight from being included.
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BOOK REVIEW

OBSERVATION AND MONITORING
OF GENDER-BASED POLITICAL
VIOLENCE AGAINST WOMEN IN THE
SOUTHEAST REGION

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The present review is the product of a scientific-social investigation that was carried out from the Institute of Legal Research of the Autonomous University of Chiapas, within the framework of the 2017-2018 electoral process. It was sponsored by the Project of Support to the Technical Accompaniment 2018, and it was integrated with financial resources of the National Electoral Institute and the Secretariat of the Interior. The research group was coordinated by Dr. Omar David Jiménez Ojeda, with Corina Giacomello, Maricela Hazel Pacheco Pazos, and Laura Eloyna Moreno Nango as researchers.

The central theme of the book *Observation and Monitoring of Political Violence against Women in the Southeast Region* (UNACH, 2018) is highly relevant, especially in the geographical space in which the research was developed in the southeastern states of Mexico: Campeche, Chiapas, Quintana Roo, Tabasco, and Yucatan. This is because it is one of the regions of the country in which emblematic cases of political violence against women have arisen in recent electoral processes. This conduct seriously violates the Democratic State, since it restricts the free exercise of women’s political rights, making it difficult to ensure the legality of electoral processes.

It is necessary to emphasize that gender-based political violence against women is not contemplated within the General Law of Electoral Offenses, which complicates its attention. Nevertheless, at the moment there is an instrument of extreme importance that provides to the competent authorities the guidelines to act in front of this type of facts, I refer to the Protocol to Attend the Gender-Based Political Violence against Women. Nevertheless, this document as it is not of general and obligatory observance does not replace the necessity to incorporate measures and suitable sanctions in the electoral legislation.

The work contextualizes the reader on the status of the exercise of women’s political rights. It also presents the historical evolution of women’s passive and active voting in the region, as well as the difficulties faced in its materialization, and then indicates how women have been incorporated into public and political life, from the moment their right to participate was recognized, to the incorporation of the principle of gender parity in the Mexican constitution, and finally presents the results obtained by women...
who participated in the last elections. Afterward, they approach the doctrinal concept of political violence against women, presenting its characteristics, to later refer to what is established in the jurisprudence of the Electoral Tribunal of the Judicial Power of the Federation, regarding the criteria to determine when political violence is carried out for reasons of gender. Of the cases that have been presented in the region, this research group has successfully carried out a profile of victims and a profile of aggressors, which is fundamental, since it will allow the creation of adequate public policies that will initially reduce and later eradicate this type of violence.

The book presents us with the difficulties faced by public servants when they learn about cases of political violence against women based on gender. It also indicates the alternative tools that can be used to provide adequate care for this type of event, such as the application of the Protocol mentioned above, as well as the application of conventionality control through the Inter-American Convention on Prevention, Punishment and Eradication of Violence against Women. Likewise, it exhibits the lack of knowledge of what should be understood as political violence against women on base on gender, this coupled with the lack of specialized training of those who make up the institutions related to their care, causing the normalization of these events in political life. At the same time, it contrasts the multiple complaints of this type of violence in the media with the few cases that are known by a jurisdictional authority. Thus, making it clear that the lack of a formal complaint is not made because of fear of reprisals that it could generate and the ineffectiveness of the protection measures that could be offered to the victims.

Finally, the work presents a series of proposals that have been the result of research conducted by the Institute of Legal Research, which I believe should be taken into account for the attention and treatment of this problem in the state. These proposals range from legal reforms to public policies that contribute to the eradication of this phenomenon in the region.
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FOUNDATION AND DEVELOPMENT OF TRADITIONAL POLITICAL PARTIES IN MEXICO. A CRITICAL APPROACH

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From the beginning of the Mexican nation, the electoral citizenship of Mexico has liberated its political stress, calming its tensions in the foundation and organization of political groups. Aiming to participate in the fight for power, because since “the Spanish Crown ceased its sovereignty over the New Spain territory, the structural adjustments and the normative instruments, originated by the transit between the Monarchy and the Republic, provoked an incessant struggle among peers to fill the places of power, won by the Battle of Independence” (Romero, 2016).

As expected, one of the main objectives was the generation and professionalization of the political and civil positions of participation, which would also attend in a punctual manner and with the greatest possible efficiency the demands and concerns generated by the nascent Mexican political citizenship.

