Vol. IX, N° 24 • October 2020
ISSN: 2007-6703

Celina López González
General translation proofreader

ESPACIO I+D, INNOVACIÓN MÁS DESARROLLO

Digital Journal of the Universidad Autónoma de Chiapas Indexed in the directory of Latindex, BIBLAT, CLASE, SIC, Actualidad Iberoamericana, REDIB and DOAJ.

ESPACIO I+D, *Innovación más Desarrollo*
Vol. IX, N° 24, October 2020.

Indexed in **Latindex, BIBLAT, CLASE, Actualidad Iberoamericana**, **Sistema de Información Cultural** of CONACULTA, **REDIB** and **DOAJ**.

It is a digital magazine of scientific and cultural dissemination of multidisciplinary nature of the Universidad Autónoma de Chiapas (UNACH).
Has a quarterly basis and record: **ISSN 2007-6703**

University Campus, Building D,
Ejido Emiliano Zapata Highway, Kilometer 8
Tuxtla Gutierrez, Chiapas; Mexico. Zip Code 29000

E-mail: espacioimasd@unach.mx

www.espacioimasd.unach.mx

INDEX

Articles

Academic Papers

EDITOR'S LETTER

Dear readers and colleagues, we present the number 24 of the Digital Magazine of the UNACH *Espacio I+D. Innovación más Desarrollo*. We wish that you and your family are well in the face of the adverse international scenario, which among other things, has compromised the health of millions.

Once again, we made this edition following all the norms that the university authorities established to safeguard the community, in such a way that, although the processes have not been interrupted, the dynamics that we face as an editorial team are in continuous movement.

As established in our editorial policies, and thanks to the visibility that the editorial management gives us, which has allowed us to enter various indexes, this publication of the Universidad Autónoma de Chiapas consolidates its internationalization since in this issue we publish articles from Cuba, Ecuador, Venezuela and, of course, Mexico. For us, as editors, it is always a pleasure to receive collaborations from other latitudes, since it represents a recognition of the editorial work done at the UNACH.

Among the materials available in this issue are: The environmental education through the ecological tourism in elderly in the locality of Fomento, Cuba with the use of audio-visual material; Knowledge and project management in university research: a case of study on the department of service technology of Venezuela's Simon Bolivar University; Application of different levels of protein and synthetic amino acids in the productive behavior of quails (Ecuador); Clinical and epidemiological characteristics of patients hospitalized for influenza A (H1N1) in Tuxtla Gutiérrez, Chiapas, Mexico; A technical study of recycled eps lightweight concrete panels used in roof systems (UNACH-Mexico); Classroom life: implications of "learning how to learn" in secondary and higher education (UDG-Mexico); Sustainable Development from an Intercultural university perspective (UNICH-Mexico); Establishing the differences in the results of two standard proctor test procedures (UJAT-Mexico).

We included two reviews in the academic documents section: *The discovery of the stars: How we came to know what stars are*, by Dr. Joaquín Bohigas Bosch, from UNAM's Institute of Astronomy, and the book *Scenarios on violence, communication, and organizations. An open discussion in the Ibero-American context*, coordinated by Dr. Alberto Zuart from the Institute of

Legal Research of the UNACH. To accompany the issue within multimedia materials, we present the report: Gender-based political violence.

In the case of our cultural supplement, continuing with the recommendations about COVID that the University has published as guidelines for coexistence, we present the capsule on “The new normality UNACH”, which may well serve as a reference for coexistence on university campuses.

We hope that this issue will be useful and that you will continue to collaborate as you have done so far, which has allowed the magazine to reach this point.

Enjoy this Space of Innovation!

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

The editors

ARTICLES

Reception: **April 24, 2019** | Acceptance: **July 14, 2020**

THE ENVIRONMENTAL EDUCATION OF THE ELDERLY THROUGH ECOTOURISM IN THE LOCALITY OF FOMENTO, VILLA CLARA, CUBA WITH THE USE OF AUDIO-VISUAL MATERIAL

—

Natacha Coca Bernal
nlcoca@nauta.cu

Carinebys Alpizar Ortueta

Marcial Dayan Alonso García

Universidad Central "Marta Abreu" de Las Villas, Cuba

To quote this article:

Coca Bernal , N., García Iglesias, M. de la C., Alpizar Ortueta, C., Alonso García, M. D., Gody Morffi , D., & Hernández Heredia, D. de la C. (2020). La educación ambiental a través del turismo ecológico en adultos mayores en la localidad de Fomento, Villa Clara, Cuba con el uso de material audiovisual. *ESPACIO I+D, INNOVACIÓN MÁS DESARROLLO, 9*(24). https://doi.org/10.31644/IMASD.24.2020.a01

— Abstract—

The research was applied in the municipality of Promotion, Villa Clara, Cuba for a year to construct through a participatory action research, an Educative Strategy of ecotourism with the use of audio-visual material in the elderly for a healthy lifestyle. Investigation-action-participation techniques were used: the participant observation, triangulation of sources, researcher's journal, focal groups of discussion, and study of the case. Some of the results of the Educative Strategy with the ecotourism, were the reduction in a considerable percentage of the levels of stress generated in the elderly, and the stability of chronic diseases. In addition, it changed their perception of tourism, since the use of the Environmental Education disabilities and potentialities of these ages can be adapted. Also, they recognized the importance of the ingestion of fruits and vegetables. This experience allowed for the socialization of the elderly and an approach to its relatives, and in the main groups of discussion, it was demonstrated how their sexual lives are part of their past, present, and future. With all their experiences audio-visual materials were made.

Keywords

Ecological tourism, environmental, adult education greater, and audio-visual materials.

The elderly are an age group ranging from 60 years old and up. "Cuba, with a 15% of the population aged 60 or over, is a country where everyone who reaches and exceeds 60 years of age is considered an elderly" (GalbánI, Soberats, & Díaz-Canel, 2006). Thanks to advances in science and technology, people are living longer, but not with the quality of life that is desired.

The vast majority of the elderly do not adapt to the aging process, physical and mental capacities tend to decrease, but, according to their physical and mental condition, some people can perform multiple activities. Depression, lack of physical exercise, and suicide are common at this stage of life. "Depression in the elderly has a systemic effect and depressed elderly people seem to have a greater susceptibility to diseases since this pathology causes neurological, hormonal and immunological changes...in emotions, it is accompanied by complex neuroendocrine modifications with a sequence of physiopathological events" (Aguilar-Navarroa & Ávila-Funesa, 2007).

The data indicate that Cuba is an aging country, which is why the national health system has prepared itself for the most frequent diseases in these ages. From the psychological point of view, it is difficult to reach each person, even when food, consultations, and free medicine are provided to those with low income, the emotional-motivational sphere is not attended to in the same way. "The approach to aging implies the enforcement of public policies and programs for the integral attention of the elderly. Cuba's challenge is to improve the well-being and quality of life of this group, that is why population aging is included as a thematic axis on which all Cuban organs and institutions are devoted to working" (Mercedes, Sánchez, Somonte, & Cabrera, 2014).

This group of people voluntarily gives up social gatherings, isolate themselves and their lives become meaningless. They were excellent workers, espouses, children, but they no longer perform these tasks, nor do they occupy their time in a healthy and didactic way. On the other hand, people around them look down on them, seek support and advice from younger people, even if they are less skilled than the elderly. "Increasing longevity has its demands that cannot be ignored, and one must ensure that the high cost of growing old is compensated by a good quality of life" (Vera, 2007).

In the town of Fomento, in the province of Villa Clara, it was possible to verify through different methods and techniques that:

- This group has a low purchasing power, due to the lack of employment options according to their age.
- They present chronic diseases such as diabetes, hypertension, heart disease, and emotional disorders, among others.
- Post-traumatic stress due to becoming widows.

- Accident and suicide risks.
- They do not have a healthy hobby because the culture and recreation are mainly aimed at the 15-40 age group. Music and dancing are not appropriate to their tastes and motivations.
- This population presents a high cultural level but they are outdated in their fields of study.
- Fashion designers work mostly for young people and do not take into account advanced ages; the design of clothes and shoes does not respond to their tastes and the needs arising from the diseases typical of this age.
- As for sexuality, they do not speak freely and without prejudice about their sexuality, they have lost their partner, it is difficult to seek a new relationship and express their love and empathy for the opposite sex.
- They show discouragement, apathy, feeling of helplessness concerning their families and the population in general.
- They do not exercise according to their age, so they have problems with weight, obesity, or low weight.
- They do not healthily use their free time.
- They do not know the tourist potential of their city.

These incipiencies and behaviors were taken from the population group of elderly, from the locality of Fomento, province of Villa Clara; which incited to investigate the construction of an Educational Strategy, from a participatory action research. These needs were detected with the following methods:

METHODS

The research used participatory action research techniques described in Kemmis' research strategy (1988) which, "is based on the notion of a self-reflective spiral of cycles of planning, action, observation, and reflection. It expresses a commitment to improving practices and is collaborative".

The *analysis of documents* was applied to evaluate aspects of the ecotourism content, as well as the existing bibliography. *Participatory observation*, throughout the research in the stages of diagnosis, planning, execution, control, and evaluation of the Educational Strategy. It was used to collect data on the stage, with the elderly, family, and specialists.

The *triangulation of sources* was used to determine the contents of each of the subsystems from the bibliography, results of studies of this science, historical records of the study of ecotourism and the elderly.

The *researcher's diary* was used to collect detailed qualitative data in each of the stages of the Educational Strategy, facilitating its subsequent

analysis. Record in an orderly, chronological way, allowing hyperlinks to documents, videos, and photos collected in 5 DVDs of graphic evidence.

Informal discussion groups, collect qualitative data from the construction of the Educational Strategy. It also helped to provide methodological training to the elderly regarding the contents of ecotourism. Approach them affectively with the objectives, missions and actions proposed, taking into account their experiences; to determine weaknesses, strengths, give suggestions. It allowed them to remember anecdotes of their past lives, their longings, and frustrations, as well as to create action plans for ecotourism.

The *case study*, was used to evaluate the Educational Strategy, allows to evidence the acquired knowledge, the affective-motivational sphere, the physical and mental health. Different authors refer to scientific results in research: Castellanos, (1998); R. A. González, Yll, & Curiel, (2003); Kemmis, (1988); Ruiz (1999), (2000), (2009); Sampier, (2006); Silva, (2007); Valle, (2007); Rodríguez, Gil, & García, (1996), however, Llanes (2012) says that "The Educational Strategy is a set of research procedures applicable to any science, it is the way to reach an objective with a certain procedure to order the activity, it allows the conscious reproduction of the studied object. The Educational Strategy is indissolubly linked to the theory".

The Educational Strategy, as a scientific result that came from the pedagogical practice, agrees with the studied subjects, for which, the following general objective is defined: Build through a participatory action-research, an Educational Strategy for ecotourism for the elderly, to encourage healthy lifestyles.

The population ranges from 60 to 75 years of age: 35 retirees from the municipality of Fomento; the selection was made intentionally and not probabilistically because the Educational Strategy responds to the particularities of the personality of these ages, their tastes, and motivations.

DEVELOPMENT

Fomento is located in the province of Sancti Spíritus, bordering on the north with the municipality of Placetas, on the east with Cabaiguán, on the south with Sancti Spíritus and Trinidad, and the west with Manicaragua in the province of Villa Clara, in Cuba. The rivers of Agabama, Mabujina, Cangrejo, and several streams cross through Fomento. It currently has several villages within which they are located: El Pedrero, Agabama, La Guanábana, La Hormiga, and Gavilanes. The main activity of the region was the sugar industry and the cultivation of sugar cane, but with the modifications in this industry, it became necessary to expand towards others.

The town has a total of 335,765 inhabitants (Cuba, 2015), of whom 17,123 are men and 16,453 women. According to data from this Population and Housing Census (2015), 18.3% of Cuba's population is 60 years and

older, and the territories with the highest degree of aging are Villa Clara, with 21.9%; Havana, 19.9% and Sancti Spíritus, 19.7%. (Cuba, 2015)

The most common diseases (see table 1) of the elderly in the municipality of Fomento, are recorded similar to the country's average: asthma, hypertension, and kidney failure, with high rates of morbidity and disability. Ecological tourism offers a possible solution to compensate for the limitations of these diseases, as well as the affective-motivational sphere of the elderly (Fomento, 2017).

Table 1
Most common diseases in the municipality of Fomento

Diseases	60-64 years		65 years and more		Total
	Masculine	Feminine	Masculine	Feminine	
Diabetes mellitus type I	17	16	16	25	74
Diabetes mellitus type II	5	5	16	26	52
Hypertension	109	256	687	1352	2404
Asthma	625	952	3096	4606	9279
Chronic renal failure	116	217	456	746	1535
Hypercholesterolemia	71	150	237	527	985
Cerebrovascular disease	16	9	113	101	239
Physical and motor impairment	109	256	687	1352	2404
Hearing-impaired	625	952	3096	4606	9279
Cancer	116	217	456	746	1535
Prostate cancer	71	150	237	527	985
Colon cancer	36	21	209	236	502
Breast cancer	2	15	3	103	123
Obesity	32	50	193	271	546
Sedentarism	48	53	106	250	457
The risk of alcohol consumption	45	69	152	345	611
Smoking	153	17	339	23	532

Source: Fomento (2017) Informe de Dispensarización de la población por zona y consultorio médico. Unpublished material.

We assume that the phases and stages declared by Rodríguez, G., Gil, J., & García, E. (1996); preparatory phase, fieldwork, analytical and informative, are the most appropriate phases to approach the study of the object, given its nature, the characteristics and particularities of the subjects that have served to develop the research, gathering of the main results, the background in studies of this type, and the possibilities of the empirical methods used.

The studied sample gave the following results: 10 people with heart problems, 12 hypertensive, 7 diabetic, 2 with physical and motor limitations,

1 with hearing loss, 3 with circulatory disorders, 1 with a psychiatric disorder, 5 obese, 3 underweight. It was found that 7 older adults suffered from more than one disease; in turn, there are 3 of them without any ailment.

To carry out this research, the qualitative approach was applied, which has stages that occurred during practice without a defined temporal border. The preparation of the research did not culminate in the construction of the Educational Strategy of ecotourism for the elderly; nor did the elaboration of instruments based on the needs that arose from the practice and the diagnosis (access to the field), but it was enriched during the very observation and execution of the ecotourism planned. As Taylor (1987) states, "the best way for the researcher to add informants to his research is to collaborate with them, to listen to their suggestions and experiences".

Participant's observation: It allowed to determine in the elderly capacities such as:

- A high cultural level
- The training they have in terms of Heritage Education of the municipality.

As needs:

- They show a high level of stress due to uncertainty and fear of the proximity of death.
- They are sad and unmotivated in everyday activities.
- They present a group of chronic diseases that hinder their mobility.
- They do not systematically perform physical exercises.
- Ignorance of environmental and heritage education.
- Food with high-calorie consumption or insufficient intake of healthy food.
- Low perception of risk.
- Distancing from family and neighbors.
- They do not express their sexuality healthily.

DESIGN STAGE

The Declaration of Human Rights states that men have the right to life, liberty, and safety. The health system takes care of the elderly, as well as their social welfare when they have a low income. The elderly have the right to recognition before their group, family, and the society where they live. At these ages, one feels a sense of helplessness in the face of diminished capacities. They have the right to be heard by their voice or through spokes-persons representing them. There can be no arbitrary interference in their

private life. Families tend to perceive that the sexual life of the elderly is not relevant, as the reproductive life of men and women ends, those around them belittle their sexuality. Senior citizens have the right to move freely and to choose their residence in the territory. When their paid work ends, they lose or stop acquiring property, families look down on them because of their lack of income or do not consider them when making decisions, but everyone has the property right, individually and collectively. Cultural meetings tend to prefer young people, the elderly are not excluded, but they do not attend because their cultural tastes are not the same.

Excursions were carried out with a monthly frequency to ecotourism sites of the municipality, a total of four excursions in a year. They were long walks dosed in short stretches in a slow march, to stimulate the circulatory system of the elderly. Toasts were made with medicinal and aromatic plants, and fruits were tasted, which had repercussions on the healthy diet of the group. They had the opportunity to have feedback with a focus on ecotourism, with a healthy environment, in contact with nature, which allowed them to decrease stress levels.

We took into account that the Environmental Education of the elderly "forms an individual; starting from the knowledge, of which values and interests are required, what can be done (capacities) and what should be done (responsibilities), taking as a reference their particular problem of the environment, resulting from the relationships that are established between the dynamics of the components of society and nature" (Ricardo, 2006)

The cultural events, with the use of peasant music: the music of the Cuban fields has a long tradition that is cultivated mostly by elderly, peasants who have musical skills, play instruments, sing and dance. It has been proved that performing rhythmic movements synchronized with music stimulates gross motor, fine motor, and kinaesthetic. The culture and idiosyncrasy of the town of Fomento have an emphasis on local development (Pérez, A., 2010). The traditional Cuban music is a soft and repetitive sound, the dancer accompanies the sound with cadenced movements of his hips, it is possible to dance as a couple in a very elegant way or in solitary; the dancers take advantage of the occasion to dress in gala suits, to use guayaberas, a traditional Cuban garment. Women use fans; all of this creates an atmosphere of gallantry and seduction that reminds the elderly of their younger years. The décima Cubana includes improvised poetry by the singers; the creation of the tenth stimulates the active and passive vocabulary of the elderly, stimulates memory, and stimulates the phonemic ear and the muscles involved in the articulation of sound.

In the cultural events the families of the elderly participated, and students of special schools; which allowed a better approach or a dynamic of inter-

personal relations. "Man learns through the senses since this is the gateway to all information" (Nico, 2016)

Senior citizen's unpublished stories were filmed in the exchanges where they told their life stories. These stories are unreliable, they were fabricated and reconstructed. The stories were told again in meetings. Simple videos were made with the use of audiovisual material. "The creation and narration are activities that allow... the individual to show social experiences... it facilitates the motivation of the outer stimuli" Coca, N., Martínez, P., & Álvarez, M. (2016).

Audiovisual material for environmental education and ecological tourism

In the creation and use of audiovisual materials, the culture and identity of the locality, native animals and plants were taken into account, because "The images are motivating, raise awareness and stimulate people's interest in a particular topic. They facilitate the instruction, complementing verbal explanations with a concrete image of easy comprehension, that contribute to the fixation of the contents. They can also present abstract graphic elements. They require global processing of the information they contain and can produce an emotional impact that generates feelings and attitudes", Chou, O. (2008).

Acts, storytelling, and traditional music were supported digitally. The participants were involved in its creation. We used modest resources, and music according to the motivations and interests of their age. This project began with a group of young lovers of hiking and environmental education, sharing their hobbies with adults was a challenge. "Music, besides being an artistic resource, can be used as a pedagogical tool that favors intellectual, motor, and language development, through the strengthening of basic learning devices such as memory, attention, perception, and motivation" Díaz, M. L., Morales, R., & Díaz, W. (2014).

The implementation of audiovisual media in the formation and development of feelings of love and care for the resources provided by nature is a priority for education and self-education of the personality and interests of society, which is essential. A whole ecotourism project was established covering a wide range of objectives. To verify this, the transferability of this research in similar populations is required to:

- To encourage what would be the promotion and tourist attraction of a place.
- To let the tourist know the options that exist.
- To capture events of relevance to the area.

- Encourage the involvement of all professionals related to tourism to promote it and attract more visitors.

RESULTS OBTAINED FROM ENVIRONMENTAL EDUCATION THROUGH ECOTOURISM FOR THE ELDERLY IN THE TOWN OF FOMENTO WITH THE USE OF AUDIOVISUAL MATERIAL.

It was found that ecotourism in this population reduced the levels of stress generated in the elderly by a considerable percentage. Healthy recreation, as well as the use of leisure time in sustainable agricultural techniques, facilitated this. It is important to participate in these types of activities because "it promotes participation, people relax, learn new things, share with others, some activities have a therapeutic effect that contributes to health care". (Arevalo & Yañez, 2016)

Manifestations of sadness and apathy, before the realization of daily tasks, diminished. The Elderly carried out their work in the institution and at home in a pleasant way and with a new meaning for their lives. Chronic diseases remained stable, the risk of accidents was reduced and the performance of moderate physical exercises allowed the development of elasticity.

The perception of the elderly, who felt that tourism was not appropriate for their age, changed when they realized that Environmental Education can be adapted to the disabilities and potentialities of their age. They did not change their eating habits, but recognized the importance of fruit and vegetable intake and incorporated it into the food routine.

The elderly in the sample, who had weight problems, were able to show a gradual tendency to balance their ideal weight, feeling stronger and more vigorous with physical exercises.

They considered expressing their sexuality to be embarrassing, and the focus group discussions showed how their past, present, and future sexual lives manifested. "Sexuality, like aging, is a cultural and social construction, where a gender and rights perspective must be considered for analysis." Pedraza, T. (2014).

Ecotourism allowed the socialization of the senior citizens who do not have work ties nor a closeness with their families. "Through an environmental action plan in a short, medium and long term" (Hernández, Y. (2012).

Motor skills were developed, with outdoor walks. Occupational therapy with plants derives its usefulness from the basis of the human being as part of nature; it requires the person to perform within an open environment and to connect with another living being in a context that provides diverse natural sensory stimuli, textures, colors, smells, sounds, and even taste, it requires flexibility to assume diverse roles, plan and deploy motor skills. It is also a creative experience.

CONCLUSIONS

In the background and research analysis, it was appreciated how ecotourism still suffers from limitations and unresolved challenges, in regards to the transformations and perspectives of Environmental Education and the elderly.

The study revealed that ecotourism in the elderly develops motor skills, reduces stress levels, decreases sadness and apathy, stimulates thinking, stabilizes body weight, allows manifestations of sexuality, socialization, and develops fine motor skills, stabilizes chronic diseases with the use of exercises, resulting in a higher quality of life for the elderly.

The results of the studies, carried out in the field, in the town of Fomento, as well as the collective actions of reflection, allowed the construction of an Educational Strategy of ecotourism that transforms the quality of life of the elderly.

COLLEAGUES

Dayana Gody Morffi Facultad de Economía. Universidad Central “Marta Abreu” de Las Villas, Villa Clara, Cuba
Dayana de la Caridad Hernández Heredia. Facultad de Economía. Universidad Central “Marta Abreu” de Las Villas, Villa Clara, Cuba.

REFERENCES

Aguilar- Navarroa, S., & Ávila-Funesa, J. A. (2007). La depresión: particularidades clínicas y consecuencias en el adulto mayor. *Gacéta Médica de México, 143*(2). Recuperado de http://www.medigraphic.com/cgi-bin/new/resumen.cgi?IDARTICULO=15149

Arévalo, M., & Yañez, J. (2016). Factores contextuales que influyen en la participación comunitaria en actividades de ocio y tiempo libre en personas en situación de discapacidad física. *Revista chilena de terapia ocupacional, 16*(2), 163-173 doi:10.5354/0719-5346.2016.44760

Castellanos, B. (1998). *Investigación educativa, nuevos escenarios, nuevos actores, nuevas estrategias*. Instituto Superior Pedagógico Enrique José Varona. Facultad de Ciencias de la Educación Centro de Estudios Educacionales.

Chou, O. (2008). *Medios de enseñanza y tecnologías de la información*. Cuba: Editorial Pueblo y Educación.

Coca, N., Martínez, P., & Álvarez, M. (2016). Fábulas sobre agricultura sostenible para escolares con discapacidad intelectual. *Revista Espacio I+D Innovación más Desarrollo, Vol. 6* N° 20, DOI http://dx.doi.org/10.31644/IMASD.20.2019.a01

Cuba, (2015). Oficina Nacional de Estadísticas Cuba. Población. Recuperado de http:// www.one.cu.

Díaz, M. L., Morales, R., & Díaz, W. (2014). La música como recurso pedagógico en la edad preescolar. *Revista infancia imágenes. 13*(1) doi:https://doi.org/10.14483/16579089.5455

Fomento (2017) *Informa de Dispensarización de la población por zona y consultorio médico*. Material no publicado.

GalbánI, P. A., Soberats, F. J. S., & Díaz-Canel, A. M. (2006). Envejecimiento poblacional y fragilidad en el adulto mayor. *Revista Cubana de Salud Pública*. Recuperado de http://www.scielo.org.pe/pdf/rspmi/v17n2/a02v17n2

Hernández, Y. (2012). *Acciones para propiciar una educación ambiental en el Consejo Popular "Simón Bolívar" del municipio Yaguajay* (Tesis de pregrado) Universidad Central ¨Marta Abreu¨ de las Villas.

González, R. A., Yll, M., & Curiel, L. D. (2003). Metodología de la Investigación Científica para las Ciencias Técnicas 1era. Parte: Diseño teórico y formulación del proyecto de investigación. Recuperado de https://www.academia.edu/13810811/Metodolog%C3%ADa_de_la_Investigaci%C3%B3n_Cient%C3%ADfica_para_las_Ciencias_T%C3%A9cnicas._Tomo_III

Kemmis. (1988). *Educational research, methodology and measurement, an international handbook*. Exeter Wheaton & Co. Recuperado de https://

s3-euw1-ap-pe-ws4-capi2-distribution-p.s3-eu-est1.amazonaws.com/books/9781135389291/9781135389291_previewPDF

Kulkarni, T., Karajgi, A., & Pandit, U. (2018). Comparison between virtual reality training using x-box 360 kinect and conventional physiotherapy on trunk, postural control and quality of life in chronic stroke survivals. *International Journal of Current Advanced Research, 7*(4). doi: http://dx.doi.org/10.24327/ijcar.2018.11577.2006

Llanes, R. (2012). *Glosario de filosofía, economía y política.* Cuba: Editorial Ciencias Médicas.

Mercedes, A., Sánchez, L., Somonte, R., & Cabrera, A. M. (2014). Envejecimiento poblacional: una mirada desde los programas y políticas públicas de América Latina, Europa y Asia. *Revista Novedades en Población*, 10(19). Recuperado de http://scielo.sld.cu/scielo.php?script=sci_arttext&pid=S1817-40782014000100002

Nico, M. R. (2016). Desórdenes de la modulación sensorial y dibujo de la figura humana. *Revista chilena de terapia ocupacional, 16*(1). doi:10.5354/0719- 5346.2018.48088

Pedraza, T. (2014). Vejez y sexualidad: reflexiones para la práctica de terapia ocupacional. *Revista chilena de terapia ocupacional, 14*(2). Recuperado de https://revistaterapiaocupacional.uchile.cl/index.php/RTO/article/view/35726

Pérez, A. (2010). *Propuesta de acción para proyectar la Educación ambiental en el Consejo Popular "Abel Santa María" desde el desarrollo comunitario. (Tesis de pregrado)* Universidad Central ¨Marta Abreu¨ de las Villas.

Ricardo, D. (2006). Ecología, ecologismo y Medio Ambiente. *Revista Luna Azul*, 25/08/2006. Recuperado de http://lunazul.ucaldas.edu.co/index2.php?option=com_content&task=view&id=279&I

Rodríguez, G., Gil, J., & García, E. (1996). *Metodología de la investigación cualitativa.* Recuperado de https://www.researchgate.net/publication/44376485_Metodologia_de_la_investigacion_cualitativa_Gregorio_Rodriguez_Gomez_Javier_Gil_Flores_Eduardo_Garcia_Jimenez

Ruiz, A. (1999a). *Invest- educación Introducción a la investigación en la educación.* Cuba: Editorial Pueblo y Educación.

Ruiz, A. (1999b). La triangulación. Editorial Chapecó. Metodología de la investigación. Educativa. Brazil.

Ruiz, A. (2000). *INVEST- EDUCACIÓN Introducción a la investigación en la educación.* Cuba: Editorial Pueblo y Educación.

Sampier, R. H. (2006). *Metodología de la investigación*. México: Hill Interamerica Editores.

Silva, C. R., Cardinalli, I., Silvestrini, M. S., Farias, A. Z., Prado, A. C. d. S. A., Ambrosio, L., Paula, B. M. d. (2017). La terapia ocupacional y la cultura: miradas a la transformación socialcerebral; una re-

visión sistemática. *Revista chilena de terapia ocupacional,* 105-113 doi:10.5354/0719-5346.2017.46383

Silva, R. (2007). Métodos cualitativos de investigación. Recuperado de http://www.sepiensa.cl/edicion

Taylor, S. J., & Bogdan, R. (1987). *Introducción a los métodos cualitativos de investigación. La búsqueda de significados.* In PAIDOS. Recuperado de http://wwwTaylor-Bogdan_observacion_part.pdf_AWSAccessKeyId=AKIAIWOWYYGZ2Y53UL3A&Expires=1540393526&Signature=7VoXLtFbXbVndjvcFs58eF7Ezig%3D&response-content-disposition=inline%3Bfilename%3DTaylor_Bogdan_observacion_part

Valle, A. D. (2007). *Metamodelos de la investigación pedagógica*. Cuba: Editorial Pueblo y Educación.

Vera, M. (2007). Significado de la calidad de vida del adulto mayor para sí mismo y para su familia. *Facultad de Medicina, 68*(3). Recuperado de http://www.scielo.org.pe/scielo.php?pid=S1025- 55832007000300012&script=sci_arttext

ANNEXED

Photography 1. Cultural activities

Photography 2. Writing short stories

Reception: **January 6, 2020** | Acceptance: **June 15, 2020**

KNOWLEDGE AND PROJECT MANAGEMENT IN UNIVERSITY RESEARCH: A CASE STUDY ON THE DEPARTMENT OF SERVICE TECHNOLOGY OF VENEZUELA'S SIMON BOLIVAR UNIVERSITY

—

María Daniela Gómez Suárez
mdgomez@usb.ve

Universidad Simón Bolívar, Venezuela

To quote this article:
Gómez Suárez, M. D. (2020). Gestión del conocimiento y gerencia de proyectos en la investigación universitaria: Caso de estudio en el departamento tecnología de servicios de la Universidad Simón Bolívar de Venezuela. *ESPACIO I+D, INNOVACIÓN MÁS DESARROLLO, 9*(24). https://doi.org/10.31644/IMASD.24.2020.a02

— Abstract—

It is possible to create new organizational knowledge and take advantage of the one that already exists, with the help of projects from organizations and the processes to carry them out. These projects take into consideration integration, scope, time, cost, quality, human resources, communication, risks, procurement, and stakeholders' management. In the particular case of universities, where different kinds of projects constantly take place, which produce results that go beyond these institutions in a way that impacts society in general. The use of appropriate tools and methodologies for project management is essential as it contributes to maintaining the necessary scientific rigor. Even more so when the linked processes can be considered as fundamental factors for knowledge management in people, processes, content, and information and communication technologies. Thus, we carried out descriptive research with a non-experimental design. It had as a general objective to determine knowledge management executed by teachers from the Department of Service Technology of the Simon Bolivar University Litoral Campus, of the State of La Guaira in Venezuela. We took into consideration the processes and knowledge areas for the research projects management carried out in the said Department. Through a self-evaluation, we diagnosed how teachers manage their projects to then link the information obtained to the elements that promote knowledge management.

Keywords

Knowledge management, project management, processes, knowledge areas, university projects.

The university research process follows a scientific and methodological approach, which corresponds to Cobo's definition (2006) about knowledge management, through which organizational knowledge is produced, captured, transformed, and used; besides, it must be considered that while researching, different mundane activities are carried out, such as projects or temporary programs that can answer the researchers' personal and professional concerns, as well as to the institution they belong to and society in general.

Therefore, according to the scientific rigor, on top of following the appropriate procedures for each field of study, when it comes to projects, tools and methodologies from the project management that "cover strategic, tactical, and operational strategies as direct responsible of their correct management" (Álvarez, 2016: 348) must be used, without forgetting that knowledge management has, as Cobo points out (2006), a practical and operational perspective that has to be taken into consideration.

But sometimes, teachers' basic training affects the research when they do not follow the appropriate methodologies or they do not use the proper tools to manage projects, especially if these cover knowledge areas outside of their professional field, for example, lack of time management for not using timetables or neglecting costs due to a lack of budget. Additionally, there are other factors that Figueredo (2017) names setbacks of the university researcher, which are: time factor, not having chosen a major within the institution, scarce budget, the psychological aspect and the lack of coincidence between personal research interests and those of the institution, which also impact on the research carried out and which, in some cases and with increasing frequency, are enhanced given the current political, economic and social situation in Venezuela, which affects the universities and all their personnel.

Given these conditions, it is essential that the research projects that are still being carried out in the country's universities can satisfy the needs that motivated them, in addition to maintaining the required scientific and methodological rigor, and that they are adequately managed by taking into account the processes that they require to reach completion within the existing restrictions, which are limited by the areas of knowledge linked to project management; thus the general objective of this research, which is of a descriptive type with a non-experimental design, where by means of a case study, it is intended to determine the knowledge management carried out by the professors of the Department of Service Technology of the Simon Bolivar University Litoral Campus, of the State of La Guaira in Venezuela, for this purpose, the processes and knowledge areas were taken into account for the management of the research projects they carry out and it was diagnosed, through a self-evaluation, how the professors manage

their projects, to later relate the information obtained with the factors that promote knowledge management.

KNOWLEDGE MANAGEMENT

When it comes to professors, these are "social agents with greater responsibility in the realization towards the internal, and visibility towards external aspects of scientism and the research function, attributed to the universities" (Figueredo, 2017: 325), to comply with the social commitment of these institutions, which they must do under an organizational and strategic approach explained below. For Cegarra and Martínez (2017), a strategy is an instrument for action and involves the act of directing or managing to meet goals, adjusted to the uncertainty of the organizational world and the highly changing environment; on the other hand, no one can currently doubt that intangible assets are strategic elements in organizations that contribute to their growth, and their management is increasingly relevant, especially in the case of developing countries because "it has become a tool for performance improvement" (González & Rodríguez, 2016: 12), and as stated by Quintas *et al* (1997) it is a process of continuous management of all types of knowledge, with which it is possible to satisfy existing and emerging needs, which identifies and uses present knowledge assets to develop new opportunities.

A business strategy, in its most classic approach, considers the organization's resources and capabilities, as opposed to knowledge-based strategies which, as indicated by Sveiby (1997; cited by Cegarra & Martínez, 2017), are sustained and have as an advantage: a high level of personalization, knowledge is focused as a procedure, there are benefits derived from efficiency and the investment made in personnel training. On the other hand, González & Rodríguez (2016: 19), state that knowledge management considers "activities such as initiate, generate, use, model, transfer and feedback, such knowledge for their purposes and strategic objectives", which is required for knowledge to become organizational assets, for this purpose first one must coordinate individual knowledge given their competences, studies, skills, and repetition of facts, which must be shared and distributed tacitly with other members of the organization to create its internal memory (Cegarra &Martínez, 2017), without forgetting that all the processes related to this management, in addition to generating, searching, storing and transferring knowledge, they seek to increase productivity and competitiveness (García, 2002; quoted by González & Rodríguez, 2016).

Olivares (2002; cited by Machado *et al*, 2007) contributes that on some occasions there is no coordinated management among the functions of the university since some teachers lack necessary managerial training, which is even more complicated without knowledge management that allows them

to face challenges inherent to the organization and the environment by providing "tools and processes that allow them to generate new knowledge and make existing knowledge profitable, thus improving the performance of the workers and, therefore, of the organization itself" (Rodríguez-Gómez & Gairín, 2015: 73). Knowledge management, according to Angulo (2016), must include a permanent and managed flow of knowledge within the organization, as this stimulates innovation, improves decision-making processes, and generates new knowledge.

Optimizing knowledge management implies organizational learning that allows operationalizing the "generation and permanent use of the existing and developed knowledge" (Rodríguez-Gómez & Gairín, 2015: 76), which should motivate a process of continuous improvement and, even more so in training contexts such as universities, which goes beyond the individual field of researchers and encompasses the entire institution. To achieve all this, knowledge management must be based on four pillars that influence its effectiveness: people, processes, content and information and communication technologies (Gómez- Vargas & García, 2015); table 1 below shows the fundamental components of knowledge management.

Table 1
Knowledge management components

Knowledge management components	Description of knowledge management components
People	Human resources
	Internalized organizational culture
Processes	The context in which knowledge management takes place
	Vision and mission of the organization. Business strategies
	Organizational methodologies and routines that people carry out
Contents	Knowledge related to each field
	Internal and external information that is gathered in documents, database, or people
	Monitored documented languages
	Presentation support and formats (documents, yellow pages, learned lessons)
Information and communication technologies (ICT)	Means to gather, store, and distribute data, information, and explicit and tacit knowledge
	Alignment with the organization's strategy and needs, especially those required when studying the other three components

Source: Gómez- Vargas y García, 2015

The components of knowledge management follow a route that starts with people acquiring and using knowledge from the initial stages of learning to

continuous improvement, creating processes and content that, under the appropriate media and environment, are stored, distributed, and captured by the members of the organization, making it the heritage of the organization.

As indicated by Gómez-Vargas and García (2015), the studies carried out on knowledge management in higher education centers and specifically in the field of scientific research, focus on analyzing only one or some variables of the processes of knowledge management, particularly those related to the creation of knowledge and ways of transferring it, but in any type of organization and through the components of knowledge management, one can develop and analyze one's capacities and, in the case of universities, this can be done with the research projects they carry out, specifically evaluating the strengths and weaknesses of professors in the area of project management, therefore, it is logical to consider metrics of this subject when evaluating knowledge management.

PROJECT MANAGEMENT

Project management is part of a broader process that the organization, as a whole, must analyze and adapt to the strategies to be developed (Álvarez, 2016). It is necessary to note that, as pointed out by Barbosa and Moura (2013), projects allow to obtain results that go beyond the scope of management of the daily routine, therefore they should not be left to chance, especially because of their particularities, which can be summarized as follows: their results are of unique characteristics, subject to a series of operational restrictions (with a hierarchy of interdependent activities) and resources (human, material and time), their teams are multidisciplinary, the execution is affected by the uncertainty and risks associated with each activity, given the interaction with different organizational and environmental variables.

The Project Management Institute defines project management as "the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements" (2013): 5); for this purpose, a series of processes must be carried out that are linked to the knowledge areas of project management. In the case of research projects carried out from universities, the impact that they have goes beyond the particular interests of the researchers and the institution, since it extends to all of society, in addition to becoming, as Gutiérrez-Vallejo *et al* (2016) state, "a meeting point for the members of the educational community to reach agreements to work together and be aware of the power they have when they act as a team and in an organized manner."

The project management process groups, according to the Project Management Institute (2013) are:

- Initiating: includes all the activities or tasks that need to be done to turn an idea into a viable project (Ollé & Cerezuela, 2017), as well as defining and authorizing the project or a stage of it.
- Planning: covers the definition of the project's scope, as well as "the elaboration of attainable objectives, based on available resources and economic, social and cultural conditions" (Pérez, 2016: 37), as well as the course of action needed to realistically achieve them.
- Executing: is the integration of resources to carry out the management plan to satisfy its specifications, completing the deliverable of the project (Wilson, 2015), when carrying out all the work that was previously defined.
- Monitoring and Controlling: considers those activities related to monitoring and regulating the project's regular progress, to identify variations from the management plan, and initiate changes or corrective actions (Wallace, 2014: 22), if necessary, at the right time.
- Closing: processes that involve the completion of all project activities as well as the formalization of the acceptance of the product, service, or result, for which the manager in charge of the project must ensure that from the technical and legal point of view, the project has been completed (Turner, 2016).

The knowledge areas of project management summarize the tools and techniques necessary to obtain results in each process group, in addition to "defining the variables that intervene in a project and that affect the product, service or expected result" (Ugas, 2008: 78); for the Project Management Institute (2013) there are ten such areas: Integration Management, Scope Management, Time Management, Cost Management, Quality Management, Human Resources Management, Communication Management, Risk Management, Procurement Management, and Stakeholder Management; each requires, on the part of those involved in the projects, competencies related to personal knowledge, skills, and abilities. Thus:

- Integration management: "includes the processes and activities necessary to identify, define, combine, unify and coordinate" the different knowledge areas (Project Man-agement Institute, 2013: 4), to obtain the desired result.
- Scope Management: definition of the work and the fundamental requirements of the project (Torres & Torres, 2014), to ensure that all the work necessary to achieve the result as planned is included.
- Time Management: considers the processes needed to complete the activities within the stipulated time frame, by defining, sequencing,

estimating resources and dura-tion of activities, and developing the schedule (Másmela, 2014).

- Cost Management: consists of budgeting and "keeping the actual cost within ap-proved limits" (Zandhuis *et al*, 2014: 93), which also includes the processes linked to obtaining financing.
- Quality Management: to verify that the project satisfies the needs for which it was planned, fundamentally complying with what Toala *et al* (2019) call client require-ments.
- Human Resources Management: it implies the assignment of roles and responsibili-ties that allow the realization of the objectives, as well as their participation in the planning and decision making of the project (Romano & Yacuzzi, 2011).
- Communications Management: ensures that the information required by all those in-volved in a project is collected, stored, and distributed promptly and by appropriate means so that there are comfort and confidence throughout the project (Turner, 2016)
- Risk Management: is done to identify, analyze, plan, anticipate, and control re-sponses to potential risk situations, all based on conceptual ideas about how the pro-ject deliverables will be (Wilson, 2015).
- Procurement Management: includes the rental or contracting of all those goods and services required by the work team and that is "necessary for the project to evolve" (Estrada, 2015: 86).
- Stakeholder management: allows the identification of "people, groups or organizations that may affect or be affected by the project", to analyze their expectations and develop strate-gies based on their possible impact (Project Management Institute, 2013: 391).

Image 1 below presents a summary of the knowledge areas and how they are linked to the processes mentioned above.

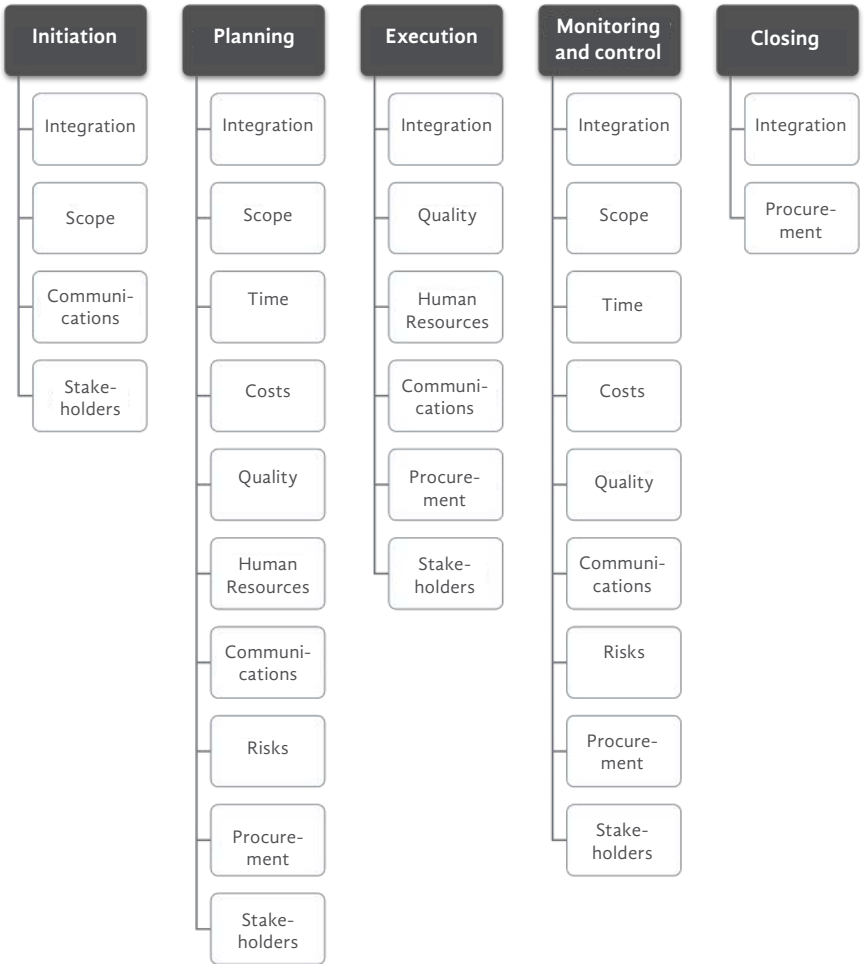


Image 1. The link between knowledge areas and project management processes.Source: adapted from Mariné and Rodríguez, 2014 (cited by Ollé & Cerezuela, 2017) and the Project Management Institute, 2013

METHODOLOGY

The present research is of a descriptive type with a non-experimental design since it was intended to describe, record, analyze and interpret "the current nature, composition or processes of the phenomena" (Rodríguez, 2005: 24), which was achieved with the general objective of determining the knowledge management carried out by the professors of the Department of Service Technology of the Simon Bolivar University Litoral Campus when considering the processes and knowledge areas for the management of the research projects they carry out. To achieve the general objective mentioned above, the following specific objectives are considered:

- Diagnose through a self-evaluation how professors manage their projects.

- Relate the information obtained with the factors that promote knowledge management.

The population under study are the professors of the referred university department, while the sample was intentionally collected to select only those professors who meet the theoretical criteria and not the statistical ones that allow for answering the research questions (Fàbregues *et al*, 2016), the sample was made up of those professors who, due to their contract, carry out research projects within the university (since some only teach within a few stipulated hours of classes).

The data collection instrument, with which the information related to the projects carried out by the professors was obtained, is a self-evaluation questionnaire proposed by Palacios (2009), in which, for each area of knowledge and each project management process, he proposes a series of questions, which are evaluated considering a weighting by scales. Later, the information collected allowed to relate the factors that promote knowledge management, through the projects carried out by the professors.

CASE STUDY

The professors of the Department of Service Technology of the Simon Bolivar University Litoral Campus who, given their contract, participated in the study to self-evaluate the management of research projects carried out, are grouped in what are called "divisions" linked to their undergraduate and postgraduate degrees, to the professionalization courses they have taken and to the subjects they teach within the institution. As can be seen in table 2, some of the teachers have methodological bases or tools that can allow them to manage projects in general, without necessarily having studied in the field, given the multidisciplinary nature of the knowledge areas that the projects require.

Table 2
Divisions of the Department of Service Technology and the professors' knowledge

Divisions	Percentage of Department Teachers per Division	Undergraduate, Postgraduate Degrees and Training Courses
Tourist and Hotel Services Division	24%	Tourism Hospitality Management Chemistry Nutrition Gastronomy Cultural and tourist heritage Marketing Economy Management Law
Customs and Commercial Services Division	33%	Economy Legal Science Customs Administration International Relations International Marketing International Business Project Management Law
Business and Transport Technologies Division	43%	Management Accounting Economy Transport Administration Human Resources Finances General Management Project Management Industrial Engineering Systems Engineering Computing Law Coaching

Source: elaboración propia, 2019

As can be seen in the table above, some teachers claim to know about project management, but there are many others who, although not specifically trained in the subject, their studies provide them with the necessary knowledge to manage at least one or several of the project management knowledge areas, which corresponds to what is reported in Chart 1, which shows the teachers' perception of the previous project management knowledge they possess.

Source: Own elaboration, 2019

To determine knowledge management, considering project management indicators, first the teachers had to make a self-evaluation about the processes they carry out and the knowledge areas linked to the projects, which was done following the questions of the questionnaire proposed by Palacios (2009), clarifying that by the time of its making, the Project Management Institute had not yet considered the Stakeholders Management as the tenth knowledge area, however, the questionnaire made included questions linked to processes that consider stakeholders, so it is relevant for this evaluation. Subsequently, the indicators derived from the self-evaluation were related to the fundamental components of knowledge management ("people", "processes", "contents" and "information and communication technologies"), to determine how professors use knowledge management through the research projects they carry out.

Next, in Table 3 it is observed how the component "people" presents weaknesses in all the processes linked to human resources, which implies that the planning of the necessary roles to fulfill the tasks and the assignment of those responsible for each activity must be improved, as well as the development and motivation of the work team and the evaluation of its performance; these weaknesses are maintained when the professor is evaluated as a manager of the projects he or she carries out, by not weighing well the work he or she carries out as an integrator of a plan that covers all knowledge areas. From these results it is necessary to emphasize that: the majority of those consulted indicated "not applicable" for their particular cases and it is congruent with the university policy that requires new professors who have not yet entered the university ranks to work on their research projects individually and, considering that most of the department's professors are in this condition, there are no staff or team members available to them when it comes to research in the early stages of their university careers, it

is also noteworthy that, despite having professional experts in management and human resources, there are significant weaknesses in these areas.

Table 3

"People" component of knowledge management linked to the project management self-assessment questionnaire

Knowledge management components	Description of knowledge management components	Questions from the self-evaluation questionnaire in project management linked to the component	Percentage of the answers indicated in the self-evaluation		Project Management Knowledge Area
People	Human resources	Organizational Planning: Roles required to adequately fulfill the different tasks identified were detected	Deficient	0,00%	Human resources
			Regular	14,29%	
			Basic	21,43%	
			Good	7,14%	
			Excellent	7,14%	
			Not applicable	50,00%	
		Recruitment of personnel: Responsible individuals with the appropriate profile for the different tasks were sought and assigned	Deficient	14,29%	Human resources
			Regular	7,14%	
			Basic	7,14%	
			Good	14,29%	
			Excellent	0,00%	
			Not applicable	57,14%	
		Team development: Improvement of the team's effectiveness through training, physical distribution, motivation, and other actions that contribute to good work	Deficient	7,14%	Human resources
			Regular	21,43%	
			Basic	0,00%	
			Good	21,43%	
			Excellent	0,00%	
			Not applicable	50,00%	
		Performance evaluation: Some kind of performance evaluation of the project participants was carried out, leading to their professional improvement	Deficient	7,14%	Human resources
			Regular	14,29%	
			Basic	7,14%	
			Good	7,14%	
			Excellent	7,14%	
			Not applicable	57,14%	
	Internalized organizational culture	Comprehensive plan: A comprehensive and coherent planwaspre-pared that considered the different areas of project management (scope, time, costs, quality, human resources, communications, risks, and procurement)	Deficient	21,43%	Integration
			Regular	28,57%	
			Basic	35,71%	
			Good	7,14%	
			Excellent	0,00%	
			Not applicable	7,14%	

Source: Own elaboration, 2019

When self-evaluating the "processes" component (see table 4), the results are similar to the previous component, since despite having teachers who are experts in topics related to the knowledge areas: scope, time, costs, quality, risks, and project integration, there are shortcomings that affect the context in which knowledge management takes place, by underestimating the probability of occurrence of risks, as well as the impact and design of a plan of response to them; also, the organization's strategic planning is affected, since as managers of the projects they carry out, a global plan that groups the execution of all activities in all processes and areas is not considered. The same happens when considering the methodologies and organizational routines carried out since it became evident that there is no system to manage changes correctly and on time; costs have not always been controlled (possibly due to the hyperinflationary context of the country, which distorts them and makes budgets out of date in hours, even if they are made in foreign currency), no indicators or corrective actions were considered given their results to maintain the requirements of the projects; the same happened in the case of risks to which there was no accurate control of responses, nor for changes that affected the projects. Special mention in this topic is made of the verification of the scope to monitor that the activities contemplated in the plan were being fulfilled, as well as the definition of these, which globally had shortcomings, although almost half of the professors stated that they carried out a "good" self-qualified management for them.