This blending of factors and circumstances resulted in the formation and consolidation of two large groups of masons (a universally extended, originally secret association whose members form an initiatory and hierarchical brotherhood, organized in lodges, with a rationalist ideology and philanthropic character [rae, 2014]). These political organizations are the first record of the birth of political parties in Mexico.

This event can be understood as the triumph of the first battle in the search for the best type of government, which would allow an organization to confront complexity and change. That is to say, democracy, a government in which one must bet on the plurality and diversity of currents, on the respect of each one of the political forces, and where, indisputably, protagonists continue to be the parties.

Masonic groups developed two different currents of thought: the “Scottish Rite” and the “York Rite.” The principles that guided the actions of the members of the so-called “Scottish Rite” were associated with discursive positions that defended monarchical institutions, also supported the conservation of economic privileges, and used political centralism as a banner. On the contrary, the supporters of the so-called “York Rite” fought for political and economic autonomy, as well as for the defense of the democratic model.

It is worth mentioning that the incursion, in either of these two lodges, was strongly related to the fulfillment of some ritual practices related to philosophy, esotericism, and eloquence, but, above all, to the search for the
personal improvement of each of its members. Likewise, "some historians agree that belonging to one of these rites was a fundamental condition to participate in national politics" (Navarro, 2013). The addition of these two lodges resulted in the consolidation of the first political parties with formal registration in Mexico: the Liberal Party and the Conservative Party, which would later evolve politically into what became known as Centralists and Federalists. Later, the image of the caudillo was accentuated in the Mexican political space, revealing the essence of the distinctive features of Latin American political societies. As Pedro Castro rightly states in his essay El caudillismo en América Latina, ayer y hoy, "the image of the caudillos populates the history, mythology, and political imaginary of Latin America" (Castro, 2007: 10). Furthermore, in Mexico "there is a long tradition of authoritarianism, in which several institutions have combined: pre-Hispanic caciquismo, the Spanish despotism of the three centuries of colonization, as well as the military caudillismo that extended practically all of the 19th century and a large part of the 20th" (López-Villafañe, 2005: 56).

In Mexico, the study of political parties is scarce, especially in aspects such as their internal functioning, their ways of socialization, or their origins. Publications have been dominated by questions that address the Post-Revolutionary State or the bases of support for the PRI and the presidency, as well as their corruptive tendencies for exercising their supremacy. Works such as La democracia en México (1965) by Pablo González Casanova, El sistema político mexicano (1972) by Daniel Cosío Villegas, El presidencialismo mexicano (1978) by José Carpizo, El Partido de la Revolución Institucionalizada (1982) by Luis Javier Garrido, La reforma interna y los conflictos en el PRI (1991) by Rogelio Hernández Rodríguez, El fin del sistema de partido hegemónico (1993) by Jacqueline Peschard, La tercera refundación del PRI (1993) by Jorge Alcocer, PRI: de la hegemonía revolucionaria a la dominación democrática (1994), and Urnas de Pandora: partidos políticos y elecciones en el Gobierno de Salinas (1995) by José Antonio Crespo, are just some examples of the issue under discussion.

In this regard, Freidenberg explains that:

Perhaps because of the difficulty of studying these organizations in a non-competitive system with hegemonic characteristics, such as the Mexican system was for more than seventy years, political scientists neglected for a long time partisan analysis, both from the perspective of electoral competition and from the internal organization. Published works focused on the State and was conditioned by the presence of the Institutional Revolutionary Party (PRI) (2006: 279).
Hence the emergence of one of the most representative sayings of Mexican political culture, expressed by former PRI president Carlos Salinas de Gortari: “the PRI acts like this because Mexico is like this” (Sanguino, 2015).

The Institutional Revolutionary Party has been, to a lesser extent, one of the central axes of the Mexican party system, a kind of mirror that reflects and dominates the political culture of this nation.

For our part, we affirm that this phenomenon is verified to a lesser extent since:

After the electoral reforms of the 1980s and 1990s, and the first competitive elections of 2000, scholars perceived the radical change that was taking place in the party system and noted that internally the parties were oligarchic, closed, non-inclusive organizations with few participatory spaces, like any other Latin American party organization (Freidenberg, 2006: 280).

This transformation in the party system can be seen clearly in the results of the aforementioned 2000 elections, mainly in the federal sphere, where for the first time the political party that had remained in power lost the presidency because, up until the early 1990s, the Mexican society lack party options, and the entire country was dominated by the Institutional Revolutionary Party.