The situation is no different when evaluating the knowledge associated with each area since most of the time no economic and social feasibility studies of the projects were carried out, nor was a clear schedule built and controlled in terms of dates of completion of the activities, nor were methodologies applied to carry out corrective actions in terms of changes in the schedules; in terms of costs, a coherent budget adapted to the schedule was not created, nor was there, in many cases, adequate management of the cash inflows and outflows generated by the projects; furthermore, there was a lack of clear specifications for quality, which is reflected in the lack of planning and the absence of indicators to measure the final results, according to the projected specifications.

Table 4

"Processes" component of knowledge management linked to the project management self-assessment questionnaire

Knowledge management components	Description of knowledge management components	Questions from the self-evaluation questionnaire in project management linked to the component	Percentage of the answers indicated in the self-evaluation		Project Management Knowledge Area
Processes	The context in which knowledge management takes place	Rating: The probability of occurrence of the detected risk events and their impact or effect was evaluated	Deficient	35,71%	Risks
			Regular	28,57%	
			Basic	0,00%	
			Good	7,14%	
			Excellent	0,00%	
			Not applicable	28,57%	
		Response plan: Response plans were designed to anticipate risks, either to mitigate or absorb the risk	Deficient	35,71%	Risks
			Regular	21,43%	
			Basic	7,14%	
			Good	7,14%	
			Excellent	0,00%	
			Not applicable	28,57%	
	Vision and mission of the organization. Business strategies	Global execution: The main elements of the plan were considered in the execution of the activities and were managed as a whole	Deficient	28,57%	Integration
			Regular	28,57%	
			Basic	28,57%	
			Good	7,14%	
			Excellent	0,00%	
			Not applicable	7,14%	
	Methodology and organizational routines that people carry out	Scope verification: It was checked at the same time the project was implemented and the activities contemplated were being carried out	Deficient	7,14%	Scope
			Regular	14,29%	
			Basic	28,57%	
			Good	42,86%	
			Excellent	7,14%	
			Not applicable	0,00%	
		Scope control: A system was employed to manage scope changes correctly, taking corrective action	Deficient	14,29%	Scope
			Regular	50,00%	
			Basic	14,29%	
			Good	14,29%	
			Excellent	7,14%	
			Not applicable	0,00%	
		Description of activities: Actions that resulted in specific products were correctly delimited	Deficient	14,29%	Time
			Regular	7,14%	
			Basic	28,57%	
			Good	42,86%	
			Excellent	7,14%	
			Not applicable	0,00%	

Processes	Organizational methodologies and routines that people carry out	Costs control: The budget was controlled by taking corrective action when changes in the budget arose	Deficient	28,57%	Costs
			Regular	21,43%	
			Basic	7,14%	
			Good	14,29%	
			Excellent	7,14%	
			Not applicable	21,43%	
		Quality control: Indicators were measured and corrective actions were taken when deviations were detected	Deficient	35,71%	Quality
			Regular	14,29%	
			Basic	21,43%	
			Good	21,43%	
			Excellent	0,00%	
			Not applicable	7,14%	
		Responses control: Periodic risk reviews were made, verifying possible risks and activating contingencies	Deficient	42,86%	Risks
			Regular	14,29%	
			Basic	7,14%	
			Good	7,14%	
			Excellent	0,00%	
			Not applicable	28,57%	
		Global control: The changes and their effects on each area of the project were managed integrally, reviewing the varia-tions and their repercussions	Deficient	28,57%	Integration
			Regular	21,43%	
			Basic	35,71%	
			Good	7,14%	
			Excellent	0,00%	
			Not applicable	7,14%	
	Knowledge related to each field	Initiation: The project was formulated and economically evaluated or its social impact was determined to decide on its implementation, with a descrip-tion of the project indicating its relevance and the desired products	Deficient	42,86%	Scope
			Regular	14,29%	
			Basic	42,86%	
			Good	0,00%	
			Excellent	0,00%	
			Not applicable	0,00%	
		Activities programming: A coherent schedule was con-structed to allow us to see when the activities would be done	Deficient	7,14%	Time
			Regular	14,29%	
			Basic	35,71%	
			Good	35,71%	
			Excellent	7,14%	
			Not applicable	0,00%	
		Schedule control: A methodol-ogy was applied to measure deviations from the progress of the work and its possible cor-rections	Deficient	28,57%	Time
			Regular	28,57%	
			Basic	28,57%	
			Good	7,14%	
			Excellent	0,00%	
			Not applicable	7,14%	

Processes	Knowledge related to each field	Budget: A coherent budget was created to adjust the various estimated costs to the sched-uled dates	Deficient	21,43%	Costs
			Regular	14,29%	
			Basic	28,57%	
			Good	14,29%	
			Excellent	0,00%	
			Not applicable	21,43%	
		Treasury management: The incoming and outgoing money in the project was properly managed	Deficient	35,71%	Costs
			Regular	14,29%	
			Basic	0,00%	
			Good	21,43%	
			Excellent	7,14%	
			Not applicable	21,43%	
		Quality planning: The results to be offered by the final prod-ucts with management indica-tors were specified	Deficient	28,57%	Quality
			Regular	14,29%	
			Basic	14,29%	
			Good	28,57%	
			Excellent	0,00%	
			Not applicable	14,29%	

Source: Own elaboration, 2019

As shown in Table 5, when it was time to self-evaluate the "contents" component, the results improve in some aspects compared to previous components, particularly if we talk about information collected, for example, in plans and definition of the scope, for which methodologies were used to identify activities and those involved, as well as to sequence and determine priorities of activities to be carried out. The rest of the self-evaluation was consistent with previous results since the failures remain when estimating the duration of activities together with those involved in them, planning resources and estimating their costs, as well as for the identification of the risks associated with them and the needs that must be covered by purchases that must be reflected in a requirements plan, as well as the choice of the most appropriate suppliers. If we consider the controlled documentary languages that are supported through specific formats such as the purchase plan with the required contracts and the closing of these, the result of the self-evaluation does not consider effective management of these processes either.

Table 5

"Contents" component of knowledge management linked to the project management self-assessment questionnaire

Knowledge management components	Description of knowledge management components	Questions from the self-evaluation questionnaire in project management linked to the component	Percentage of the answers indicated in the self-evaluation		Project Management Knowledge Area
Contents	Internal and external information that is gathered in documents, database, or people	Scope planning: A methodology was used to define the scope of the project considering different stakeholders, users, clients, and interested in the results	Deficient	21,43%	Scope
			Regular	21,43%	
			Basic	0,00%	
			Good	57,14%	
			Excellent	0,00%	
			Not applicable	0,00%	
		Scope definition: Each activity of the project was identified so that it could delimit the scope of the project	Deficient	7,14%	Scope
			Regular	21,43%	
			Basic	14,29%	
			Good	50,00%	
			Excellent	7,14%	
			Not applicable	0,00%	
		Sequencing: Priorities between activities were identified, developing a network that allowed them to be properly sequenced	Deficient	7,14%	Time
			Regular	21,43%	
			Basic	21,43%	
			Good	50,00%	
			Excellent	0,00%	
			Not applicable	0,00%	
		The estimate of durations: Some criteria were used to assign execution times in con-sultation with those involved	Deficient	14,29%	Time
			Regular	21,43%	
			Basic	42,86%	
			Good	14,29%	
			Excellent	7,14%	
			Not applicable	0,00%	
		Resource Planning: A plan was developed to identify the re-sources required to do the activities	Deficient	21,43%	Costs
			Regular	7,14%	
			Basic	28,57%	
			Good	28,57%	
			Excellent	0,00%	
			Not applicable	14,29%	
		Estimated costs: Cost esti-mates were prepared using consistent information and estimation methods	Deficient	14,29%	Costs
			Regular	14,29%	
			Basic	28,57%	
			Good	21,43%	
			Excellent	0,00%	
			Not applicable	21,43%	

Contents	Internal and external information that is gathered in documents, database, or people	Identification of risks: It was determined that risky events can affect the effectiveness of the project, using checklists, brainstorms, etc.	Deficient	21,43%	Risks
			Regular	42,86%	
			Basic	0,00%	
			Good	14,29%	
			Excellent	0,00%	
			Not applicable	21,43%	
		Requirements plan: How pur-chases would be made was designed according to the needs detected	Deficient	21,43%	Acquisitions
			Regular	7,14%	
			Basic	28,57%	
			Good	28,57%	
			Excellent	0,00%	
			Not applicable	14,29%	
		Application cycle: A good process was made, looking for suppliers, obtaining offers, and choosing the most suitable one	Deficient	14,29%	Acquisitions
			Regular	7,14%	
			Basic	28,57%	
			Good	28,57%	
			Excellent	0,00%	
			Not applicable	21,43%	
	Controlled documentary languages	Purchasing plan: A pur-chasing plan was created to identify the materials or sub-contracts required to make the projects	Deficient	21,43%	Acquisitions
			Regular	7,14%	
			Basic	28,57%	
			Good	21,43%	
			Excellent	0,00%	
			Not applicable	21,43%	
	Supports and presentation formats (docu-ments, yellow pages, lessons learned	Closing of contracts: The closure of the contracts awarded and the accountability of these contracts were properly carried out	Deficient	35,71%	Acquisitions
			Regular	21,43%	
			Basic	7,14%	
			Good	14,29%	
			Excellent	0,00%	
				21,43%	

Source: Own elaboration, 2019

The evaluated means of collecting, storing, and distributing data, information, and knowledge (presented in table 6), show that the self-evaluated processes with the best weights correspond to the management of communications, particularly at the time of planning, identifying information needs, and when periodic reports on project progress should have been made to those involved. The rest of the processes linked to this component had concentrated responses among deficient, regular, and basic results, affecting quality assurance and compliance with specifications, follow-up of contracts and communications, but this time in the processes related to the timely and optimal distribution of information, as well as the collection of lessons learned at the project closure.

Table 6

"Information and Communication Technologies" component of knowledge management linked to the project management self-assessment questionnaire

Knowledge management components	Description of knowledge management components	Questions from the self-evaluation questionnaire in project management linked to the component	Percentage of the answers indicated in the self-evaluation		Project Management Knowledge Area
Information and Communication Technologies (ICT)	Means to gather, store, and distribute data, information, and explicit and tacit knowledge	Quality assurance: A quality system was used to ensure proper compliance with speci-fications	Deficient	28,57%	Quality
			Regular	14,29%	
			Basic	50,00%	
			Good	7,14%	
			Excellent	0,00%	
			Not applicable	0,00%	
		Communication planning: Stakeholders' information needs were identified	Deficient	7,14%	Communica-tions
			Regular	21,43%	
			Basic	7,14%	
			Good	35,71%	
			Excellent	7,14%	
			Not applicable	21,43%	
		Distribution of information: Team members were well in-formed, knowing where or how to get the data they needed	Deficient	7,14%	Communica-tions
			Regular	21,43%	
			Basic	7,14%	
			Good	14,29%	
			Excellent	7,14%	
			Not applicable	42,86%	
		Progress reports: Periodic reports and meetings were held to keep the various stakeholders informed	Deficient	21,43%	Communica-tions
			Regular	14,29%	
			Basic	14,29%	
			Good	14,29%	
			Excellent	7,14%	
			Not applicable	28,57%	
		Administrative closing: A final closing was carried out that allowed collecting in a system of informa-tion management the main learnings of the project	Deficient	21,43%	Communica-tions
			Regular	21,43%	
			Basic	7,14%	
			Good	14,29%	
			Excellent	14,29%	
			Not applicable	21,43%	
	Alignment with the strategy and needs of the organization, especially those required when studying the other three components	Contract administration: An efficient work in the manage-ment and inspection of the contracts was carried out, with some system to follow up	Deficient	21,43%	Acquisitions
			Regular	21,43%	
			Basic	28,57%	
			Good	0,00%	
			Excellent	0,00%	
			Not applicable	28,57%	

Source: Own elaboration, 2019

CONCLUSION

It is increasingly recognized the importance, for any organization, to consider the processes and components that lead to optimal knowledge management as key success factors, because it is an organizational strategic element, even more so in universities, whose ultimate goal is the creation and dissemination of knowledge, and the impact of the activities and projects carried out have influence at local, national and even international levels. However, if an organization has not been aware of the need and importance of this, either because of temporary problems, such as the country's situation that prioritizes other types of management, which give weight to urgent actions over those planned or if the so-called stumbling blocks of the researcher are added, it ends up affecting one of the pillars of the teaching career within universities; this affects the processes to not be optimized, therefore, the objectives are not achieved and the results do not have the desired impact or scope.

To correct and improve the management of projects or knowledge, it is necessary to first identify what is being done and how it is being done, to detect faults, which will then allow the necessary corrective actions to be taken. As was seen in the case study, failures in project management could be linked to knowledge management, by evaluating the impact that some facilitating and inhibiting factors currently have on management in the institution, which are linked to the actions and processes of projects carried out by professors and at the institutional level, the information they handle and the format in which they collect and share it through information and communication technologies.

If the component "people" is analyzed, it is notorious that currently, the teaching staff that participates in the research projects of the studied department does not adequately manage the project's processes related to human resources, neglecting until now the assignment of roles and responsibilities, the development of work teams and the necessary feedback, which can also be observed with the integration management when considering each teacher as a manager of the projects he or she carries out. The situation is similar when the "processes" component is self-evaluated, since the weaknesses manifested in the study, to generate knowledge, are linked to the management of the project management areas of scope, time, costs, quality, risks, and integration, thus, professors of the department have problems verifying the scope, they lack systems or methodologies for change management as well as management indicators, they do not verify the full compliance of the plan, activities, schedules, costs, and budgets, they neglected corrective actions designed to maintain project requirements, failed to evaluate economic and social feasibility, they underestimated risks when identifying them and designing a plan to respond to them, and as project managers,

there was no overall vision that linked organizational strategic planning with all processes and areas of project management, nor was the impact of changes within the project as a whole assessed.

In the case of the "contents" component, professors stated that they plan projects and define the scope as a means to collect information, they also indicated that they use methodologies to identify, sequence, and prioritize activities and stakeholders; failures occur when they have to estimate the duration of activities, plan resources, estimate costs, identify risks, plan purchases that cover all needs, choose suppliers and manage contracts.

When the "information and communication technologies" component is considered, there is a better self-evaluation in the processes that allow to identify information needs and periodically report the progress to those involved, however, there are results that compromise quality assurance and compliance with specifications (and therefore the final result of the projects); nor do they follow up on contracts, or the timely and optimal distribution of information so that all those involved are notified of progress and results, and they do not collect the lessons learned at the end of the projects, so there is nobody of knowledge available to the university community.

It is necessary to clarify that at no time does this research have the purpose of distorting the work carried out by the professors of the department, to which the researcher precisely belongs to. Furthermore, it should be pointed out that the control system required by the Dean's Office and the Research Coordinators by areas of study of the Simon Bolivar University, requires the delivery of results to justify the money invested, as well as to renew the professors' contracts, so it was verified that the projects in their great majority fulfilled the objectives for which they were proposed; with this work it is evident that a) many professors intuitively carried out the required processes, and b) there is a need for training in project management, so it is ideal that within the current budgetary restrictions, the university supports the professors by providing the necessary training and promoting an organizational culture with dynamic and multidisciplinary processes, supported by optimal management, forming a common body of knowledge that covers the entire university community and that reinforces the motivation of teachers by various means so that they achieve professional recognition as academics and with quality results that impact positively on society as a whole. It is necessary to clarify that this situation may be similar in other university contexts, so similar research is encouraged in the rest of the institution and other universities.

REFERENCES

Álvarez, M. (2016). El poder de la gestión de proyectos en la cultura organizacional. *Revista Ciencias Estratégicas. Vol. 24*, N° 36, pág. 345-363. República de Colombia.

Angulo, R. (2016). Gestión del conocimiento y aprendizaje organizacional: una visión integral. *Revista Informes Psicológicos. Vol. 17*, N° 1, pág. 53-70. República de Colombia.

Barbosa, E. y Moura, D. (2013). *Proyectos educativos y sociales. Planificación, gestión, seguimiento y evaluación*. Reino de España: Narcea Ediciones.

Cegarra, J. y Martínez, A. (2017). *Gestión del conocimiento una ventaja competitiva*. Reino de España: ESIC Editorial.

Cobo, A. (2006), Modelo de capital intelectual de la Consejería de Educación de la Junta de Andalucía. Indicadores de capital humano y gestión del conocimiento. Tesis Doctoral, Universidad de Málaga, Reino de España, [Tesis en línea] Disponible en: http://www.biblioteca.uma.es/bbldoc/tesisuma/16754621.pdf

Estrada, J. (2015). Análisis de la gestión de proyectos a nivel mundial. *Palermo Business Review. 12,* 61-98. República Argentina.

Fàbregues, S., Meneses, J., Rodríguez-Gómez, D. y Paré, M. (2016). *Técnicas de investigación social y educativa*. Reino de España: Editorial UOC.

Figueredo, C. (2017). La gerencia avanzada en el proceso de investigación científica universitaria. Revista Scientific. Vol. 2, N° 6, pág. 322-336. República del Ecuador.

Gómez-Vargas, M. y García, M. (2015). Factores influyentes de la gestión del conocimiento en el contexto de la investigación universitaria. *Revista Información, cultura y sociedad. N° 33*, pág. 29-46. República Argentina.

González, J. y Rodríguez, M. (2016). *Gestión del conocimiento, capital intelectual e indicadores aplicados*. Reino de España: Ediciones Díaz de Santos.

Gutiérrez-Vallejo, E. Gracia-Chancay, J. y Quiñonez-Mosquera, J. (2016). Liderazgo y gerencia de proyectos educativos y sociales. *Revista Dominio de las Ciencias. Vol. 2,* N° 4, pág. 274-283. República del Ecuador.

Machado, F., Reyes, L. y Rietveldt, F. y Luquez, P. (2007). Articulación de las funciones universitarias: un marco de transformación académica. *Revista Formación Gerencial, año 6,* N° 6, pág. 64-87. República Bolivariana de Venezuela.

Másmela, R. (2014). *Como implementar sistemas para la gestión de proyectos en organizaciones para el desarrollo de software guiados por un modelo de mejora continua*. República de Colombia: Grafiweb.

Ollé, C.; Cerezuela, B. (2017). *Gestión de proyectos paso a paso*. Reino de España: Editorial UOC.

Palacios, L. (2009). *Principios esenciales para realizar proyectos.* Un enfoque latino. 4ta. edición. Caracas, República Bolivariana de Venezuela: Universidad Católica Andrés Bello.

Pérez, G. (2016). *Diseño de proyectos sociales: aplicaciones prácticas para su planificación, gestión y evaluación*. Reino de España: Narcea Ediciones.

Project Management Institute (2013). *Guía de los fundamentos para la dirección de proyectos: Guía del PMBOK*. Quinta edición. Estados Unidos de América: PMI Publications.

Quintas, P., Lefrere, P. y Jones, G. (1997). Knowledge Management: a strategic agenda. *Revista Long Range Planning. Vol. 30*, N° 3, pág. 385-391. Reino de los Países Bajos.

Rodríguez, E. (2005). *Metodología de la investigación. La creatividad, el rigor del estudio y la integridad son factores que transforman a un estudiante en un profesionista de éxito*. Estados Unidos Mexicanos: Universidad Juárez Autónoma de Tabasco.

Rodríguez -Gómez, D. y Gairín, J. (2015). Innovación, aprendizaje organizativo y gestión del conocimiento en las instituciones educativas. *Revista Educación. Vol. 24*, N° 46, pág. 73-90. República del Perú.

Romano, G. y Yacuzzi, E. (2011). *Elementos de la gestión de proyectos.* Serie documentos de trabajo de la Universidad del CEMA. 449, 1-32. República Argentina.

Toala, M., Romero, R., Ganchozo, M., Álvarez, C., Jaime, M., Pinargote, J. Romero, V. y Bazurto, J. (2019). *Introducción a la gestión de proyectos*. Reino de España: Editorial Área de Innovación y Desarrollo.

Torres, Z. y Torres, H. (2014). *Administración de proyectos*. Estados Unidos Mexicanos: Grupo Editorial Patria.

Turner, R. (2016). *Gower Handbook of Project Management*. Quinta edición. Estados Unidos de América: Editorial Routledge.

Ugas, L. (2008). La gestión de los proyectos en las empresas del sector energético. Caso: ENELVEN – CARBOZULIA. *Télématique Revista Electrónica de Estudios Telemáticos, Vol. 7*, N° 2, pág. 70-97. República Bolivariana de Venezuela.

Wallace, W. (2014). *Gestión de proyectos.* 4ta. edición. Edimburgo, Reino Unido: Edinburgh Business School.

Wilson, R. (2015). *Mastering project management strategy and processes. Proven methods to meet organizational goals*. Estados Unidos de América: Pearson Education.

Zandhuis, A., Snijders, P. y Wuttke, T. (2014). *El compañero de bolsillo de la Guía del PMBOK*. Primera edición. Reino de España: Van Haren Publishing.

Reception: **April 12, 2020** | Acceptance: **July 13, 2020**

APPLICATION OF DIFFERENT LEVELS OF PROTEIN AND SYNTHETIC AMINO ACIDS IN THE PRODUCTIVE BEHAVIOUR OF QUAILS

—

Silvia Patricia Patarón Andino

Nelson Antonio Duchi Duchi

Irma Patarón

Richard Muyulema Erazo
rimuer1@gmail.com

Escuela Superior Politécnica de Chimborazo (espoch)
Riobamba, Ecuador

To quote this article:
Patarón Andino, S. P., Duchi Duchi, N. A., Patarón Andino, I. M., & Muyulema Erazo, R. N. (2020). Aplicación de diferentes niveles de proteína y aminoácidos sintéticos en el comportamiento productivo de codornices. *ESPACIO I+D, INNOVACIÓN MÁS DESARROLLO, 9*(24). https://doi.org/10.31644/IMASD.24.2020.a03

— Abstract—

The effect of different levels of crude protein (PB) added with synthetic amino acids (AAS) on the productive behavior of laying quail was evaluated. 500 quail were used, which were randomly distributed to four treatments according to a completely randomized design with five repetitions T1: 21% PB + 0.15% AAS, T2: 20% PB + 0.19% AAS, T3: 19% PB + 0.22% AAS and control treatment T0: 22% PB. The results showed that the best consumption of nutrients was obtained in quails fed with T2 (P <0.01), for the variables: Dry matter (22.31 g / day); Metabolizable energy (0.07 Mcal/Kg); Lysine (0.27 g/day); Methionine (0.08 g/day); Threonine (0.15 g/day). The highest consumption of PB was with T1 (P <0.01) with 4.61 g/day. The best productive performance of quail was obtained with T2 with 83.69% of egg production. The T2 was adjusted to a third-order linear model (P <0.01) and it was found that the production percentage will depend on 66.90% of the protein levels with 10.75 g, as the average egg weight, 9, 00 g total egg mass and 0.80% mortality. A slight increase in the transverse diameter was observed for the morphology of the T2 egg (P <0.01) with 26.10 mm. The best Benefit/Cost ratio was with animals in T2 and $1.30 was obtained. Synthetic amino acids with low PB levels improve productive behavior in laying quail.

Keywords

Quail production, Bird feeding.

Poultry farming emerged as a complementary activity to agricultural systems, in which birds were fed with seeds from crops and natural foods taken from their environment (worms, earthworms, etc.) (Pitakpongjaroen & Wiboonpongse, 2015), while diseases were treated based on traditional knowledge (Syakalima, Simuunza & Zulu, 2017). In turn, birds reduced some farm pests, fertilized the land with manure, and contributed meat and eggs to the family diet (Tovar, Narváez & Agudelo, 2015).

In Ecuador, the poultry industry began during 1950 and 1960, and in recent years improvements have been made in the genetics of breeds for fattening and feeding (Orellana, 2014). The genetic lines used by Ecuadorian companies in chicken production are Cobb and Ross (Ruiz, 2016). Quail is the smallest species exploited in the commercial poultry sector (Panda & Singh, 1990). The reason for its success is explained by the high level of production and the nutritional quality of the egg, which has allowed its acceptance in the market (Iqbal *et al*., 2015).

The breeding of quail (*Coturnix coturnix japonica*) is a high-performance poultry activity. The low initial investment, the few requirements of land spaces, the fast return of capital, the nutritional value of meat and eggs, the low cost of production, the high production level; the fast growth, the rusticity and the precocity of this species, are some characteristics that make the product attractive and turns it into an alternative source of nutrients with the egg production (Ciriaco & Roncal, 2016).

The Japanese quail has generated great interest among poultry farmers dedicated to egg production in Ecuador since it requires little economic investment for its breeding (Özsoy & Aktan, 2011). Therefore, the objective of this study is to evaluate the amount of crude protein plus synthetic amino acids and their response to the productive behavior of laying quail.

MATERIALS AND METHODS

Location of the area of study

The present research was developed in the quail farm "Reina del Quinche" located in the parish Veloz, canton Riobamba, province of Chimborazo, Ecuador, which lasted 120 days. The bromatological analysis of the diets used was carried out in the laboratory of the National Institute for Agricultural Research (INIAP).

Experimental Units

The number of experimental units was 500 quails, which were randomly distributed in four treatments and five repetitions per treatment, with an experimental unit size of 25 birds.

Treatment and experimental design

The experimental treatments were crude protein (PB) levels plus the amount of synthetic amino acids (SAA): T1: 21% PB + 0.15% AA; T2: 20% PB + 0.19% AAS, T3: 19% PB + 0.22% AAS, T4: 22% PB (control treatment) A completely randomized design was used, with the following additive linear model:

$$Y_{ij} = \mu + \tau_i + \varepsilon_{ij}$$

Where:

Y_{ij} = Observation in j-th repetition i-th level of crude protein

μ = General average

τ_i = Effect of the i-th level of crude protein (19, 20, 21, 22%)

ε_{ij} = Experimental error

Statistical analysis and significance tests

The numerical field and laboratory results determined in this research were processed using the statistical program SPSS (version 18) and Excel 2013 (Microsoft Office®), performing the following statistical analyses: Analysis of variance, analysis of correlation and regression, and separation of means using Waller Duncan's test with a significance level of $P < 0.05$ and $P < 0.01$.

Experimental Procedure

The area of study was disinfected with AQUAT 50 (Quaternary Ammonium Compound 20%) at a rate of 1 ml per liter of water, which was applied by backpack spray, seven days before the reception of the quails. Iodine was applied for the asepsis of feeders and drinkers in doses of 2 ml per liter of water, four days before the arrival of the birds.

All quails were given water with electrolytes plus vitamins to reduce transfer stress. At the second week of reception of the birds, feed consumption was evaluated and production was estimated in percentage. The first seven days were considered a critical period for offering the adaptation diet.

All birds were weighed daily and placed in the linear feeders. All of them were offered 25 g of bird food/day and water *ad libitum* through automatic cup-type drinkers, to which vitamins were added to reduce stress during waking. This handling practice was carried out after 15 days of permanence, and electric caution, iodine, and vitamins were used. Every

two months the mixed vaccine against Newcastle and infectious Bronchitis was applied in the eye, to lower the bacterial load iodine nebulizations were performed twice a week, and to avoid the attack of fungi, they were given 1 ml of iodine per liter of water once a day.

Egg production was quantified daily and was done twice a day (8:00 am and 5:30 pm) with a plastic basket. For this, they were offered 14 hours of natural or artificial light, the electric power was activated from 6:00 to 10:00 pm.

A thermometer was used to control the temperature between 18 and 22°C and to avoid airflow the curtains were handled to create a microenvironment. The place was cleaned with a shovel and broom every 15 days to reduce the accumulation of ammonia and not to affect the birds' respiratory tracts. A layer of lime and rice husk was spread on the floor (Salinas, 2015).

RESULTS AND DISCUSSION

Nutrients intake

Total feed intake

Total feed consumption in laying quails with different levels of protein plus synthetic amino acids was different (P<0.01), the lower consumption was obtained with T1 (Table 1). Daily feed consumption was different (P < 0.01). The highest daily consumption of feed was recorded in quails treated with T2, T0, and T3; and the lowest consumption with T1 (Table 1).

Table 1
Nutrient intake in laying quails treated with synthetic amino acids with low levels of crude protein in the diet

VARIABLES	TREATMENTS					
	T0	T1	T2	T3	SE	Prob.
Total feed intake, kg	2,34 a	2,25 b	2,34 a	2,33 a	0,0063	0,001
Feed intake, MS g/day	22,29 a	21,43 b	22,31 a	22,20 a	0,0629	0,001
Crude protein intake, g/day	4,03 d	4,61 a	4,48 b	4,38 c	0,0141	0,001
ME intake, Mcal/day	0,07 a	0,06 b	0,07 a	0,07 a	0,0007	0,002
Calcium intake, g/day	0,81 a	0,80 ab	0,78 b	0,71 c	0,0024	0,001
Phosphorus intake, g/day	0,12 b	0,11 c	0,11 c	0,13 a	0,0006	0,001
Lysine intake, g/day	0,20 c	0,23 b	0,27 a	0,23 b	0,0007	0,001
Methionine intake, g/day	0,06 c	0,06 c	0,08 a	0,07 b	0,0008	0,001
Threonine intake, g/day	0,11 c	0,13 b	0,15 a	0,13 b	0,0004	0,001

Same letters do not differ significantly according to Waller Duncan (P <0,05 and P <0,01).
SE: Standard error.
Prob: Probability.
ME: Metabolizable energy.

Source: Own elaboration

Regarding these results, Tapia (2010) registered consumption of 22.33 g/bird/day and total consumption of 2.74 kg. Hurtado, Torres & Ocampo (2013) concluded that protein directly interferes with the consumption of feed per bird, by increasing or decreasing its percentage within the ratio, according to the total kcal offered.

Crude protein intake

Protein consumption in quails treated with synthetic amino acids in the present research showed statistical differences between treatments ($P < 0.01$). The highest consumption was recorded with T1 and the lowest consumption with the control treatment (Table 1). These results are lower than the average obtained by Yamane, Ono & Tanaka (2007), and Portillo (2005) with averages of 4.9 g/day and 5.47 g/day in their respective order varying according to food consumption and the percentage of protein in the diet. Similarly, Begin & Insko (1994) determined that 4.71 g/day is required when the posture rate is 78% to 80% with a diet of 21% to 22.9% of protein and 2600 Kcal/kg ME.

Energy intake

T1 birds had the lowest average of ME consumption, which differs ($P < 0.01$) from the rest of the treatments (Table 1). These values match with those reported by Yamane, Ono & Tanaka (2007) who obtained normal parameters with consumption of 0.062 Mcal/day.

Labier & Leclercq (1992) found daily necessities of 0.082 Mcal/day for quails with an average weight of 220 g and showed that the energy level influences the conversion rate and egg mass.

Calcium intake

Averages of calcium consumption showed differences ($P < 0.01$). The lowest consumption was recorded in quails treated with T2 and T3 (Table 1). These results surpass those found by Shrivastav & Panda (1999) who stated that for laying, 550 mg to 650 mg/quail/day of calcium consumption are necessary, equivalent to 0.55 to 0.65 g/day depending on the bird's weight, which can vary from 140 to 220 g and the daily egg mass of 9 or 10 g. Similarly, these data exceed the results presented by Labier & Leclercq (1992) with an average of 730 mg of calcium consumption corresponding to 0.73 g/day.

Phosphorus intake

Differences were found for phosphorus consumption (P <0.01). The highest consumption was recorded in quails with T3 and the lowest consumption with the T1 and T2 (Table 1). Phosphorus consumption obtained in this research is higher than those registered by Shrivastav & Panda (1999) and lower than those reported by Labier & Leclercq (1992) where averages of 0.055 and 0.15 g/quail/day are reached. Shrivastav & Panda (1999) mentioned that the ratio of calcium and phosphorus in poultry rations or feeds is known as calcium/phosphorus ratio, which for quails in production, is 4:1, which differs from the one reported in the present research, the calcium/phosphorus ratio was 6:1 for T0; 7:1 for T1 and T2; and 5:1 for T3.

Lysine intake

Daily lysine consumption per bird was different (P < 0.01). The highest consumption was recorded with T2 and the lowest consumption with the control treatment (Table 1).

Oliveira *et al*. (1999) tested two levels of crude protein in the ratio (19.0 and 14.1%) supplemented with five levels of lysine (0.65; 0.85; 1.05; 1.25 and 1.45%) and concluded that the best weight and highest egg production was achieved with 1.05% lysine and 19% crude protein. The authors explained, that due to the low protein content of the serving, catabolism increased and the amino groups of the protein were diverted for the synthesis of non-essential amino acids or uric acid.

Methionine intake

Quails' methionine intake was different (P < 0.01). The highest methionine consumption was recorded with T2, and the lowest consumption with the control treatment and T1 (Table 1). The highest consumption obtained in this research is equal to the consumption of methionine achieved by Yamane, Ono & Tanaka (2007) who indicated that the optimal production without impairing the rate of consumption is achieved with a daily intake of 0.08 g/bird/day.

Threonine intake

The threonine intake showed differences (P <0.01). The highest consumption was recorded with T2 and the lowest consumption with the control treatment (Table 1). The above results exceed those found by Yamane, Ono & Tanaka

(2007) which indicate that production is not affected by a daily intake of 110 mg of threonine equivalent to 0.11 g/day/quail with diets of 22% protein.

Threonine's toxic effect on food is considered little or null since it is easily metabolized by the body, as well as its derivative compounds. Therefore, histidine, tryptophan, and methionine are not considered an amino acid of toxicity (Castañón, 1994).

Productive behavior

Weight at the beginning of laying

In the analysis of variance of the weight of the quails at the beginning of laying, the best treatment was the control treatment with 181.44 g, while T1 was lower with 174.92 g, for T2 a value of 173.21 g was obtained, and the last was T3 with 168.68 g (Table 2). Results which, when compared with Ortega (2011) in his study on the determination of the effect on different microenvironmental temperatures in the initial phase, growth, development, and laying in quails, reported weight at the beginning of laying of 170.74 g, lower results than those found in the present investigation.

Final weight

The analysis of final weight variance did not register statistical differences ($P> 0.05$), so the averages were 196.84; 195.44; 195.24 and 192.23 ± 1.4978 g corresponding to T1, T0, T3, and T2 respectively see Table 2.

According to the results obtained during the research period, when compared with the values found by Ortega (2011) and Obregon (2012), they show inferiority since they registered pesos of 208.84 and 201.04 g.

Percentage of quails in production

The percentage of production presented statistical differences ($P<0.01$), where the percentage of production in quails treated with T2 presented the greatest average with 83.69% followed by quails fed with T3 and T0 with 79.13% and 78.51% of production in their respective order and with a lower percentage of egg production was recorded in quails treated with T1 with 75.27% with a dispersion for each average of ± 0.4724 % (Table 2).

Hurtado *et al*. (2013) in their study on the effect of protein levels on the performance of Japanese quails in the laying phase, obtained the highest percentage in quails fed 20.5% PB and 2850 Kcal/Kg with an average of 84.69% while the lowest percentage was obtained with diets whose protein

was 22% and 3050 Kcal/Kg with an average of 79.23%, results which are corroborated by this research.

Total egg mass

Significant differences were registered (P<0.01) for this variable, being the highest response in T2 birds with an average of 9.00g, followed by the control treatment with 8.46g, finally the T3 and T1 treatment that shared significance with averages of 8.38; 8.07 g and with a dispersion for each average of ± 0.0555 g (Table 2).

The results obtained in this research exceed those found by Moura *et al.* (2009) and which is also lower than those found by Ortega (2011) with averages of 8.09 and 10.72 g.

Mortality rate

The analysis of variance for the percentage of mortality in the production phase did not report statistical differences between the means of the treatments (P>0.05) however numerically the lowest percentage of mortality was for T2 with 0.80% followed by 1.60% for T1, and sharing the same range To and T3 with 2.40% having a dispersion for each mean of ± 0.5797% as shown in Table 2.

Table 2
Productive behavior of laying quails treated with synthetic amino acids with low levels of crude protein in their diet

VARIABLES PRODUCTS	TREATMENTS					
	T0	T1	T2	T3	SE	Prob.
Weight at the beginning of laying, g	181,44 a	174,92 a	173,21 a	16,68 a	1,3464	0,057
Final weight, g	195,44 a	196,84 a	195,23 a	192,24 a	1,4978	0,801
Birds in production, %	78,51 b	75,27 c	83,69 a	79,13 b	0,4724	0,001
Total egg mass, g	8,46 b	8,07 c	9,00 a	8,38 bc	0,0555	0,001
Mortality rate, %	2,40 a	1,60 a	0,80 a	2,40 a	0,5797	0,790

Same letters do not differ significantly according to Waller Duncan (P <0.05 and P <0.01).
SE: Standard error.
Prob: Probability.

Source: Own elaboration

However, Amarrilla & Albornoz (2013), reported that mortality in the laying stage should not exceed 4%, while for birth and development it should be 10% and for birds whose purpose is fattening it should be 5%.

Similarly, these results are lower than those found by Obregon (2012) who, in his study on the use of different levels of natural hibotek growth promoter in the breeding, development, and raising of quails and its effect until reaching production peak, achieved 10% mortality. This is given to the addition of threonine in the diets since this is important in the humoral immune response since it is necessary for the formation of the hypervariable regions of the immunoglobulins or antibodies.

Egg structure evaluation

Egg weight

No significant differences were reported in the egg's weight (P>0.05), being 10.78, 10.75, 10.72, and 10.60 ± 0.04374 g for T0, T2, T1, and T3 treatments respectively. (Table 3).

Table 3
Evaluation of quail eggs components treated with synthetic amino acids with low levels of crude protein in the diet

EGG STRUCTURE	TREATMENTS					
	T0	T1	T2	T3	EE	Prob.
Egg weight, g	10,78 a	10,72a	10,75 a	10,60 a	0,0434	0,571
Shell weight, g	1,51 a	1,48 a	1,43 a	1,47 a	0,0110	0,168
Yolk weight, g	3,58 a	3,54 a	3,62 a	3,53 a	0,0268	0,714
Albumen weight, g	5,69 a	5,70 a	5,71 a	5,60 a	0,0316	0,676
Lengthwise diameter, mm	31,64 a	31,78 a	31,79 a	31,62 a	0,0892	0,899
Transverse diameter, mm	25,22 b	25,29 b	26,10 a	25,02 b	0,0460	0,001
Shell thickness, mm	0,20 a	0,20 a	0,19 a	0,20 a	0,0013	0,541

Same letters do not differ significantly according to Waller Duncan (P <0,05 y P <0,01).
SE: Standard error.
Prob: Probability.

Source: Own elaboration

But in their research, Moura *et al*. (2000), reached an average weight of 10.33 g lower than those reached in the present research, pointing out that lysine levels are not sufficient to promote maximum egg weight, suggesting that the lysine requirement for egg weight is higher than the level for egg production.

Shell weight

For this variable no statistical differences were found when using Tukey's test (P>0.05) with the averages of 1.51; 1.48; 1.43, and 1.47 g for T0, T1, T2, and T3 treatments in their respective order with a dispersion for each average of ± 0.0110 g. (Table 3). The results found are superior to those found by Melo *et al*. (2008) who used a supplemented ratio with 0.50% seaweed meal reporting a shell weight of 1.13 g.

Yolk weight

For yolk weight, no significant differences were found (P>0.05), being the averages for T2, T0, T1, T3 of 3.62; 3.58; 3.54 and 3.53 g in their respective order and with a dispersion for each average of ± 0.0268 g. (Table 3).

The results found are superior to those found by Melo *et al*. (2008) in their research where they mention the quality of quail eggs when using seaweed meal and ammonium dihydrogen phosphate, used as an alternative source of phosphorus with an average of 3.20 g. Similarly, Moura *et al*. (2009) reported an average of 3.19 g in their study where they discuss the effect of different dietary levels of total lysine on the egg quality of Japanese quail.

Albumen weight

The addition of synthetic amino acids in diets with low protein levels did not show significant differences (P>0.05), with weights of 5.71; 5.70; 5.69; 5.60 ± 0,0316 g for quails belonging to T2, T1, T0, and T3 (Table 3). The results are within the ranges of the lineage, but not of those found by Melo *et al*. (2008) where it reached an average of 6.88 g using 0.25% seaweed meal.

Economic evaluation

The greatest profitability was obtained with the T2 treatment with 20% protein plus the addition of 0.19% synthetic amino acids, with profit/cost indexes of 1.30 USD, which means that for every dollar spent during the research period on the production of laying quail, a net benefit of 0.30 USD was obtained. Table 4.

Table 4
Economic evaluation in the production of quails treated with synthetic amino acids with low levels of crude protein in the diet

CONCEPT	TREATMENTS			
	T0	T1	T2	T3
OUTFLOW				
Cost of Quails 1	212,50	212,50	212,50	212,50
Concentrated 2	212,12	187,34	189,31	185,73
Health 3	6,58	6,58	6,58	6,58
Prevention 4	2,11	2,11	2,11	2,11
Biosecurity 5	8,38	8,38	8,38	8,38
Construction and facilities 6	14,67	14,67	14,67	14,67
Basic utilities 7	5,00	5,00	5,00	5,00
Labor 8	55,78	55,78	55,78	55,78
Packaging of the final product 9	3,02	2,92	3,19	3,04
TOTAL OUTFLOW	520,15	495,27	497,50	493,79
INCOME				
Egg sales 10	502,55	485,95	530,95	507,05
Quail manure 11	16,00	16,00	16,00	16,00
Birds in production 12	97,60	98,40	99,20	97,60
TOTAL INCOME	616,15	600,35	646,15	620,65
PROFIT/COST (USD)	1,18	1,21	1,30	1,26

1. Cost of Quails $ 1.70/codorniz.
2. 22%PB $ 0,64/kg; 21%PB $ 0,62/Kg; 20%PB $ 0,61/kg; 19%PB $ 0,60/Kg.
3. Cost of antibiotics $ 3.08/Treatment and Vitamins $ 3.50/Treatment
4. Cost of Vaccine $0.01/dose and Iodine $ 0.63/ml
5. Cost Disinfectants $ 8.38.
6. Depreciation of facilities and equipment $ 14.66.
7. Cost of electricity and water $20.
8. Cost of labor $1.89/day
9. Box cost $ 0.15/unit.
(10). Egg sales $ 0.05/unidad.
11. Manure sale $ 2/bag.
12. Quote of birds in production $0.80/bird.

Source: Own elaboration

CONCLUSIONS

The breeding of quails reports many favorable benefits, due to the low initial investment, easy adaptation to the environment, in addition to obtaining high production of eggs which allow the poultry farmers to develop a highly profitable business with a rapid return on investment.

The increase in demand in the Ecuadorian market for the consumption of quail eggs has allowed poultry farmers to expand their farms with the production of this species, innovating their facilities, carrying out research, and testing new diets that allow them to reach high production levels.

To elaborate diets for quails considering 20% of gross protein plus 0.19% of synthetic amino acids, since according to the results obtained, it is expected to obtain better productive and economic parameters through the use of this level.

Given the consumption of amino acids as free metabolites supplied in the diet, it is necessary to continue studies of metabolic valuation of amino acids in the final product for this animal species.

REFERENCES

Amarrilla, P., & Albornoz, M. (2013). *Guía para el coturnicultor. Todo lo necesario para la incubación de codorniz y para el avicultor*. 1ed. Buenos Aires: Dunken. p 85.

Begin J, & Insko W. (1994). *The effects of dietary protein level on the reproductive performance of coturnix breeder hens*. p. 142-143.

Castañón, M. (1994). *Estudio recapitulativo de la nutrición nitrogenada en las aves*. sn. st. México. DF, Edit. Limusa-Grupo Noriega. p 565.

Ciriaco, P., & Roncal, H. (2016). Efecto del uso de aditivos en dietas de codornices reproductores (Coturnix japonica*)* bajo condiciones de verano en la costa central. *Anales científicos 77*(1), 118–123.

Hurtado, N., Torres, D., & Ocampo, Á. (2013). Efecto de los niveles de proteína sobre el desempeño de codornices japonesas en fase de postura. *Orinoquia, 17*(1), 30–37.

Iqbal, M., Roohi, N., Akram, M., & Khan, O. (2015). Egg quality and egg geometry influenced by mannan-oligosaccharides (MOS), a prebiotic supplementation in four close bred flocks of Japanese quail breeders (Coturnix coturnix japonica). *Pakistan J Zool 47*: 641-648.

Labier, M., & Leclercq, B. (1992). *Nutrition et alimentation des volailles*. 20.

Melo, T., Ferreira, V., Oliveira, J., Carneiro, A., Moura, A., Silva, C., & Nery, V. (2008). Calidad del huevo de codornices utilizando harina de algas marinas y fosfato monoamónico. Revisado en: http://www.uco.es/organiza/servicios/publica/az/php/img/web/22_10_17_05CalidadMelo.pdf.

Moura, A., Soares, R., Fonseca, J., Vieira, R., & Nery, V. (2009). Efecto de diferentes niveles dietéticos de lisina total sobre la calidad del huevo de codornices japonesas (Coturnix japonica). Revisado en: http://www.bioline.org.br/pdf?la09010.

Obregón, R. (2012). Utilización de diferentes niveles de promotor de crecimiento natural hibotek en la cría, desarrollo y levante de codornices y su efecto hasta alcanzar el pico de producción. *Repositorio digital. ESPOCH. Ecuador*. pp. 66-69.

Oliveira, A., Furlan, A., Murakami, A., Moreira, I., Scapinello, C., & e Martins, E. (1999). Exigência nutricional de lisina para codornas japonesas (Coturnix coturnix japonica) em postura. *Rev. Bras. Zootecn*., 28: 1050-1053

Ortega, N. (2011). Determinación del efecto de diferentes temperaturas microambientales en las fases inicial, crecimiento, desarrollo y postura en codornices. *Repositorio digital. ESPOCH. Ecuador*. pp. 78,77.

Orellana, J. (2014). Información sobre el sector avícola del Ecuador. *XXXII Seminario Internacional Mercado Avícola*. Quevedo, Ecuador.

Özsoy, A., & Aktan, S. (2011). Estimation of genetic parameters for body weight and egg weight traits in Japanese quails. *Trends Anim Vet Sci J 2*: 17-20.

Panda, B., & Singh, R. (1990). Development in processing quail meat and eggs. *Worlds Poult Sci J 46*: 219- 234.

Portillo, J. (2005). Evaluación de la interacción genotipo-nivel de proteína en codorniz japonesa reproductora (Coturnix coturnix japonica) en trópico seco. *Repositorio Digital. Universidad de Colima.* México. p. 89.

Pitakpongjaroen, T., & Wiboonpongse, A. (2015). Optimal production systems in highland communities in Chiang Mai Province. *Italian Oral Surgery. Vol. 5*, pp. 22-29.

Ruiz, B. (2016). Repuntan pollo y huevo en la avicultura latinoamericana. *Industria avícola 63*: 10-38.

Salinas, M. (2015). Acondicionamiento de equipos existentes en la producción de codornices en la finca villa margarita maria. *International Journal of Soil Science, 10*(1), 1–14. https://doi.org/10.3923/ijss.2017.32.38

Shrivastav, A., & Panda, B. (1999). A review of quail nutrition research in India. *World's Poultry Science Journal, 55*:1, 73-81.

Syakalima, M., Simuunza, M., & Zulu V. (2017). Chicken diseases and their ethno-botanical treatments among the rural poor in southern Zambia, Africa en *Livestock Research for Rural Development. Vol. 29*, núm. 1.

Tapia, X. (2010). Evaluación económica de diferentes niveles de proteína bruta utilizados en la alimentación para codornices en producción. *Repositorio Digital. Universidad Nacional de Loja. Ecuador*. p. 63-64.

Tovar, J., Narváez, L., & Agudelo, L. (2015). Tipificación de la gallina criolla en los agroecosistemas campesinos de producción en la zona de influencia de la selva de Florencia (Caldas). *Luna Azul. 41*(41), 57-72.