Perhaps one of the relevant contributions of this political party –PRI– was the correct option for the political moment that the Mexican nation was going through since it became one of the main artisans in the construction of this nation’s political culture. Also, by having the support of the system, it knew how to decipher society’s opinion, as well as knowing its concerns, and following up on its demands, since:

During its period of hegemony (...) the political jargon used to distinguish between the precise demands, which could be absorbed by the system in a transformative way, and what was called “the package”, that is, a large set of simultaneous demands presented as a unified whole. It was only with the latter that the regime was not prepared to negotiate –it generally responded to them with ruthless repression– (Laclau, 2005: 109).

The increasingly frequent use of “ruthless repression” caused a certain fondness for the implantation of a "new" authoritarian regime to spread throughout the country, which brought with it a growing social discontent and a nascent polarization of Mexican electoral citizenship. The PRI, in its eagerness to impose at all costs its top decisions on their government’s actions, began to neglect the middle class, since they were not contemplated
in the regime’s corporate logic (Nateras, 2005: 264). Some affirm that this was the breaking point for the beginning of the “scar operation”, which was orchestrated by a social and business leadership that rested on Manuel Gómez Morin, an academic who, through a constituent assembly held in the month of January 1939, founded the National Action Party (PAN, 2020).

The new member of the Mexican party system “accepted the political game rules, without questioning its functioning, nor the normative bases of the system, thus contributing to its stability and legitimacy” (Loaeza, 1981: 169). This political discipline is part of the essence of National Action and could have its foundations in the type of party that it is, since “following Duverger’s logic, the PAN was born as a party of cadres, since its founder, Manuel Gómez Morin himself formed it with the idea of integrating a select and permanent group” (Nateras, 2005: 265). A type of party whose theses were conceived by notable personalities, and in the majority of cases, coming from well-to-do economic sectors that shared the conservative ideals and the Christian democratic current, belonging to the rightist political spectrum.

Doing politics has to do with the conciliation of agreements and PAN was an applied student and learned the lesson. It knew how to develop new strategies for change and conciliate the interests of conservative sectors that didn’t support the socialist movement led by its counterpart in the Party of the Mexican Revolution, General Lazaro Cardenas del Rio. This action led to a strengthening of the Mexican right-wing sector, contributing to the professionalization of the opposition in Mexico.

In this context, an electoral circumstance in the presidential elections of 1988 was verified. In this election, different voices were represented by socialist and Marxist organizations. Candidates such as Cuauhtémoc Cárdenas Solórzano from the National Democratic Front (FDN), Manuel de Jesús Clouthier del Rincón from the National Action Party (PAN), and María del Rosario Ybarra de la Garza from the Workers' Revolutionary Party (PRT), expressed their discontent and disagreement with how the results of this electoral process were made known.

It is important to highlight this event, given that the Secretary of the Interior at the time (1982-1988), Manuel Barlett Díaz (UNAM, 1994), along with the consent of the Federal Electoral Commission (the body in charge of counting the votes), argued that there was a flaw in the counting instruments and declared “a system failure.” Up until this failure, the FDN candidate was ahead of the other contenders, framing in the social imaginary a manipulation of the system to favor the Institutional Revolutionary candidate and declare him the winner of the contest.

This fact, along with the demand for a real democratic opening with the same scope of the State party, began a strong social agitation that resulted in the foundation of the Party of the Democratic Revolution:
Following a certain part of the society’s will, the PRD was structured to promote an alternative nationalist project to the PRI’s authoritarianism. It emerged from great electoral fraud that deepened the political crisis of the system that had begun in 1968, and that slowly grew through the years. With the emergence of the PRD, democracy can be seen as the regime that will make it possible to achieve a more just and egalitarian society (PRD, n.d.: 1).

The PRD development has been accompanied by components that seek as their sole purpose to confront the regime to create another one. Through the years, its main lines of discourse have been nourished by questions that involve criticism of the government in power, capitalizing on social discontent, perhaps because until now it has not occupied the highest political position in the Mexican nation.

The breaking point that we have addressed in previous lines, the defeat of the hegemonic party in the 2000 presidential elections and the consolidation of new political forces (PAN and PRD) with real possibilities of winning elections, as well as the changes the party system has gone through in recent years, and the turbulence to which it has been subjected, sustained by a growing deficit of confidence in the Mexican political parties, are enough concerns that committed us to offer a proposal, from a different perspective to the study of political parties in Mexico.
REFERENCES