Yamane, T, Ono, K, & Tanaka, T. (2007). Protein requirement of laying japanese quail. *British Poultry Science. 20*:4, 379-383, DOI: 10.1080/00071667908416596

Reception: **September 1, 2019** | Acceptance: **March 27, 2020**

CLINICAL AND EPIDEMIOLOGICAL CHARACTERISTICS OF PATIENTS HOSPITALIZED FOR INFLUENZA A (H1N1) IN TUXTLA GUTIÉRREZ; CHIAPAS, MEXICO

—

José Antonio Sánchez Lozano[1] • antonioslozano@gmail.com

Rosa Margarita Durán García[1] • rosa.duran@unicach.mx

María Georgina Rivas Bocanegra[1] • georgina.rivas@unicach.mx

Ángel Gutiérrez Zavala[1] • guzava@hotmail.com

Oscar Alfaro Macías[2] • oalfaro22@hotmail.com

1 Universidad de Ciencias y Artes de Chiapas, Mexico

2 Laboratorio Estatal de Salud Pública del Instituto de Salud del estado de Chiapas, Mexico

To quote this article:

Sánchez Lozano, J. A., Durán García, R. M., Rivas Bocanegra, M. G., Gutiérrez Zavala, Ángel, & Alfaro Macías, O. (2020). Características clínicas y epidemiológicas de los pacientes hospitalizados por influenza A (H1N1) en Tuxtla Gutiérrez; Chiapas, México. *ESPACIO I+D, INNOVACIÓN MÁS DESARROLLO, 9*(24). https://doi.org/10.31644/IMASD.24.2020.a04

— Abstract—

To evaluate the clinical and epidemiological characteristics of patients hospitalized for influenza A H1N1 in Tuxtla Gutiérrez, Chiapas, Mexico, a cross-sectional study and case series were conducted. It was found that a total of 6,120 samples of people suspected of being infected by the H1N1 influenza virus; 51.5% (3,151) were positive, with the highest percentage of cases in the City of Tuxtla Gutierrez. Of the 1,567 positive cases, (49.7%) were women. The average age of the population studied was 21.5 ± 4.5 years. The most affected group was 30 to 50 years (48.7%), followed by a group of 15 to 29 years (29.5%). Housewives and students (mother and children), were a vulnerable group to get sick; because they presented the highest cases (62%); regarding the risk classification, the most frequent concomitant pathology was diabetes mellitus for 11.5% (n = 9) followed by arterial hypertension with 8% (n = 6) and different respiratory diseases 10.2% (n = 8). Likewise, it was found that cough and general malaise were present in the majority of patients.

Keywords

Influenza A (H1N1), epidemiological characteristics, Chiapas.

Influenza is a newly emerging respiratory communicable disease in human populations, with a rapid increase in incidence and geographic spread. Such an emergency is possible when, over time, infection in animals crosses species barriers due to the transformation of the viral genome, infecting humans (Mc Closkey, Osman, Alimuddin & Heymann, 2014).

Of the four types of influenza viruses A, B, C, and D, types A and B cause seasonal epidemics each year, usually in the winter months; the other two usually cause no or very mild human infection (CDC, 2019). Type A viruses have different bird species as reservoirs and infect pigs, horses, and other mammals, as well as humans; they mutate continuously and rapidly and exhibit a high degree of pathogenicity and virulence (Kumar, Asha, Kahnna, Ronsard, Meseko, Sanikas, 2017). Type A viruses are the only ones that can trigger human influenza pandemics, being classified in subtypes from two surface proteins: hemagglutinin and neuraminidase, which give it its infectivity and pathogenicity capacity, being identified 18 subtypes of the first one and 11 of the second one, with multiple combinations, from which 131 have been detected in nature (CDC, 2019).

The A (H1N1) pdm09 virus by its scientific name, which emerged in the spring of 2009 and caused the pandemic, has since been in seasonal circulation around the world; with virtually minimal genetic changes in its antigenicity (CDC, 2010). Currently in circulation in human populations are types A (H1N1) pdm09 and A (H3N2), the latter with more rapid changes genetically and antigenic (CDC, 2019), which represented the majority of cases worldwide (PAHO, 2019). In Mexico since 2009 the same viral subtypes are predominant, for example, the virus A (H3N2) in the 2017-2018 influenza season, or the virus A (H1N1) pdm09 in the recent 2018-2019 season (Department of Health 2019, 5).

According to the WHO report, 18,500 deaths were confirmed by laboratories worldwide between April 2009 and August 2010. This figure would represent a small fraction of the deaths that most likely occurred associated with influenza since the total average estimate of deaths due to A (H1N1) pdm09 by country would have been in the range of 105,700 to 395,600; which by including deaths associated with cardiovascular or respiratory comorbidity would rise to 151,700 to 575,400; most in the young and mature adult population, in the range of 18 to 64 years. More than 51% of the deaths would have occurred in Africa and Southeast Asia; in America and the Western Pacific, the number of deaths associated with influenza A (H1N1) would be 6 times higher in indigenous than in non-indigenous populations. Overall, 0.001% to 0.007% of the world's population would have died during the first year of the virus' circulation between 2009 and 2010, rising to 0.001% to 0.011% when adding the comorbidity associated with influenza

deaths; less or similar to that recorded in other pandemics, except 1918 (Dawood, *et al*, 2012).

In Mexico, between April and May 2009, a preliminary analysis of influenza deaths was conducted by the Department of Health. The epidemic, which officially began in March in the center of the country, had a two-phase behavior in its morbidity curve due to its displacement towards the southeastern states, where Chiapas is located. Although the registration of laboratory-confirmed deaths began in April, it is possible that previously there were other unrecorded deaths, as it was not known that we were facing an epidemic. 79% of mortality was concentrated in those under 30 years of age. The average mortality rate was 1.1 cases per million inhabitants, however, the rate was higher than the average between the ages of 20 and 59, with 1.5 and 1.9 per million, respectively. The fatality rate was 2.2% in this period. Only 17% of the 122 cases studied received hospital care in the first 72 hours and up to 42% died within that time, meaning that the rest of the cases had a delay in the timing of care in addition to the quality of care at the beginning of the epidemic. 58% of the deceased had some comorbidity (Fajardo-Dolci, *et al*, 2009).

In Chiapas, the influenza epidemic began in fact at the end of June 2009 and in July the seriously ill were concentrated in the Hospital Regional de Tuxtla Gutiérrez, which to deal with the severity of the illness only had 6 intensive care beds and some intermediate care beds. No published information was found regarding the behavior of morbidity and mortality of the epidemic in the state, the existing one, refers precisely to the shortcomings and needs in facilities, equipment, and supplies as well as trained personnel and standardized procedures to deal with the situation, which the federation tried to remedy with the acquisition of equipment and training of local staff. Perhaps most serious was the apparent inadequacy of the organization of the health system by state authorities, who failed to assess the risk posed by the epidemic to the Chiapas population (Volkow *et al*, 2011).

The study presented below aims to fill an information gap, describing clinically and epidemiologically the behavior of the epidemic in the state of Chiapas in 2009, from cases hospitalized and confirmed by influenza A (H1N1) pdm09, in the Hospital Regional "Dr. Rafael Pascacio Gamboa" of the Institute of Health of Tuxtla Gutierrez, Chiapas.

MATERIAL AND METHOD

The population under study consisted of all patients, of any age and both sexes, who were admitted to the regional general hospital, in the city of Tuxtla Gutiérrez, Chiapas; with the confirmed diagnosis of influenza A

H1N1, through the reverse transcription-polymerase chain reaction (RT-PCR) test, from April 24, 2009, to September 21, 2009.

The type of study was a case series. The data were collected from the clinical files of hospitalized patients and the information was complemented with the case studies, for epidemiological notification, with a form from the Single Information System for Epidemiological Surveillance (SUIVE), where it was confirmed the accomplishment of the sample taking, with the method for the detection of virus A (H1N1).

The variables of interest were: sociodemographic, clinical and personal, pathological and non-pathological background, as well as aspects related to treatment. Once the information was collected, a database was created in the statistical program SPSS, version 18. A univariate descriptive analysis was then performed, followed by bivariate analysis.

The inclusion criteria were: to have been admitted to the Hospital General Regional de Tuxtla Gutiérrez, to have an epidemiological study of the case, and to have a confirmed diagnosis of influenza A (H1N1), using the RT-PCR test performed at the State Public Health Laboratory; and the exclusion criteria: to be an outpatient, to have another type of confirmatory test for the disease other than RT-PCR, patients who do not have a clinical record.

RESULTS

During the study period, 217 patients were hospitalized, of whom 89 (41%) tested positive for H1N1 influenza A through RT-PCR; of these 78 (87.6%) met the inclusion criteria. Table 1 shows that the group from 30 to 59 was the most affected, followed by the group from 15 to 19 years old.

Table 1
Frequency of illness according to age group among hospitalized patients in the study, in the state of Chiapas, Mexico; April 24 to September 21, 2009

Age group	N	%
14 years and less	1	16.
15 to 29 years	2	29.
30 to 59 years	3	48.
60 years and more	4	5.
Total	7	10

Source: clinical file from the Hospital General Regional "Dr. Rafael Pascacio Gamboa" of Tuxtla Gutierrez, Chiapas, Institute of Health

Women made up the majority of the hospitalized patients with 60.3%, (n=47), who were generally housewives. Those affected of reproductive

age represented 72.3% (n= 34) and six of them (12.8%) had an obstetric condition (four with pregnancy and two in postpartum period), the average age of the women was 21.5 years old.

Men constituted 39.7% of the patients (n= 31); the average age was 32 years (range 3 to 70), and their most important activities were as students, 12 (38.7%) and drivers, 5 (16%).

Of the entire series, it was noted that in those over 15 years of age, four (5%) were illiterate, eight (11.5%) had only primary education and 10 (12.8%) had secondary education; however, in 22 patients (28.2%) no schooling was recorded in the file.

Concerning their place of residence, 82% (n=64) belonged to the municipalities that make up the Health Jurisdiction (J.S) No. 1, whose seat is Tuxtla Gutiérrez, of which 46 (71.8%) were residents of the capital city. 15.4% (n=12) were referred from other jurisdictions. Finally, two patients (2.6%) were identified as tourists, coming from Coatzacoalcos (state of Veracruz) and Villahermosa (state of Tabasco).

Regarding the risk classification, 11.5% had diabetes mellitus, the most frequent concomitant pathology, followed by arterial hypertension with 8% (n=6) and different respiratory diseases 10.2% (n=8), among which asthma stood out with 5.1% (n=4); besides others such as pulmonary tuberculosis, COPD, chronic rhinitis, with one case each. When reviewing the non-pathological personal history, living with animals 28.3% and overcrowding 24.4% turned out to be the most frequent conditions.

As shown in table 2, 23 patients presented pathological risks representing 30% and nearly 63% non-pathological, while 27 patients had 3 or more risks.

Table 2

Distribution of patients according to type and number of risks

History	n	%
Of pathological risk	23	29.5
Of non-pathological risk	49	62.8
Patients with a maximum of two risks	26	33.3
Patients between 3 and 6 risks	23	29.5
Patients with 7 or more risks	4	5.0

Source: clinical file from the Hospital General Regional "Dr. Rafael Pascacio Gamboa" of Tuxtla Gutierrez, Chiapas, Institute of Health

The average time between the onset of symptoms and the time patients asked for medical attention was 3.7 days, ranging from 0 to 14 days. Of the inpatients, 47 (60.3%), were the same or below the average; the trend was

1 day in 25 patients (32%). The average number of days of hospitalization was four (range 1 to 24).

At the time of hospitalization, a clinical history was taken to identify the initial clinical picture, to gather the typical symptoms or a nosology diagnostic, and it was found that cough and general malaise were present in most patients (table 3).

Table 3
Percentage distribution of signs and symptoms of cases on admission

Signs and symptoms	n	%
Cough	71	91.0
Overall sickness	63	80.8
Dyspnea	48	61.5
Fever	43	55.0
Flue	27	34.6
Headache	24	30.8
Throat sore and pain	14	18.0
Chest pain	8	10.3
Cyanosis	5	6.4

Source: clinical file from the Hospital General Regional "Dr. Rafael Pascacio Gamboa" of Tuxtla Gutierrez, Chiapas, Institute of Health

The coughing had an average duration of 3.4 days (a one-day trend in 28 patients; range 1 to 14). The patients who had dyspnea were 48 (61.5%), with an average of 2.3 days. Finally, cyanosis was recorded in five patients (6%); all with one day of evolution.

According to the American College of Chest Physicians Society for Critical Care Medicine Consensus Conference criteria, 40 patients (51.3%) were classified as having systemic inflammation syndrome, of which 35 (87.5%) had at least one disease or history considered to be at risk; including four patients who had a history of chronic respiratory disease.

Excluding those who died; 10 patients (25%) had sepsis as the first cause of complications and five of them (12.5%), went with septic shock, which finally conditioned that two (5%) had acute renal failure. In this group of patients, the average increased to five days (range 0 to 14), to seek care, from the onset of symptoms.

The criterion for admission to the Intensive Care Unit (ICU) was respiratory failure. Of the 40 patients with systemic inflammation syndrome, 20 (50%) were admitted to the ICU, whose average age was 35 years (range 21 to 52). The average number of days at the ICU was 10 (range 6 to 19).

The average number of days these patients sought medical attention from the beginning of the illness was six (range 2 to 14). Of which nine patients (45%), were at or above this average.

For all hospitalized patients, the average number of days between symptom onset and swab sampling for RT-PCR was 4.3 days (range 1 to 15); 63% (n= 49) were equal or below this average; the trend was one day for 22 patients (28%).

Regarding the time of initiation of antiviral therapy, 33 patients (44%) received oseltamivir within the first 48 hours of symptom onset; no deaths were recorded during this period. The first death was recorded on the third day of the onset of symptoms. The average time from the appearance of signs to the beginning of antiviral treatment was 4.3 days (range, 0 to 16), and in 29 patients (38.7%), it began after this average. Then, there was the use of antimicrobials in 20 patients (25.6%).

The number of deaths was 15 patients (19.2%); 10 were women (66.7%), including one pregnant woman and one postpartum woman, as well as 5 men (33.3%). The average age of those who died was 35 (women 32 and men 41). The age range of these patients varied from 23 to 52 years.

Regarding schooling, 10 of the deceased had a basic education (66.7%). There were two with a college degree. One of the 4 illiterate people also died and in 2 cases no record was found. When analyzing the occupation, 9 women were housewives and one was a teacher. Of the men, three were dedicated to construction, one was an architect, and the other two were drivers.

Because of its geographical location: 11 patients (73.3%), belonged to the area of influence of the Health Jurisdiction (J.S.). No. 1 (Tuxtla Gutierrez), two cases from J.S. No. 2 (San Cristobal de las Casas), one case from the Health Jurisdiction. J.S. No. 8, (Tonala), and one of them was a tourist from Villahermosa, Tabasco. By municipality, five patients had their residence in Tuxtla Gutierrez, and three in Jiquipilas, Chiapas.

Regarding the pathological risk history, the most frequent was diabetes mellitus, with five cases (33.3%), followed by obesity with three cases (20%), and of the history of chronic respiratory diseases, asthma was the only one present with only one case.

Of the non-pathological risk background; the most frequent was exposure to animals in seven cases (46.7%), followed by exposure to wood smoke in four cases (26.7%), overcrowding and migration were present in three cases (20%). Alcoholism and smoking were only present in one case for both; however in 5 cases, for each background, no record was found. In summary, eleven patients had three risk factors and one patient had seven.

Coughing was characterized by being purulent and hemoptoic in half of the deceased, 49.9% (n=7). Dyspnea was also present in 14 patients (93%), classified as "severe or very severe" according to the "American Thoracic

Society", with an average of three days (range 1 to 5). With cyanosis, five patients (33.3%) were treated, all with one day of evolution.

The complications that led them to death were: sepsis in 14 of the cases (93.3%); 12 evolved to septic shock and acute renal failure (85.7%).

The average stay of the 15 deceased who were also admitted to the ICU was nine days (range 0 to 23). The average from the onset of symptoms to seeking medical attention was six days (range 3 to 14), and the average from the onset of symptoms to death was 16 days (range 4 to 26).

It is worth mentioning that the proportion of deaths was significantly higher in people who started treatment after the fourth day, 12 (80%) than in those who started it before, 3 (20%). The case fatality rate during the study period was 4.76/1000 confirmed cases of influenza A (H1N1).

DISCUSSION

In Mexico, the Department of Health reported to the WHO; between March and April 2009, the occurrence of three outbreaks: in the then Federal District and now Mexico City (854 cases of pneumonia, with 59 deaths), in San Luis Potosi (24 cases with three deaths), and Mexicali (four cases and no deaths). The state of Chiapas began to appear in the statistics until May 6, 2009, in a preliminary report by the Federal Department of Health, which published the first case of death (Department of Health 2009).

As of September 26, 2009 (the period included in this study), Chiapas already had 12% of the cases registered at a national level (INDRE; n= 3561); and as of October, there was a considerable decrease in the number of reported cases, with a difference by mid-July 2010 of only 157 positive cases in 10 months (INDRE; n=3718), which in statistics took the state from first place of confirmed cases to sixth (Salud México, 2010).

In the state, the most affected age group was from 5 to 29 years (65%), and the average age was close to 31 years; a similar result to those registered in Mexico City (López , Solís AM, López V, García Rivas D and Lozano JJ,2010) in the national statistics (Fajardo *et al*, 2009) and in other countries such as: Brazil (Duarte PAD 2009), Canada (Kumar A *et al*, 2009), Iran (Mehdi, G M *et al*, 2009), and China (The National Influenza A Pandemic (H1N1) 2009)

The age groups considered at risk for IRA (<5 and >65 years) had an overall rate of 5 and 1. 5 /10,000 respectively and the hospitalization rate was 4 /100,000; figures similar to those of other studies (Pan American Health Organization [PAHO], 2009), (Ayora, TG 1999), (Virus Investigation Team, 2009), (Libster *et al*, 2010), (Louie JK *et al*, 2009) (Telo Velosa CS, 2009) and (O'Riordan and Sean, 2009). It should be noted that the general strike rate, in the region of Tuxtla Gutierrez was 40/10,000 inhabitants, and the hospitalization rate was 4.5/100 infected.

Housewives and students (mother and child), were a vulnerable group to get sick, they presented the highest cases (62%). However, it is interesting that housewives, mostly, registered during July (n=14) with an average on July 4th; and with the data obtained the mother-student relationship was not found, since the group of students was registered mostly during June (n=19) with an average on June 7th. Also, no complete family groups were identified. This allows us to assume that the mechanism of transmission is the common one; from person to person; and that it followed a pattern similar to that proposed by Cauchemez S. and collaborators (2009); whose index states that transmission in homes where two people live is 29%, and in homes where six people live is 9%.

Concerning pathological and non-pathological clinical history, obesity and diabetes mellitus were the most significant concomitant diseases in the affected population Louie JK *et al* (2009), Jain S. *et al* (2009), Pérez Padilla *et al* (2010), although there is a very important bias since 25% of this data was not recorded in the file. Something important to note is that it does not agree with other studies that show up to 60% incidence of these diseases (Louie, JK *et al*, 2009) (Perez, Padilla, *et al*, 2010). However, it corresponds to the proportion of the population with diabetes (Mexican Diabetes Federation, 2010), (INSP, 2007), but not to people with hypertension (INSP, 2007), (Velázquez, Monroy O, *et al*, 2002) results similar to those presented by Singapore (Cutler, JL *et al*, 2010) which only identifies 13% of similar pathologies.

Likely, the population did not interpret the influenza A (H1N1) pandemic as implying a high risk of illness and death, since the time ranges for seeking medical care were very wide, which was especially observed in patients who died (Pérez R., de la Rosa D., Ponce de León S, 2009).

Cyanosis and dyspnea were the most significant clinical aspects on admission with the risk of death, this condition is manifested because 63% of the deceased had oximetry less than or equal to 75% of oxygen saturation.

The proportion of pregnant or postpartum patients who became ill, compared to the 2008 birth rate (153,738) according to INEGI data, was 0. 5 per 10,000 births; it is minimal to be considered a risk ratio for women with an obstetric condition and differs from other studies conducted in the United States, where the rate of pregnant women infected with the Influenza A (H1N1) virus is four times higher than the general population (Louie JK, Acosta M, Jamieson DJ, Honein MA, California Pandemic (H1N1) Working Group, 2010).

Considering the analysis of the average time between the beginning of the illness and the moment of requesting medical attention; a fundamental aspect in the difference between life and death, was the taking of the antiviral medication. It could be established that patients who took it after four days

had a higher risk of dying (Caffaratti, M and Briñón, M.C. 2004). This time had an average of almost 60% delay (average of 7 days, range of 3 to 18), concerning the group of those who did not die. The case fatality in the study period is similar to that expressed by the *Committee of the WHO consultation on clinical aspects of pandemic* (H1N1) 2009 influenza 2010.

Some limitations were observed in this study, especially in the primary sources. There were multiple changes in the reporting formats of the clinical record, leading to a deficiency in data management; this was most likely a consequence of not considering an epidemic in the State's epidemiological surveillance program, due to an apparent historical lack of seasonal influenza in the State; despite being a notifiable disease according to the regulations of the Subsecretaria de Prevención y Control de Enfermedades, and the Directorate of Epidemiology, based on NOM-017-SSA2-1994, for epidemiological surveillance of the Department of Health (Department of Health, 1999).

In 50% of the files, a complete medical history was not found, and to obtain socio-demographic and background data, it was necessary to resort to different medical and social work notes, among others. For the generalization of these findings, we must be cautious, since the cases in the study represent a small proportion of the reality of cases that occurred during the epidemic and that required hospitalization. The second limitation of the study is that it was a study of hospitalized cases, so the epidemiological characteristics cannot be estimated exactly, since it is not a study based on the general population.

Within the limitations of the study, we can point out that its findings cannot be generalized to a larger population, for the following reasons: the cases come from a single hospital, so many other cases may not be part of the study; it is not a community-based study, so the epidemiological measures obtained may have some bias; finally, the geographical dispersion of the infection was not taken into account, and could have an important impact on morbidity.

REFERENCES

Ayora -Talavera G. (1999) Influenza: Historia de una enfermedad. Mérida. *Revista Biomédica, 10*(1): 57-61.

Caffaratti, M y Briñón, M.C. (2004). *Oseltamivir y Zanamivir. Nuevos antivirales para el tratamiento de la gripe*. Córdova, España: Universidad Nacional de Córdova, 1-13.

CDC (2010). 2009 H1N1 Flu. Disponible en https://www.cdc.gov/h1n1flu/ (consultado el 24 de febrero del 2018).

CDC (2019). Influenza (gripe). Tipos de virus de influenza. Disponible en https://espanol.cdc.gov/enes/flu/about/viruses/types.htm (consultado el 13 de enero del 2020)

Caucheme S, Donnelly CA, Carrie R, Azra C G, Christophe F, Charlotte K, Lyn F, Neil MF. (2009). Household Transmission of 2009 Pandemic Influenza A (H1N1) Virus in the United States. *The New England journal of medicine, 361*(27): 2619-2627.

Committee of the WHO consultation on clinical aspects of pandemic (H1N1) 2009 influenza. (2010). Clinical aspects of pandemic 2009 influenza A (H1N1) virus infection. *New England Journal of Medicine, 362* (6): 1708-1719.

Cutter JL, Ang LW, Lay FY, Subramony H, Ma S, James L. (2010). Outbreak of Pandemic Influenza A (H1N1-2009) in Singapore, *Acad Med Singapore, 39* (4): 273-282.

Daewood Fatimah S, Luliano A Danielle, Reed Carrie, Metzer Martin I, Shay David K, Cheng Po-Yung, Bandaraneyake Don, Breiman Robert F, Brooks W Abdullah, Buchy Phillippe, Feikin Daniel R, Fowler Karen B, Gordon Aubree, Tran Hien Nguyen, Horby Peter, Huang Q Sue, Katz Mark A, Krishand Anand, Lal Renu, Montgomery Joel M, Melbak Kare, Pebody Richard, Presanis Ann M, Razuri Hugo, Steens Anneke, Tinoko Yeni O, Wallinga jacco, Yu Hongjie, Vong Sirenda, Bresse Joseph, Widdowson Marc Alain (2012). Estimated global mortality associated with the first 12 months of the 2009 pandemic influenza A H1N1 virus circulation: a modelling study. *The lancet* Vol. 12. Sept. 2012. Disponible en http://dx.doi.org/10.1016/S1473-3099(12)70121-4 (consultado el 21 de febrero del 2018)

Duarte PAD, Alisson V, Nazah CHMY, De Oliveira M, Tannous L, Duarte C.,... Réa.Neto A. (2009). Outcome of influenza A (H1N1) patients admitted to intensive care units in the Paraná state, Brazil. *Rev Bras Ter Intensiva. 21*(3): 231-236.

Fajardo Dolci German E, Hernández Torres Francisco, Santacruz Varela Javier, Rodríguez Suárez Javier, Lami Phillippe, Arboleya Casanova Heberto, Gutiérrez Vega Rafael, Lee Gabriel Manuell, Cordova Villalobos

José Angel (2009). Perfil epidemiológico de la mortalidad por influenza humana A (H1N1) en México. *Salud Pública de México. 51*, 361-371.

Federación Mexicana de Diabetes, A.C. (2010). *Diabetes en números.* Chiapas. Recuperado de http://www.fmdiabetes.org/v2/paginas/d_numeros.php.

Instituto Nacional de Salud Pública. (2007). *Encuesta Nacional de Salud y Nutrición 2006. Resultados por entidad federativa, Chiapas*. 61-71.

Jain, Seema, y otros. Hospitalized Patients with 2009 H1N1 Influenza in the United States, April–June 2009. *Atlanta*: *new england journal medicine, november 12,* 2009, Vol. 361; 20, págs. 1935-1944.

Kumar A, Zarychansky R, Pinto R, Cook DJ, Marshal J, Lacroix J.,...Canadian Critical Care Trials Group H1N1 Collaborative. (2009). Critically Ill Patients With 2009 Influenza A (H1N1) Infection in Canada. *Journal American Medical Association*. *302* (17): 1872-1879.

Libster R, Bugna J, Coviello S, Hijano DR, Dunaiewsky M, Reynoso N.,... Polack FP. (2010). Pediatric hospitalizations associated with 2009 pandemic influenza a (H1N1) in Argentina, *New England Journal of Medicine. 362* (1) 45-55.

López I, Solís AM, López V, García Rivas D y Lozano JJ. (2010). Perfil epidemiológico de la infección por el virus de la influenza A H1N1 en un hospital de concentración de la Secretaría de salud del Distrito Federal. *Medicina Interna de México. 26* (2): 123-129.

Louie JK, Acosta M, Winter K, Jean C, Gavali S, Schechter R.,...California Pandemic (H1N1) Working Group. (2009). Factors associated with death or hospitalization due to pandemic 2009 influenza A (H1N1) infection in California. *The Journal off the American Medical Association, 302* (17): 1896-1902.

Louie JK, Acosta M, Jamieson DJ, Honein MA, California Pandemic (H1N1) Working Group (2010). Severe 2009 H1N1 Influenza in Pregnant and Postpartum Women in California. *The New England journal of medicine. 362* (1): 27-35.

McCloskey Brian, Dar Osman, Zumla Alimuddin y Heymann David L (2014). Emerging infectious diseases and pandemial potential: status quo and reducing risk of global spread. Disponible en www.thelancet.com/infection. Vol.14. Disponible en http://dx.doi.org/10.1016/S1473-3099(14)70846-1 (consultado el 02 de febrero del 2018)

Mehdi Gooya M, Sorous M, Mokhtari-Azad T, Hagdoost A, Hemati P, Moghadami M.,...Lankarani K. (2009). Influenza A (H1N1) pandemic in Iran: Report of first confirmed cases from June to November 2009. *Center for Infectious Disease Control, Ministry of Health and Medical Education, Tehran, Islamic republic of Iran. Tehran*. 1-17.

OPS. Informe de la situación de influenza (2019). Actualización regional – SE 1, 2019. Disponible en https://www.paho.org/hq/index.

php?option=com_content&view=article&id=3352:influenza-situation-report&Itemid=2469&lang=es (consultado el 13 de enero del 2020).

Organización Panamericana de la Salud. (2009). *Casos de influenza por un nuevo subtipo: Actualización para las Américas*. 1-2, Boletín.

O'Riordan y Sean. (2009). Risk factors and outcomes among children admitted to hospital with pandemic H1N1 influenza. Toronto. *Canadian Medical Association Journal.10* (1503): 1-6. cmaj.091724.

Perez-Padilla, Rogelio; de la Rosa-Zamboni, Daniela; Ponce de Leon, Samuel (2009). *Pneumonia and Respiratory Failure from Swine-origin Influenza A (H1N1) in México*. [ed.] Instituto Nacional de Enfermedades Respiratorias. México: s.n., august 13, 2009, New England Journal Medicine, Vol. 361; 7, págs. 680-689.

Secretaría de Salud. NORMA OFICIAL MEXICANA NOM-017-SSA2-1994, PARA LA VIGILANCIA EPIDEMIOLÓGICA. México, México: Comité Consultivo Nacional, 19 de octubre de 1999.

Secretaría de Salud (2019). Generalidades de influenza y cierre preliminar de la temporada 2018-2019 (Segunda y última parte). Vigilancia epidemiológica semana 52, 2019. Boletín epidemiológico. Sistema Nacional de Vigilancia Epidemiológica. Sistema único de información.

Telo Velosa CS y Silva Marisela. (2009). Influenza humana a H1N1: pandemia esperada. *Boletín Venezolano de Infectología. 20*(1): 6-11.

The National Influenza A Pandemic (H1N1) 2009 Clinical Investigation Group of China. (2009). Clinical Features of the Initial Cases of 2009 Pandemic Influenza A (H1N1) Virus Infection in China. Beijing. *The new England journal of medicine. 361*(26): 2507-2517.

Velázquez O., Rosas M., Lara A., Pastelín G, Grupos ENSA 2000 y Attie F, Tapia R. (2002). Hipertensión arterial en México: resultados de la encuesta nacional de salud (ENSA) 2000. *Imbiomed. 3*(3): 771-785.

Virus investigation team. (2009). Emergence of a novel swine-origin Influenza A(H1N1) virus in humans. *New England Journal of medicine.* 360(25): 2605-2615.

Volkow Patricia, Bautista Edgar, De la Rosa Margarita, Manzano Graciela, Muñoz Torrico Marcela Veronica, Pérez Padilla Rogelio (2011). La respuesta de las unidades de terapia intensiva frente a la pandemia de influenza A (H1N1) 2009: la experiencia en Chiapas, México. *Salud Pública de México. 53*, 345-353.

World Health Organization. (2009). *WHO ad hoc scientific teleconference on the current influenza A (H1N1) situation*. 1-6.

Reception: **August 1, 2019** | Acceptance: **March 25, 2020**

A TECHNICAL STUDY OF RECYCLED EPS LIGHTWEIGHT CONCRETE PANELS USED IN ROOF SYSTEMS

—

Francisco Alberto Alonso Farrera
alfa@unach.mx

José Ernesto Castellanos Castellanos

Juan José Cruz Solis

Alexander López González

José Francisco Grajales Marín

Iveth Adriana Samayoa Aquino

Facultad de Ingeniería, Universidad Autónoma de Chiapas, Mexico

To quote this article:
Alonso Farrera, F. A., Castellanos Castellanos, J. E., Cruz Solis, J. J., López González, A., Grajales Marín, J. F., & Samayoa Aquino, I. A. (2020). Estudio técnico para el uso de paneles de concreto ligero de eps reciclado para sistemas de losa. *ESPACIO I+D, INNOVACIÓN MÁS DESARROLLO, 9*(24). https://doi.org/10.31644/IMASD.24.2020.a05

— Abstract—

This article presents a technical studio of a lightweight concrete panel prototype for the construction of a modular single-family home. The compressive and flexural strength of the panel is studied. Expanded polystyrene (EPS) recycled is used as a lightweight material. Compression, flexion, and load tests were carried out to determine the strength of the concrete and the panel. The results obtained show that this type of panel meets the minimum requirements for lightweight slab systems specified in the Mexican technical standards.

Keywords

Panels, EPS, Lightweight concrete.

Environmental problems occupy the international agenda, of those we can highlight water pollution and degradation of the ground; being the Expanded Polystyrene (EPS) one of the materials that contaminate the water and ground the most, this due to that they take place in great amounts for packaging of appliances, computer equipment, etc., causing the deterioration of the characteristics of these resources. EPS becomes a material with a highly usable potential, especially for the construction industry, which already covers a large area as a lightweight material for concrete slabs, thermal and acoustic insulation to mention just a few, however, there is no great field of action for it as a truly functional aggregate for structural concrete, which can support large loads, due to its poor mechanical properties, besides, there are even fewer studies that tell us how to use the waste produced by EPS (Lopez, 2013).

In Mexico, there is a type of housing called "Social Interest", which is consigned to groups of people with limited economic resources. These social interest housing units are built in series; they have an approximate area that varies from 30 to 80 square meters, with structural and architectural designs that are similar to each other, based on the minimum conditions of the building regulations in force in the area (Trujillo *et al*., 2010). However, there are prototypes of housing in marginalized areas that are designed to support slab systems based on sheets, wood, or clay tiles, which, over time, owners switch to reinforced concrete slabs, increasing the weight that such housing can support.

Different types of housing have been proposed, among which are the modular type. Jiménez (2012), describes that a modular house is built industrially, with the characteristic that most of its elements can be assembled and it only needs to be located in space for its correct organization. This type of housing can have one or several sections, being the lightened slabs one of the main slab systems used in this type of housing.

Since its inception, lightweight concrete has been obtained through various methodologies, including the use of lightweight foams or the total and partial replacement of conventional aggregates with low-density aggregates (Liu and Chen, 2014). It is clear that the use of EPS in construction is not new, however, the intention is to implement recycled EPS as a replacement for thick aggregate and thus provide greater lightness to the panels for load-bearing walls and slabs in homes and at the same time, reduce the waste that EPS produces. Several articles are describing how this has been attempted, with unsatisfactory results from a resistance point of view.

The objective of the project is to propose a lightweight concrete panel prototype with recycled aggregates that can be used as floor systems (slabs) that can replace the joist and vault system, with better performance in both compression and bending, for use in modular housing (Image 1).

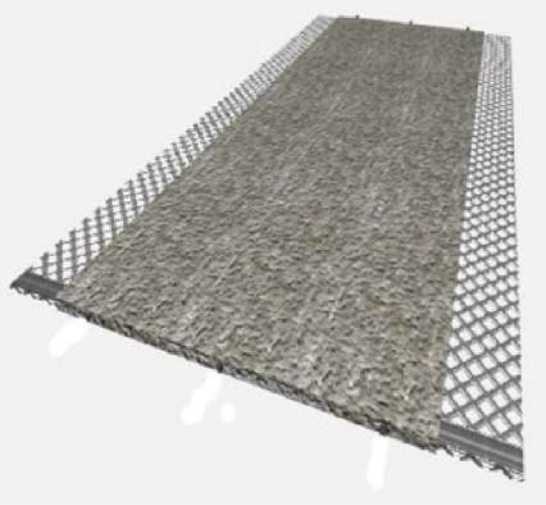


Image 1. Recycled panel prototype. Source: Own elaboration

BACKGROUND

In recent years, in the laboratory of Concrete Technology of the Faculty of Engineering of the Universidad Autónoma de Chiapas, studies have been developed regarding the use of EPS to be used as a light material in the production of mortars and concrete.

Ocaña and Zea (2016), present a study in which they propose the use of crushed EPS, in the shape of pearls, to be used as a lightening agent in lightweight concrete, proposing the use of lightweight concrete plates with dimensions of 122*60*8 cms, as modular elements for building houses. In this study, a block of lightweight concrete with a volumetric weight of 1,100 kg/m^3 was obtained, with very low compressive strength, as shown in Image 2

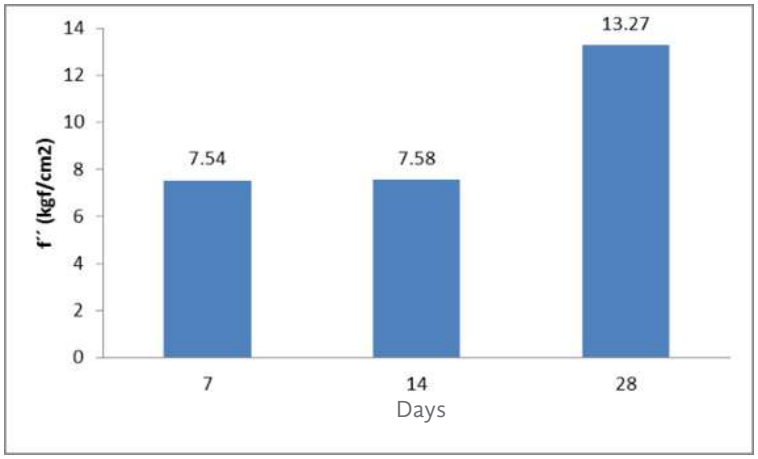


Image 2. Average resistance of the dosage used. Source: Ocaña and Zea (2016)

Romero and Laguna (2017) present a modification to the dosage and type of panels used by Ocaña and Zea (2016) that would allow a better assembly

between them and with better mechanical properties, which is shown in images 3, 4, and 5.

Image 3. Recycled concrete panel prototype of 110*60*5 cms, with a bump of 10*2 cms. Source: Romero and Laguna (2017)

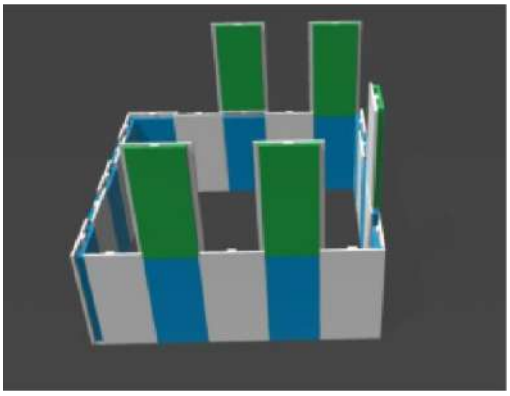


Image 4. Proposal for assembly in modular housing. Source: Romero and Laguna (2017)

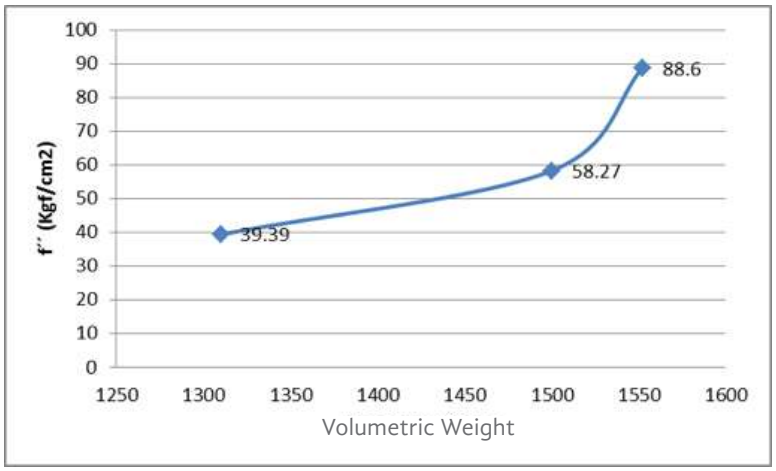


Image 5. The ratio of compressive strength to volumetric weight at 28 days of age. Source: Romero and Laguna (2017)

As can be seen, the dosage with a volumetric weight of 1,550 kg/m^3, gave the highest resistance to compression.

In Albores (2017), the study of light concrete specimens is shown to be used as vaults, with greater thicknesses than those used in the two previous studies, using the same dosages proposed by Romero and Laguna (2017), obtaining the same compressive strengths. The bending tests carried out on the 60*60*7 cm vaults are shown in Table 1.

Table 1
Average results obtained in bending tests

Specimen (60*60*7 cms)	Weight (kg)	Load (kgf)	Resistance (kgf/cm^2)
E1 without wire	66.80	899	15.29
E2 with wire	66.67	1183	20.15
E3 with wire	66.92	1293	21.99

Source: Albores (2017)

Therefore, this article presents the technical study to compression and flexion of a proposed light concrete plate measuring 110*60*4 cms reinforced with chicken wire, as shown in image 6, assembled as shown in image 7, to obtain a modular house according to the architectural project presented in image 8.

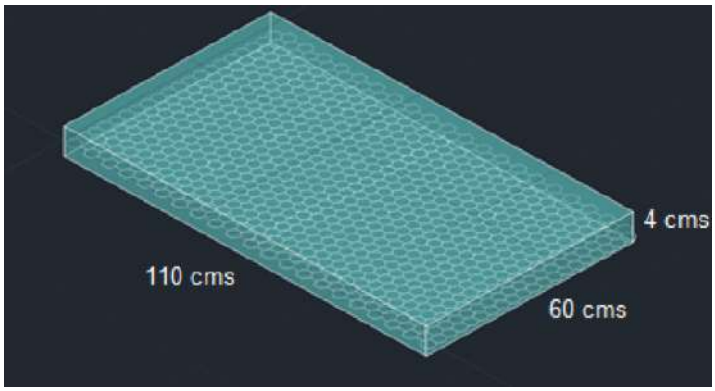


Image 6. Lightweight concrete plate prototype. Source: Own elaboration

Image 7. Panel assembly proposal . Source: Own elaboration

Image 8. Modular housing. Source: Own elaboration

TECHNICAL STUDY DEVELOPMENT

Below are the steps that were taken to achieve the specific objectives set out in this project:

- Collection of expanded polystyrene: EPS waste was collected.
- Selection: From the EPS waste collected, the specimens in the best condition and with the largest particle diameter were selected. Since there are characteristics that make one EPS different from another, i.e. the EPS produced from packaging has a larger particle

diameter than that of disposable containers, in addition to the different degree of compaction of the pieces and the cohesion of their particles; therefore, only the packaging product was chosen, since it is much easier to grind.

- Shredding: Once the EPS was selected, we proceeded to crush it by mechanical means, using the material that passed through the wire number 10 (2 mm).
- Lightweight concrete mix design: To carry out the dosages, a block of concrete with a resistance of 150 kgf/cm² was used as a base, under the IMCYC (2011), making the pertinent adjustments, such as replacing the thick aggregate with recycled EPS. The characterization of the sand properties was carried out (Table 2 and Image 9) according to what is established in the standards NMX-C-073-ONNCCE-2004, NMX-C-077-ONNCCE-1997, NMX-C-165-ONNCCE-2014, NMX-C-166-ONNCCE-2018, and the thick aggregate was replaced in volume by EPS.

Table 2

Characterization of the sand of the Banco de Río Santo Domingo

Thinness module	2.8
The sand rating according to the function of the thinness module	Thick sand
Absorption (%)	6.73
Density (kg/dm³)	2.97
Through wire no. 200 (%)	3
Loose-dry volumetric weight (kg/m³)	1,502
Compact dry volumetric weight (kg/m³)	1,646

Source: Own elaboration

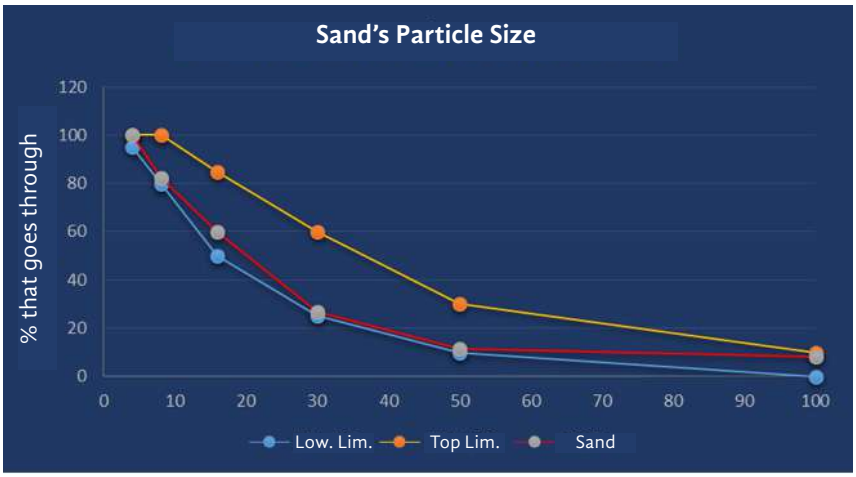


Image 9. Particle size curve of the Santo Domingo bank sand. Source: Own elaboration

- Elaboration and testing of compression and bending specimens: Cylindrical specimens were elaborated to carry out the compression test of each one of the specimens, as it is indicated in the standard NMX-C-159-ONNCCE-2016, which were tested at 7, 14, and 28 days respectively (Image 10), following the processes of the standard NMX-C- 109-ONNCCE-2013 and NMX-C-083 ONNCCE-2014. As well as the realization of beams to determine the resistance to the flexion of the concrete, using a simple beam with load in the thirds of the span, according to the established in the standard NMX-C-191-ONNCCE-2015 (Image 11). In both cases, two experimental campaigns were carried out, 10 compression tests and 3 bending tests per campaign.

Image 10. Uniaxial compression cylinder test. Source: Own elaboration

Image 11. Bending beam test. Source: Own elaboration

- Panel elaboration and testing: Lightweight panels with dimensions 110*60*4 cms reinforced with chicken wire (Image 12) were made and tested by applying cyclic loads, to know their bending performance (Image 13). Only one experimental campaign was conducted using 8 concrete panels and two different types of chicken wire (22 and 23 calibers).

Image 12. Panel elaboration. Source: Own elaboration

Image 13. Loading and unloading test. Source: Own elaboration

RESULTS ANALYSIS

Regarding the resistance to compression, the Student's t-test was performed, obtaining a mean of f'c=116.93 kgf/cm^2, with an s=6.6476 with a 95% CI confidence interval (113.708, 120.092), obtaining a statistic t=76.63 (Image 14). Also, a comparison study of more than two samples was carried out (one-way ANOVA) obtaining the results shown in Table 3 and Image15.

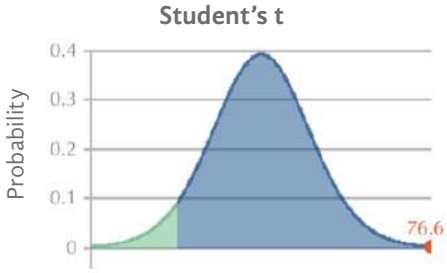


Image 14. Student's t-test result. Source: Own elaboration

Table 3

ANOVA RESULTS

Source of Variation	Ss	Df	Ms	F
Treatment	331.40	3.00	110.4667	3.19996
Error	552.40	16.00	34.5250	
Total	883.80	19.00		

Source: Own elaboration

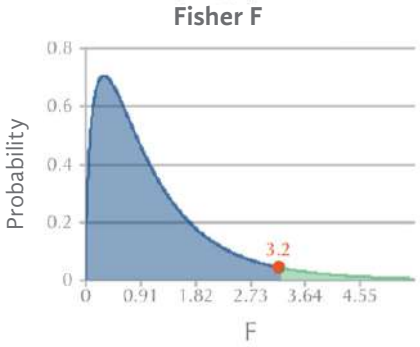


Image 15. Fisher F graphic results. Source: Own elaboration

Therefore, it is considered that a good resistance to compression was obtained, if we compare it with the volumetric weight obtained which was 1,650 Kg/m^3 with that of conventional concrete which is 2,200 kg/m^3; for a proposed mix design of conventional concrete of f'c=150 kgf/cm^2. Image 16 shows the results obtained at 7, 14, and 28 days.

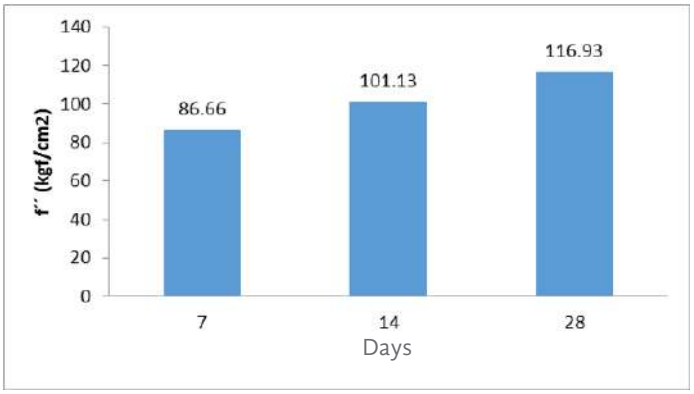


Image 16. Average compressive strength of lightweight concrete. Source: Own elaboration

Concerning the bending resistance, in Table 4 the average results obtained in each campaign of experimentation are shown, it is observed that the use of EPS with dimensions smaller than 2 mm, improves the adhesion of the concrete obtaining a better performance to flexion.

Table 4
Results of the bending test on lightweight plates

Beam (15*15*50 cms)	Weight (kg)	Load (kgf)	Resistance (kgf/cm²)
VC1	18.70	2,137	28.49
VC2	18.64	2,112	28.16

Source: Own elaboration

As for the tests on lightweight concrete panels, the average result obtained with live-loading and unloading cycles was 300 kg/m², which is higher than the 190 kg/m² established by the building regulations for mezzanine slab systems. Table 5 shows the average results obtained with the 22 caliber chicken wire and the 23 caliber chicken wire. In Images 17 and 18, the results of the deformation obtained in the panels are shown.

Table 5
Results obtained from the 3 loading and unloading cycles test

Sample	Length (cm)	Height (cm)	Width (cm)	Weight (kg)	Age (Days)	Deformation (mm)
Panel 22 Cal.	110	3.8	60	46.7	28	0.648
Panel 23 Cal.	109	4.0	60	42.5	28	0.456

Source: Own elaboration

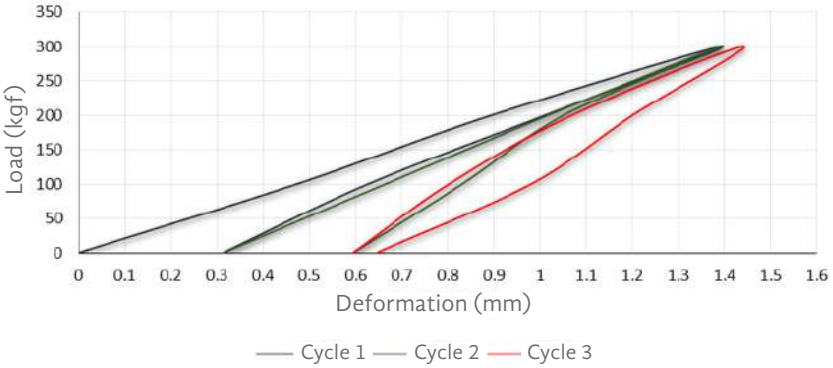


Image 17. Graph of the 3 loading and unloading cycles test in the panel with 22 caliber chicken wire. Source: Own elaboration

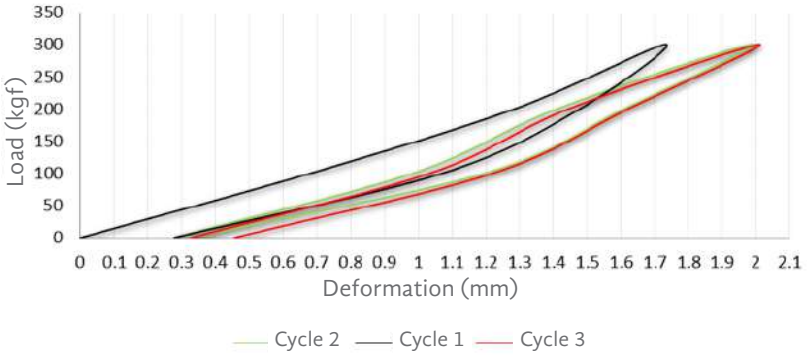


Image 18. Graph of the 3 loading and unloading cycles test in the panel with 23 caliber chicken wire. Source: Own elaboration

It can be seen that the deformations that occur in the panels are within what is stated as permissible deformations in the literature for reinforced concrete elements.

CONCLUSIONS

The results obtained in the tests carried out on cylindrical specimens, beams, and panels, show that the proposal of a panel made with EPS lightweight concrete, improves the performance of the panel in compression and bending, due to the use of EPS in smaller sizes than those used in previous projects, thus obtaining a lightweight concrete more homogeneous and with greater adhesion in its components.

By obtaining better performance in compression and bending, this panel can be proposed as a slab element for modular homes, guaranteeing its safety and durability. Compared to the joist and vault system, there are

economic savings by eliminating a joist due to the size of the panel, because the commercial vault is smaller, and also because of the use of recycled EPS.

The construction of modular homes using lightweight panels is an ecological solution because it uses one of the least recycled materials in Tuxtla Gutierrez, Chiapas, as well as being lightweight elements, reduce the load transmitted to the ground, decreasing the size of the foundation.

REFERENCES

Albores, L. (2017). *Estudio técnico del comportamiento mecánico de bovedillas de concreto ligero. Tesis profesional*. Universidad Autónoma de Chiapas. Diciembre 2017.

IMCYC (2011). *Posibilidades del concreto*. Construcción y Tecnología en Concreto, 13. Instituto Mexicano del Cemento y del Concreto.

Jiménez, G. (2012). *Viviendas prefabricadas modulares con el Sistema Steel Framing para el área metropolitana de la Ciudad de México*. México, D.F.: UNAM.

Liu N. y Chen, B. (2014). Experimental study of the influence of EPS particle size on the mechanical properties of EPS lightight concrete. Science Direct , 227 - 232.

López, M. (2013). E*valuación de los procesos de corrosión en concretos aligerados con EPS expuestos en medios simulados y reales. Evaluación de los procesos de corrosión en concretos aligerados con EPS expuestos en medios simulados y reales. Xalapa, Veracruz, Mexico*.

Ocaña, H. y Zea, F. (2016). *Aplicación del material poliestireno reciclado en la construcción de muros y losas. Tesis profesional*. Universidad Autónoma de Chiapas. Marzo 2016.

Romero, L. y Laguna, C. (2017). *Estudio técnico para la elaboración de paneles de concreto ligero a base de EPS reciclado como agregado grueso para viviendas modulares. Tesis profesional.* Universidad Autónoma de Chiapas. Agosto 2017.

Trujillo, A. Orduña y Licea, R. (2010). *Análisis experimental de un sistema constructivo innovador para vivienda económica en zonas sísmicas.*

CITED STANDARDS

NMX-C-073-ONNCCE-2004 Industria de la Construcción – Agregados – Masa Volumétrica – Método de Prueba.

NMX-C-077-ONNCCE-1997 Industria de la Construcción – Agregados para Concreto – Análisis Granulométrico – Método de Prueba.

NMX-C-083-ONNCCE-2014 Industria de la Construcción – Concreto – Determinación de la Resistencia a la Compresión de Especímenes – Método de Ensayo.

NMX-C-109-ONNCCE-2013 Industria de la Construcción – Concreto – Cabeceo de Especímenes Cilíndricos.

NMX-C-159-ONNCCE-2016 Industria de la Construcción – Concreto – Elaboración y Curado de Especímenes de Ensayo.

NMX-C-165-ONNCCE-2014 Industria de la Construcción – Agregados – Determinación de la Densidad Relativa y Absorción de Agua del Agregado Fino – Método de Prueba.

NMX-C-166-ONNCCE-2018 Industria de la Construcción – Agregados – Contenido de Agua por Secado – Método de Prueba.

NMX-C-191-ONNCCE-2015 Industria de la Construcción – Concreto – Determinación de la Resistencia a Flexión del Concreto Usando una Viga Simple con Carga en los Tercios del Claro.

Reception: **October 6, 2019** | Acceptance: **April 23, 2020**

CLASSROOM LIFE: IMPLICATIONS OF "LEARNING HOW TO LEARN" IN SECONDARY AND HIGHER EDUCATION

—

Florentino Silva Becerra
cienaga16m@hotmail.com

Martha Valadez Huizar
martha_vala@hotmail.com

Centro Universitario de Ciencias Sociales y Humanidades de la Universidad de Guadalajara, Mexico

To quote this article:

Silva Becerra, F., & Valadez Huizar, M. (2020). La vida en las aulas: implicaciones de "aprender a aprender" en la educación Secundaria y Superior. *ESPACIO I+D, INNOVACIÓN MÁS DESARROLLO, 9*(24). https://doi.org/10.31644/IMASD.24.2020.a06

— Abstract—

The transformation of teaching versus the transformation of knowledge where the circumstances of the changes in human nature are obstructed by the parallel change. To respond to this situation, innovation is imposed through creative participation for incorporation into the life of the 21st century. The great challenge will consist in the transformation of our thinking, which clings to the traditional framework, where relearning and unlearning permanently implies processes of current educational complexity. Faced with this scenario, educational institutions are in the intricate situation of making changes in their structure. What is the discrepancy between the institutional framework and the knowledge society framework? What are the situations that are involved in the teaching and learning process of students and teachers? Its objective is to show the distance between the current educational postulates -learning how to learn- and the situations that are lived in the teaching and learning process in secondary and higher education. The process of self-regulation to learn represents a desirable concept but not sustained by educational practice. Although what prevails are traditional practices and exclusive educational environments that deny access to educational change in teaching and learning, only the methodological experience will allow us to understand the process of learning how to learn.

Keywords

Learning how to learn, self-regulation, autonomy, globalization, complexity, and knowledge.

The report of the "International Commission on Education for the 21st Century", assisted by the United Nations Educational, Scientific and Cultural Organization (UNESCO), coordinated by Jaques Delors, talks about the transformation of teaching in the face of the most transcendent phenomenon of all these evolutions: the knowledge revolution, our current era. In this regard, Brunner and Tedesco (2003, p. 23) state that: "knowledge took 1,750 years to double for the first time, counting from its beginnings in the Christian era; then it doubled in volume every 150 years, then every 50 years. Now it does so after five years, and it is estimated that by the year 2020 it will double every 73 days." As can be seen, knowledge moves at an uncontrollable speed. As a consequence of this phenomenon, teaching and learning are subject to a pace of transformation that, due to circumstances that are typical of changes in human nature, it is almost impossible to generate a parallel state, so we live in a challenging world that, due to the unprecedented transformations generated by globalization, pours a complex world.

Delors (1996) comments about thinking and building our common future, in which education has the mission of allowing everyone, without exception, to make all their talents and all their capacities for creation bear fruit, which implies that everyone can take responsibility for themselves and carry out their project.

Globalization is a global phenomenon that has generated the knowledge revolution, the effects on our lives respond to innovation through creative participation for incorporation into the life of the 21st century. The great challenge would consist in the transformation of our thinking, which clings to the traditional framework, denying the possibility of generating an evolution that does not keep up with the increasing speed of change and the unpredictability that characterizes this world (Mayor, 1999).

In this respect, Morín (2000) proposes interdisciplinarity to transform our ways of thinking, which imply permanent relearning and unlearning, or what we conceptually know as learning how to learn. An educational vision that leads to the modification of our pedagogical practices, because it is in the classroom where our behaviors are manifested and the ways to respond to the current educational complexity are evident (Escotet, 1992).

Faced with this scenario, educational institutions find themselves in the intricate situation of making changes in their structure, which is difficult to do because it implies the transformation of administrative and academic management. This work aims to reflect on the discrepancy between what is asked of educational institutions, within the framework of the knowledge society, and some situations experienced by teachers and students in the daily life of teaching a class.

The purpose of this work is to show the distance between the current educational postulate, learning how to learn, which involves the develop-

ment of complex cognitive processes, and the situations experienced in the process of teaching and learning in basic and higher education. For the first level, a secondary school principal's experience is taken; one of the authors of this work, to expose that the difficulties of daily life in a classroom, such as the environment of violence, learning problems, emotional problems, etc., limit the teacher to achieve this educational purpose since he or she also does not have the necessary tools to face these situations.

With this same approach, we reach the topic in higher education, starting from the existence of this distance between the educational vision of learning how to learn, but here with pedagogical practices, so we expose some learning strategies that can contribute to developing cognitive processes that support the self-management of the student.

THEORETICAL PERSPECTIVE

Today, in the field of education, we speak of self-regulation, autonomy, and learning how to learn, as processes that allow people to continue learning throughout their lives. They are concepts that represent the provision of intellectual and social tools to access continuous learning, and as a consequence, a permanent education that is generated as a strategy to face the learning needs of the 21st century. But what do we understand by these concepts? What are they for?

The concept of self-regulation was introduced by Albert Bandura in 1971 when he addressed his theory of "social learning". According to Bandura (1991) among the determining variables of self-regulated learning are those that concern the being as an individual -such as motivation, previous knowledge or learning strategies- those referred to performance, or behavioral ones such as self-observation, self-evaluation, self-reaction, and contextual ones, which correspond to the environment where self-regulation or external feedback is produced.

Brown (1978, p 77) defines self-regulation as "the conscious reflection on one's knowledge during the learning process" and specifies that it is a process that has to do with the management of cognitive resources for the control of lasting and necessary learning throughout life, through planning, monitoring, and evaluation, strategies that the individual employs to solve problems (Sáiz & Montero, 2015; Veenman, 2011). In this self-regulatory process, the use of previous knowledge is necessary for the evaluation of self-learning, as well as the definition of learning goals established by the student, which lead him to a process of constant reflection on what he wants to achieve and in how much time.

Holec (1981) defines the process of self-regulation as the ability that an individual develops to take charge of the conduct of his learning, through the

acquisition of intellectual and social tools, which facilitate the management of his learning and the generation of a growing autonomy in his academic studies. The development of the self-regulation process, such as learning goals and the use of previous knowledge, incorporated into the cognitive structure of individuals, can remain throughout life (Moreno & Martinez, 2007, p. 52), adding also the awareness of socio-affective processes (Crispin, 2011).

Finally, Moreno and Martinez (2005), underline the pedagogical effort of the teacher, necessary to guide the student to solve concrete aspects of his learning during the revision of his planning, control, and evaluation of behaviors, which will lead him to the accomplishment of a task. This pedagogical support is necessary until the student shows personal progress in his emotional and cognitive autonomy, through the observation of his ability to decide for himself, guided by his interests and needs (Sepulveda, 2003), adding the context of his ability to work in a team (Martin, 2008).

The previous conceptualization shows that living in the 21st century, the priority is for individuals to be ready to learn under the present context and the changes that are taking place, to have the capacity to use basic, modifiable, and uniform knowledge to generate more. The phrase from Abraham Lincoln is important here, *I do not think much of a man who is not wiser today than he was yesterday*, a comment that exposes the need for the ability to adapt to live new situations that the world offers and constantly transform. A person who lends himself to living these changes is a person who has learned how to learn.

Of the enunciated characteristics, we can affirm that learning how to learn is a process, that is to say; a set of learning associations chained to the human being, that is developed in a time and a space that can be infinite, whose phases lead to a specific objective, same that shows the appropriation of knowledge and competences to unfold their potential throughout their life. Then, we would assume that to learn how to learn, the teacher's role is still important and requires training and/or pedagogical updating to acquire the commitment to build, develop, and use their skills in students who have the willingness and motivation to learn in varied contextual situations.

METHODOLOGY

The present work is built under the methodology of a detailed, selective, and critical study that integrates the essential information in a unitary and overall perspective (Icart & Canela, 1994). Its purpose is to examine the published literature and place it into perspective (Ramos *et al*, 2003). The review starts from questions that guided the data collection, which was analyzed, units of analysis were established, and conclusions were drawn. The objective was to carry out a descriptive review of the literature that

would allow us to identify key elements to provide answers to new questions, as well as to identify theoretical approaches. We chose documents containing formal aspects and reviewed them: a critical reading of documents, the stages of carrying out a bibliographic review, or the elaboration of mind maps or concept maps.

LEARNING HOW TO LEARN IN A SECONDARY SCHOOL

Following Delors (1996) in his emphasis on life-long education, which implies the formation of new citizens to face the transformations of today's life in a complex world, and that the contents of the subjects have to foster the desire to learn, we are interested in mentioning the experience of a secondary school principal with teachers and students, underlining the distance that prevails between the school environment and the requirements of current teaching and learning, centered on the concept of learning how to learn.

To begin with, one of the questions that arise is how can the teacher harmonize the progress of scientific and technological development with the curricula and the knowledge needs of the students? They require several skills, such as the mastery of information and communication technologies, as well as research. In this regard, Tedesco (2011) points to the need to develop the learning how to learn competence of the teacher as a guide to learners, also their adaptation to changing attitudes and roles, and presents some questions, how to transform oneself to teach in this changing world? How to understand the culture of the 21st century? How to undertake this path?

UNESCO, through the complex thought of Edgar Morin (1999) expresses the challenge of the education of the future, learning how to learn from teachers and students, pointing out that both face a paradigm where new methods and problems are defined, generated by the diverse ways of life, which contradict the traditional approach of teaching and learning spaces. The need to transform teaching practices has generated a crisis for teachers, some because they do not have the necessary tools to face these paradigm changes and others because they resist such changes.

As a response to this vision of learning, the Mexican Educational System, guided by the philosophical thought expressed in Article 3, establishes that education is a right of Mexicans that should tend to the harmonious development of human beings; a humanist perspective that has the purpose of promoting the knowledge, skills, and competencies that children and adolescents need to reach their full realization (SEP, 2016: 39). But where does the concept of learning how to learn fit in so that the teacher acquires this new skill?

On the other hand, in basic education, the 2011 plan is presented as a design by competences, pointing out the development of these competences for life, that is to say, competences for lifelong learning, which is nothing

else than the satisfaction of current needs, as well as the way to face permanent risks of error and illusion. This framework contemplates the reading ability, the writing ability, the mastery of more than one language, as well as digital skills, pointing out the competence of learning how to learn.

Learning how to learn appears here as one more tool, of the same magnitude as digital skills or reading and writing, necessary tools to continue learning and with it the presence of lifelong learning. Then the category of learning how to learn is not seen as a different space containing its elements but joins the range of strategies to achieve this goal. So what does it mean to learn how to learn?

The basic education plan (2016, p. 39) proposes that the role of the school "is no longer to teach children and young people what they do not know, but what they need to learn how to learn." That is, a place eminently focused on learning strategies, on how to learn the content and not on the content itself. It repeatedly states that in addition to reading comprehension and written expression, it adds understanding of the natural and social world, analytical and critical reasoning, as well as creativity. Knowledge and skills are emphasized as fundamental for learning how to learn (SEP, 2016, p.40).

This plan brings as a consequence the transformation of teaching and learning and implies the construction of diverse methodologies that support the process of training, reconstruction, and updating the teacher's educational and pedagogical practice. This has not been possible, rather there is confusion and confrontation among teachers because of the lack of clarity on how to put into educational practice the educational concept of learning how to learn.

We know that today's school is no longer the only place to learn, due, among other things, to the infinite sources of information, a fact that forces the teacher to rethink education and his or her educational practice. The need for the creation of support spaces for teachers to guide them in the process of learning how to learn is fundamental. They cannot be asked to teach a process that they have not experienced themselves. In addition to this need, the teacher requires tools to deal with the context of violence inside and outside the school. Also, to know how to manage diversity, inclusion, and equity-like so many other problems you face in a classroom environment.

A FEW ISSUES IN CLASSROOM LIFE

Diversity, inclusion, and equity

A school that had the task of transmitting knowledge to a restricted population, under the principle that everyone should learn the same thing and at the same pace, now becomes a school that works with diversity, inclusion, and with equity, which transforms the way of teaching and learning. Added

to this understanding of new thinking is the influence of emotions on the process of teaching performance, where we know that they leave a lasting imprint, positive or negative, on learning achievements. So the function of the school would have to be transformed to generate spaces where to learn the appropriate methodologies. Here the teacher is included emotionally, as well as the students, to learn to think hand in hand with personal motivations. Likewise, to value what is learned together with others, the interest and motivation to learn throughout life must be fostered (Delors, 1996).

Today we talk about the methodological problem, which includes factors such as diversity, inclusion, and equity, this is a call of attention to say that the context of the classroom today acquires different connotations that involve teaching. Discourses on diversity have highlighted that difference is a value, pointing out that one does not work with special students, but with different people, therefore the school is a space of differences because in the current school students from different contexts and conditions converge to form a plural community. Particularly in secondary education, which has received this new modality of work called "working with the difference". If the students are different and the teachers are different, how can this interaction between learning and teaching be amalgamated?

The traditional school worked in one way: to learn the same thing and at the same pace, for equals, today it is understood that improving learning has to do with inclusion, to address the difference. Besides, it is also intended to set aside the memorism that tradition shaped into a methodology of learning and teaching, as a basic strategy in pedagogical practice. Now, the question is how to transform it or turn it into a useful tool for self-learning?

The fundamental premise that society is made up of diversity, where now the scope of learning is a universal right, regardless of individual characteristics, so the concept of educational inclusion has evolved in recent years, as it is often associated with students living in situations of poverty or who have special needs. Currently, a consensus has been reached among Latin American countries, expanding the concept to achieve greater access to education, in search of quality education without any discrimination, considering students with disabilities, indigenous populations, rural populations, migrants, or students who have dropped out of school.

Making a classroom inclusive has been a challenge for teachers and managers, because the differences permeate the context, the most intelligent students, students who fall behind, the passing students, the failing students; the teacher's decision on the conduct of the group, among other aspects that fall within the context of teaching practice. Regardless of emotional or cognitive development, teachers are involved in a transition from a model, in which their role was at the center of decisions, to a participatory one, in which the teacher has become the mediator of the teaching and learning

process. The topic of discussion here is whether the learning processes are enriched by this model, or whether teachers have the strategies and tools to support the development of inclusive education.

What we do know is that, on the issue of inclusion and equity, teachers are involved in the confusion generated by the transition that is taking place, primarily they are asked to evaluate students according to their performance, where no methodology allows the inclusion of all students in classroom work, because a homogeneous offer of opportunities becomes in inequality in learning. For this reason, it is understood that an equitable offer is necessary to take advantage of the richness of diversity and to transcend to a redistribution, restructuring, and change of the educational offer, but how to do it? There is no clarity about the theoretical and/or methodological support that can be provided to the teacher to accurately address this educational purpose.

As a strategy to intervene in the change in schools, the collegiate work of teachers and directors comes up, organized in the School Technical Council (CTE), a collegiate body, with a greater decision, in the technical and pedagogical environment of each school of Basic Education. It is in charge of making and executing decisions focused on reaching the maximum achievement of the students' learning. The seventh collegiate meeting, of a total of eight in the school year, was called "an inclusive school knows its students". Following this guide for collegial work, members discussed the diversity of students in their groups, asking themselves about progress in inclusion with equity in the school.

In the search for teachers to get involved in this new way of approaching learning, they presented three students from each of the groups that are at risk of not achieving the expected learning or in a situation of exclusion, to generate ways of addressing diversity from collegial participation. In this meeting, they built the strategies to address learning problems related to emotions, also for complications that students have in each subject, such as willingness to learn, or even problems of understanding the subject.

In these meetings it is reiterated that the problem of these students exceeds the capacity of attention, for example, there are children with visual impairment and the problem is not addressed, or most commonly, family emotional situations that affect their school performance, where the teacher does not have the tools to support them. In addition to the above, the teacher faces problems in which his or her actions come up against the culture of the students generated in this world of transformations, the teachers' culture and the contrast of the new educational culture, where failure and desertion in the model of inclusive education mean labeling, discrimination, and exclusion. It is now difficult to distinguish whether the failure is due to the lack of knowledge expected for a certain grade or to discriminatory causes.

Violence and delinquency

The external contexts of the school are influenced by vandalism, where violence takes place. Faced with this situation, the teacher coexists with aggressive environments, without finding the right answer to these situations, which become contexts of school culture, as well as the limitations to respond to the effects of these actions, which make a complex field. The characters with delinquent characteristics, become models of the students' lives, diminishing the motivation towards the teaching and learning process. They encourage the actions of the students with their social position and power, justified by this context of life: not bringing the materials to work, making it difficult to lead the group due to their actions; they need to mediate with the leaders to achieve the work in the classrooms.

This type of situation is only one of some that the teacher has to overcome, where even living these circumstances, the lack of commitment for the fulfillment of the learning objectives is pointed out. In the face of this diversity of situations, it is worth asking how educational models analyze school contexts to develop their work methodology.

Faced with the context of the problem of inclusion and violence, the task of learning how to learn is left to the teacher, with the necessary competencies to face these scenarios, in addition to fulfilling the educational purpose established in Article 3 of the Constitution, which refers to the harmonious development of all the faculties of the human being. Also, be prepared for the changes in the knowledge society, which requires you to acquire a greater ability to interpret the phenomena, creativity, and information management in changing environments.

The school is no longer the only place to learn, the infinite sources of information evoke circumstances that force a rethinking of compulsory education, where the development of critical thinking, analysis, logical reasoning, and argumentation, is only part of learning that facilitates the resolution of problems throughout life. While the other part is human development and socio-affective management, which are fundamental aspects of understanding and facing the changes that impact human beings emotionally and cognitively. The teacher faces a complex problem, represented by a group of individuals - the students - who synthesize the advance of the cultural change of the knowledge society, which progresses much faster than the educational culture of its context, its tools, and its pedagogical knowledge.

LEARNING HOW TO LEARN IN HIGHER SCHOOL

In the context of higher education and particularly in research training, the concept of learning how to learn has connotations such as the development

of complex cognitive processes and flexible thinking, creativity, innovation, self-regulation, aimed at the self-management development of the student, an idea increasingly reinforced in educational approaches that aim to review the present and future learning needs of university students. The question is, if in educational programs teachers have the academic structure to develop these processes or if it is assumed that students have already learned to be self-managing and it is not part of their teaching function.

This educational conception would imply sowing, first in the teachers, the conception of the meaning of continuous learning for the development of creativity and innovation, which are objectives for the development of research skills. In any educational modality, the teacher is the one who guides, in some way, the student's learning, hence the need to restructure their thought patterns, for the teaching of a class, tutoring, and directing a thesis.

Particularly in research training, the need is mentioned for a configuration of capacities to face problems of high complexity and uncertainty, even with sufficient cognitive preparation for the generation of innovative insights that make possible the discovery of alternative paths for the understanding of those problems that have a structure that is difficult to define (Abreu & De la Cruz, 2015). It is an advance to start discussing this profile of students that is related to the development of creativity, experts in research training confirm this (Moreno, 2013). The problem is that understanding conceptual meaning is not enough to know what cognitive and pedagogical tools are necessary to prepare students to face uncertainty and, above all, to lead them to insight.

While these processes are important in graduate studies, in research training they become more relevant to facilitate cognitive openness in posing research problems relevant to social needs. The development of flexibility of thought, creativity, complex thinking, and tolerance to uncertainty, represent complex processes of understanding in themselves. Both for knowledge of appropriate pedagogical practices for students and educational and research goals.

There is little research on pedagogical tools that can guide students towards the appropriation of cognitive tools for the understanding of personal learning. In this respect, it seems that too much emphasis has been placed on the need to solve complex problems and less attention has been paid to the cognitive difficulties that can prevent both teachers and students from perceiving and facing such complexity.

The teacher's review of these difficulties implies, among many other tasks, the recapitulation of his/her educational practice, the recovery and restructuring of his/her experience and knowledge to integrate them into his/her learning, to face the problems that today's society demands outside and within the school context. The educational or pedagogical practices that are complemented with technological resources to interact with students in

knowledge management must also be rethought. It is in this complex situation where questions arise in higher education, among them, the reinvention of the concept of learning itself as a continuous process, the creation of cognitive tools that require teachers and students to understand and cope with a complex reality, as well as what technological proposals, for the development of creativity.

As it is known, most of the university and postgraduate teachers do not have pedagogical training, their educational practice is a product of the experience and models learned during their professional training. Therefore, just as in basic education, there may be confusion in some concepts involving learning how to learn at this educational level, such as regulation and self-management of learning, tolerance of ambiguity, the meaning of an insight, etc., as well as in the pedagogical practices that may favor these processes.

In the case of training for research, the pedagogical practices, in many cases, are not oriented towards this purpose, but to the traditional curricular contents, of little interest for the students, abundant loads of readings in the seminars that, although they have formative intentions for research, are not always fulfilled. To address this situation, it is suggested to improve the quality of instruction, which involves the organization of learning experiences to live, outside and inside the classroom (Moreno, 2006). The perspective of the thesis direction should also be oriented as a pedagogical practice for the assessment of effective strategies for research learning (Fernández & Wainerman, 2013). There is insufficient research on pedagogical strategies to develop in the student cognitive tools that favor continuous learning. As an example of some of them, we will present three proposals to develop some cognitive processes related to learning how to learn; the first one, deals with the benefit of knowing how to elaborate inquiring questions, the second one exposes the reflexive implication of concept mapping and the third one describes the importance of learning goals.

Knowing how to elaborate inquiring questions

A recurring theme in proposals for the training of university students and, above all, in the training of researchers, is that students should have the tools to face the complexity of current problems. These cognitive tools should be conceived as a posture to educational problems, to develop creativity and self-management, as well as to use information in an educational way (Organist, Serrano, MacAnally & Lavigne, 2013). However, there is the question of whether educational contexts provide them with such tools, such as learning to question reality. Is it possible to face complexity

without questioning? Elaborating questions represents a cognitive exercise for the understanding of oneself, of others, and the social context.

To develop creativity it is necessary to encourage curiosity in the students, and for that, it is necessary to teach them to ask themselves about their interests, motivations, and academic problems. An example of the pedagogical value of the question in the classroom to develop the investigative observation of reality is presented by Plata (2011) as an option in the training of university students to contribute to education for uncertainty. Based on the ideas of Gadamer and Freire, it talks about the benefits of using the question as a tool for students to learn to think for themselves, serve as a guide to introduce them to knowledge by recognizing their interests and formulate explanatory hypotheses from their own experience. Returning to Gadamer (1999), he states that the basis of the desire to know "presupposes a knowledge that is not known, the determination not to know being what gives that first sense of openness to the question; that is why all knowledge must first pass through the question" (p.148). In this research experience, it is shown that the importance of asking questions is unknown by the students, even, it is not appreciated as a task linked to the research work, nor for their professional activity. The answer that we present, from one of the participants, gives us evidence to reflect about how in the teaching work we can give answers without questions or digested knowledge without relating them to the personal interests of the students. Organista (*et al*, 2013) when asked about what they thought, they answer "we get used to the fact that they give us everything so we don't know how to react with questions, communicate with questions to develop more interests and more knowledge. So the investigative spirit is cut off".

This expression about "everything is given to us" can not only refer to teachers but to the information, they obtain through different technological devices, which are accessible to most students, which, however, it has been observed that they are not used as a tool for a personal educational benefit (Plata, 2011, p. 18). Inquiry questions can also be generated by the student himself during the teacher's classroom presentation. It has been observed in research on the usefulness of notes and annotations for learning, students who apply summary strategies and also, self-interrogation strategies improve understanding as well as recall of information (Espino & Miras, 2013).

We consider the practice of asking questions in-class notes, has been a vivid pedagogical experience. Recently, in a graduate course, students were asked to submit a handwritten report on the suggested readings; they were not asked for a summary, but personal reflections on the readings. Two of them deliver their report and add personal questions, related the doubts with the positions of the revised theories, and also linked to their thesis research topic. Questions that are taken as part of the topics to be discussed

in class, to cover the empty learning spaces not only of this student but also of the others. In this way, the questions served as the binding link from the previous class to the present one.

Reflective involvement of concept maps

In higher education, the need to update teachers to review their pedagogical practice in the development of materials and tools, appropriate to their style and subjects to be taught, is relevant. With the technological development, several alternatives have been offered to the teacher, the incorporation of games as a learning strategy, multimedia educational materials, training from the platform, etc., Moodle (Díaz, Villalobos González-Pienda & Nuñez, 2017). In this last research, the authors highlight the role of the teacher, both in virtual and face-to-face learning, mentioning that the teacher represents a reference to support students in an important aspect for the development of student autonomy by making the student see the capabilities that he or she does not perceive of himself or herself.

From this idea, research exploring the training of pedagogical skills in teacher education is relevant because it can be incorporated previously into their professional practice. Also, such training can reveal their abilities and disabilities, which position them in experiencing the learning process as a student lives it. Reyes and Ramos (2018) present research with teachers of the seventh semester of the major in pedagogy, which aims to observe the benefit of developing concept maps to be used as a tool for learning and also as a strategy that enables a metacognitive process.

The authors show how by elaborating concept maps on the notions of didactics, mathematics, and class design, as well as the reasons they had for doing them that way, a progression takes place, both in learning and in the treatment of conceptual elaboration. The difficulty of the participants to elaborate the concept maps is highlighted; during the process of the realization of the task, they are discovering the cognitive and emotional problems that imply the restructuring of their thought, the selection of the knowledge, the organization of ideas, and the hierarchy of concepts. The reflective process is constant, so at the same time that the induction towards metacognition is observed, the progression of the professor's thought is emphasized, evolving in the sense of recognizing his problems to synthesize his knowledge, order it conceptually, etc.

The relevance of this research is the reflective involvement of the teacher, through the learning of a tool that facilitates the development of their thinking, breaking fixed structures of how to present knowledge. Also, this process, which leads to metacognition, experiences the process of learning that you can later transfer with your students.

Learning goals and formative evaluation

The design of learning goals, centered on the development of competence and mastery of the task, represents one of the components of the process of self-regulation of learning and has been addressed in current research, both in its theoretical postulates and pedagogical interventions (Valle, Rodríguez, Núñez, González-Pienda & Rosario, 2007). Goal setting is a complex activity, which involves a cognitive reordering to prioritize interests and to recognize the motivations that lead to their realization. Since Sternberg's theory of thinking styles (1999), this cognitive activity is represented in hierarchical thinking, manifested in the planning of their mental processes, according to their personal goals, academic or non-academic, it is also a thought that enhances the development of creativity.

Some empirical works have shown that hierarchical thinking contributes to the development of metacognitive consciousness (Valadez & Moreno, 2017). In this regard, a pedagogical intervention is carried out with graduate students, to observe if the recognition of their thinking style can be a metacognitive tool that facilitates the detection of problems in their thesis research progress. The results show that the scarce development of hierarchical thinking negatively affects the decision of the research topic (Valadez, 2016). Taking into account these results, it is proposed that the recognition of thinking styles can initiate a self-management process in students, particularly, the development of hierarchical thinking, which can exercise the definition of goals oriented to personal interests.

The relationship between learning goals and assessment focuses on considering a formative assessment process in the sense that assessment becomes an opportunity to support learning by promoting self-regulation. This type of assessment encourages students to decide their own learning goals, taking into account their context and needs, including their style of thinking, to enjoy their learning. Thus, evaluation is a recapitulation on the fulfillment of that goal, an activity that also favors the metacognition and error recognition as part of their learning (Alvarez, 2008).

CONCLUSIONS

As mentioned throughout this work, the concept of learning represents a desirable concept, unsupported by educational practice. Although basic and higher education has different referents, what prevails in both are traditional practices and educational environments that do not favor a change in the perception of teaching. The social complexity, shown in students in the basic education classrooms, has surpassed the teacher and the school structure. Educational research that includes context is required to know the charac-

teristics of the school and to provide alternatives and pedagogical support to teachers to initiate a change in the perception of learning.

It would be desirable that teachers, both at the basic and higher levels, experience a change in thinking to learn how to learn. If this does not happen, it is difficult for them to transfer it to their students, and the distance between the concept and the pedagogical practice will be present, especially in higher education, and postgraduate courses, which aim at the self-management development of students for innovation and creativity, which require changes in educational practice.

The pedagogical proposals presented show the importance of the pedagogical design of a class to teach thinking; also that the activity of reading is not enough for its comprehension, even in abundant quantities. It is necessary to use strategies, such as scaffolding, for students to build their learning and develop their cognitive tools.

Learning how to learn implies effort, disposition, and interest of the teacher and the student, for the permanent reflexive activity, not only on the knowledge but on oneself and the relationship with others. It is a task and research topic to know the distance between this concept and the daily life of the educational and personal environment.

REFERENCES

Alvarez, I. M (2008). Evaluar para contribuir a la autorregulación del aprendizaje. *Electronic Journal of Research in Educational Psychology 7*(3), 1696-2095.

Abreu, L. F., y De la Cruz, G. (2015). Crisis en la calidad del posgrado ¿Evaluación de la obviedad, o evaluación de procesos para impulsar la innovación en la sociedad del conocimiento? *Perfiles educativos, 37*(147), 162-182.

Bandura, A. (1971). Analysis of modeling processes. In A. Bandura (Ed.), *Psychological modeling*: Conflicting theories. Chicago: Aldine-Atherton.

Brown, A. L. (1978). Knowing when, where, and how to remember: A problem of metacognition. En R. Glaser (Ed.), *Advances in Instructional Psychology* (Vol.1, pp.77-165). New York: Halsted Press.

Brunner, J. (1998). *Globalización Cultural y Posmodernidad. Chile*: FCE.

Brunner, J. y Tedesco, C. (2003). *Las nuevas tecnologías y el futuro de la educación*. Buenos Aires. IIPE UNESCO.

Crispín, B. (2011).*Aprendizaje autónomo: orientaciones para la docencia*. México: Universidad Iberoamericana.

Departamento de Educación del Gobierno Vasco. (2012). *Competencia para Aprender a Aprender.* Recuperado desde: http://ediagnostikoak.net/edweb/ cas/materiales-informativos/ ED_marko_teorikoak/ Aprender_a_ aprender.pdf

Delors, J. (1996). *La educación encierra un tesoro*. París: Santillana-UNESCO.

Diaz, A., Villalobos, M.V., González-Pienda, J.A. y Nuñez (2017). Impacto de un entrenamiento en aprendizaje autorregulado en estudiantes universitarios. *Perfiles educativos, 39*(157), 87-104.

Escotet, M. (1992). *Aprender para el futuro*. Madrid: Alianza

Espino, S., Y Miras, M. (2013). El proceso de anotación y uso posterior de los apuntes para el aprendizaje. *Revista Mexicana de Investigación Educativa, 18*(159), 1257-1280.

Fernández, L. y Wainerman, C. (2013).La dirección de tesis de posgrado: ¿una práctica pedagógica? *Perfiles educativos, 37*(148), 156-171.

Ferrater- Mora, J. (2009). *Diccionario de filosofía*. Barcelona: Editorial Ariel.

Gadamer, Hans-Georg (1999), *Verdad y método*. Salamanca, Ediciones Sígueme.

Holec, H. (1981). *Autonomy in Foreign Language Learning*: Oxford University Press.

Icart Isern, M. T., & Canela Soler, J. (1994). *El artículo de revisión. Enfermería clínica. 4*(4), 180- 184.

Martín, E. (2008). *Aprender a aprender: una competencia básica entre las básicas*. Madrid: Universidad autónoma de Madrid.

Mayor J. (1995). *Aprender a aprender y aprender a pensar*. Madrid, Editorial Síntesis.

Moreno, R.; Martínez, R. (2007). Aprendizaje autónomo. Desarrollo de una definición Acta Comportamentalia: *Revista Latina de Análisis de Comportamiento, vol. 15,* núm. 1, pp. 51- 62 Universidad Veracruzana. Veracruz, México.

Moreno, M.G. (2006). *Formación para la investigación*. Guadalajara, México: Universidad de Guadalajara.

Moreno, M. G. (2013). Retos actuales de la formación de investigadores en educación en México. En M. G. Moreno y M. Valadez, *Miradas analíticas sobre la educación superior.* Guadalajara, México: Universidad de Guadalajara, 415-424.

Organista- Sandoval, J. Serrano-Santoyo, A. MacAnall, L. y Lavigne (2013). Apropiación y usos educativos del celular por estudiantes docentes universitarios. *Revista electrónica de Investigación Educativa 15*(3) ,138-156.

Morín, E. (2000). *Los siete saberes necesarios para la educación del futuro*. UNESCO - IESALC, Ediciones Faces/UCV. Caracas

Plata, M. E. (2011). Procesos de indagación a partir de la pregunta. Una experiencia de formación en investigación. *Praxis & Saber 2*(3) ,139-171.

Ramos, M. H., Ramos, M. F., & Romero, E. (2003). Cómo escribir un artículo de revisión. Revista de postgrado de la VIa Catedra de Medicina (126), Disponible en http://med.unne.edu.ar/revista/revista126/como_esc_articulo.htm. [Consultado ocho de octubre de 2019].

Reyes- Santander, P.A., y Ramos-Rodriguez, E. (2018). Mapas Conceptuales en la educación matemática en nivel universitario. *Revista electrónica de Investigación Educativa 20*(2), 25-36.

Reimers, F. (2016). *Teaching and Learning for the Twenty First Century*. Cambridge: Harvard Education Press.

Sternberg, R.J. (1999). *Estilos de Pensamiento*. Barcelona, España.

Sáiz, M.C. & Montero, E. (2015). *Metacognition, Self-regulation and Assessment in ProblemSolving Processes at University*. En A. PeñaAyala (Ed.), Metacognition: Fundaments, Applications, and Trends (pp.1-27). doi 10.1007/978-3-319- 11062-2-5.

SEP (2016). *Educar para la libertad y la creatividad*. México: SEP.

SEP (2016).*Modelo educativo 2016*. Mexico: SEP.

Sepúlveda R. (2003). Autonomía moral: Una posibilidad para el desarrollo humano desde la ética de la responsabilidad solidaria. *Revista de Psicología, vol. 12*, núm. 1, 2003, pp. 27-35 Universidad de Chile Santiago, Chile.

Tedesco, J. (2011). Los desafíos de la educación básica en el siglo XXI. *Revista Iberoamericana de Educación, 55*(1), 31-47. Recuperado de http://rieoei.org/rie_contenedor. php?numero=rie55

Valadez, M. (2016). Indicios para gestionar el aprendizaje personal identificando los estilos de pensamiento. En M. Valadez, M. G. Moreno y C.E.

Vivero, *Avances y perspectivas de la investigación educativa y de género*. Guadalajara, México: Universidad de Guadalajara, 107-117.

Valadez, M.; Moreno, M.G. y Romero, M.A. (2017). Transiciones en la formación de posgrado. Recuperación de la experiencia y acercamiento conceptual desde tres enfoques. En V. Ortiz y A. Ponce, *Diversas miradas sobre el posgrado y la investigación educativa en Latinoamérica.* Guadalajara, México: Universidad de Guadalajara.

Valle, A., Rodríguez,.S. Nuñez, J.C., González-Pienda, J.A. y Rosario, P. (2007) Metas académicas y estrategias de aprendizaje en estudiantes univesitarios. *Revista Semestral du Associação Brasileira de Psicología Escolar 11*(1),31-40.

Veenman, M. (2011). Learning to Self-Monitor and Self-Regulate. En R. E. Mayer y P. A. Alexander (Eds.), *Handbook of Research on Learning and Instruction* (pp. 197-218). New York and London: Routledge.

UNESCO (2017). *Replantear la Educación ¿Hacia un bien común mundial?* Paris. UNESCO.

Reception: **October 8, 2019** | Acceptance: **May 4, 2020**

SUSTAINABLE DEVELOPMENT FROM AN INTERCULTURAL UNIVERSITY PERSPECTIVE

—

Jorge Antonio Velazquez Avendaño
jorgevelazqueza@yahoo.com.mx

Unidad Académica Multidisciplinaria de Yajalón, Universidad Intercultural de Chiapas, Mexico

To quote this article:
Velazquez Avendaño, J. A. (2020). El Desarrollo Sustentable desde una mirada universitaria Intercultural. *ESPACIO I+D, INNOVACIÓN MÁS DESARROLLO, 9*(24). https://doi.org/10.31644/IMASD.24.2020.a07

— Abstract—

The meeting of concepts that arise interest and high expectations also usually promote reflection and analysis in the search for definitions that contribute to a better understanding of their meanings, such as the terms *sustainability, development, interculturality*, and *community bonding*, particularly in intercultural contexts, that is, in spaces where communities that are supposed to converge are different, such as indigenous and mestizo, and that end up enriching the reflexive process. A lot of intention has run around the concept of Sustainability, but little has happened if we associate it with the concept of *Development* and *Interculturality*, a communion that allows you to take a look at the development of communities from a different perspective, from the look of people around their daily life under a sustainable approach, from their perception of things as obvious from day to day as is the handling of garbage in their homes to complex problems such as the contamination of rivers and basins by human actions. We have to ask ourselves how people want to live and how they apply sustainability in their environment and how it relates to other different cultural groups, but that share the same territory. In this sense, *Sustainability, Development*, and *Interculturality* promote the need of linking communities that come from different cultures, and they become the reasons for the intercultural university to mobilize and existing, whose purpose is to discover their thoughts and its actions around this issue of *Sustainable Development*.

The aim of this work is precisely to contribute to the reflection and analysis of the concept of *Sustainable Development* in a context of *Interculturality*, whose importance is that various universities, particularly intercultural ones, promote it as a professional career closely linked to a central pedagogical axis which is recognized as community bonding, which is seen as a training foundation of special importance for its professionals in training in *Sustainable Development*, which facilitates, among other attributes, recognizing and explaining the impact on the quality of life of Human communities have the use and preservation of resources (understood as natural, human, ecological, etc.), at present and predict their effect in the future.

Keywords
Sustainable, Development, Interculturality, Community engagement.

In the evolution of the development or progress of humanity towards better conditions of well-being, one of the central axes in this domain is the so-called "paradigms of development" that at the end of the Second World War had an unprecedented impulse, but without a fundamental proposal, since it privileges the use of natural resources for the sake of economic growth, which was supposed to be "unlimited". However, it is not until the 80s, when an element known as Sustainability bursts onto the scene, calling into question and puts on the analysis table "unlimited growth" and becomes a kind of measuring mirror of these paradigms and their implemented policies. This concept, until then not very well known, draws the world's attention by exposing the risks to the continuity, not only of human progress but of its very existence as a consequence or effect of those development policies implemented, even to this day, whose effects impact negatively on the environment.

Many nations finalized their development in these models, dictated from the centers of world power and that undoubtedly brought progress, but also consequences that the Brundtland Commission of the United Nations (UN, 1987) raised, realizing that human welfare, social and economic development, but also their survival, depends on the rational use and preservation of natural resources (NR) for future generations, placing it as a core factor in measuring development and therefore in the elaboration of new public policies that contemplate the development of nations from a comprehensive development perspective based on the ecological-economic-social trinomial.

Such premise brings with it challenges that summon to deepen in the study and analysis of the concept of *Sustainable Development*, from different possible perspectives, especially from a intercultural university since the reason that animates them is the understanding, as much of the visions as of the interrelations of the culturally different human communities, that converge in sites or common territories, employing actions that propose to discover the elements or components that sublime in these multi and intercultural territories, with the supreme purpose of forming professionals in this area that contribute to understanding better the local development from a sustainable approach.

INTERCULTURALITY AND ITS CORRESPONDENCE WITH *SUSTAINABLE DEVELOPMENT*

An element of great interest for the study of *Sustainable Development*, from the culturally diverse communities, but that coexist and share common territories, is the term recognized as *Interculturality* whose understanding has been treated by multiple authors like C. Walsh (2007), who explains it from three perspectives that he recognizes as relational, functional and critical,

while others like Albo (2003), situate it from three important questions: (1) Identity of people who share a specific culture, (2) Differentiation from other groups of a different culture, and (3) Correspondence of groups that share cultural elements and make possible the connection in cultural diversity.

However, it is very important to keep in mind that when we speak of *Interculturality* we are referring to a concept that implies changes through time and that can be static or dynamic, which we will refer to later.

Interculturality, in a first approach, we can observe that it is nourished by another concept whose main characteristic is its complexity, we refer to the term culture, which, at least, groups three relevant questions: 1.- relationship with nature, material and economic development (production, food, housing, etc.); 2.- social relations between people and groups (family, community, politics); and 3.- the imaginary (or symbolic) that gives meaning to the whole: language, religion, art, the legal and judicial system (Albo, 2003).

If to the culture we add the suffix *inter* we can observe two questions of interest, on the one hand, this suffix has a connotation of movement, of dynamism, as fluids that come and go in an intense connection; and on the other hand, it places a sense of the existence of, at least, two poles and thus refers to the recognition that at least there is a connection, a relationship, of two cultures whose fluids go from one side to the other and vice versa.

Not only two poles but many poles are connected or related. And such a situation makes the term *interculturality* of the greatest relevance for understanding the relationships between the different cultures of the world. At least this term has three aspects that should be highlighted:

The first is the dynamism present in *interculturality*. It must be understood as a deep relationship of at least two cultures, which have a generalized impact, particularly on behaviors (we refer to the visible ways in which human beings conduct themselves), above all, on the character of man (we refer to that which is not visible, but which is the real reason for a man's behavior), that is, the changes in the characterology of human beings (Fromm, 2006), which when they come into contact, influence each other, considering that this contact can be violent and imposing or subtle and friendly. In any case, the impact causes substantial changes in all aspects, from character to cultural manifestations, and this is what should have greater emphasis in the studies that are carried out from interculturality.

The second is *static* contact and exchange. It could be thought that it does not have major implications in the characterology of men and social relations; however, even when the changes are not considered of relevance for the cultures that are interconnected, they do not cease to have their importance in the modification of certain patterns of behavior and of some changes of perspectives and/or cosmovisions, which can lead them to a

sort of what Albo (2003), calls inculturation, or derive in some other like transculturation, etc.

Finally, we have a very important aspect to take into account, the historical analysis of the cultures involved (Harris, 1986; Quijano, 2000), both of the social groups involved and their predominant characteristic features and of the encounter itself, since from the historical analysis of these cultural encounters we find elements to understand the current evolution of the behavior of our interculturalities. As an example, in Latin America, the encounter of two opposed cultures could be enough: the Spanish culture and the Mesoamerican ones.

In the light of that encounter, it is possible to observe, from an intercultural perspective, a dichotomy that we can analyze from the roles of dominating-dominated, given in a framework of both violent and brutal encounter, and cunning and marauding, resulting in the subjugation and dispossession of one culture by the other, operated through the introduction of a new element or instrument of submission and power recognized as "race" (Quijano, 2000), which led to the structuring of a society of "races" and "castes" with all the characteristics of submission and exploitation of the dominant culture. This survives, in one way or another, to this day, which can well be identified as the *Coloniality of Power* (Walsh, 2006), which describes a whole culture of domination inherited through the centuries.

Considering what has been mentioned and based on our observations and experiences in the course of time, at the Universidad Intercultural de Chiapas, specifically at the Unidad Académica Multidisciplinaria de Yajalón, from a perspective of school formation-education, it has been possible to visualize, closely to the cultural groups that participate in it, a double relationship in the construction of intercultural relations, understood as Baronnet and Bermúdez (2019) say, as a construction that does not occur in a vacuum, "...but in the midst of tensions, conflicts, and appropriations, inserted in social and power relations, and shaped by the history of the regional context...", this is a positive effect that goes beyond the conversations and interactions of the bonds of friendship and coexistence between students who come from different cultures, whether indigenous or mestizo, since there is a harmonic development and mutual tolerance, we have also registered that historical legacy of racism, the disdain of one culture for the other, whether Tzeltal, Ch'ol, or mestizo, but which seeks the disqualification of the other.

At first, there is a tacit acceptance of the existence of other cultures different from one's own, accompanied by a growing interest in knowing more about the other, recognizing what they are like, how they behave, what economic-productive activities they carry out, what socio-cultural activities they undertake, how they do it, why they do it and what actions they take

to protect the environment, which can well be summarized in the actions that many communities carry out in rituals to ask for water, for example, or for crops, etc, Baronnet and Bermúdez (2019), recognize this as the relationship in the process of bonding. I consider that it is here where the concept of *Sustainable Development* and *Interculturality* find their greatest correspondence since *Sustainable Development* becomes a catalyst of values, behaviors, and attitudes of the people involved.

Sustainable Development is also the bearer of a wealth of knowledge that comes from both local communities and university classrooms, that is, although there is no term in the mother tongues that identifies and gives meaning to the concept of *Sustainable Development*, it does not prevent its study from the local languages, since somehow there are actions of the communities that are identifiable with the paradigm of *Sustainability*, in such a way that we have seen ancestral agro-cultural rituals, (for example of water). The same in the city of Yajalón, which is predominantly mestizo, that in the community Amado Nervo, which is Ch'ol, or that in the community Aurora Grande, which is Tzeltal, the students and teachers in the classrooms manage to abstract them and make them converge with the philosophy that animates the approach of *Sustainable Development*.

The study of the second case is very interesting for a historical analysis from the point of view of *Interculturality* since the cultural expressions observed can be inherited from colonialism, those that prevent, as Quijano says (2000) that "we all feel like citizens of the same category", which should be made visible and studied from a *Sustainable Development* point of view, in correspondence with *Interculturality*. Clarifying that although it is not the constant in the intercultural university environment, if it is perceived in the territory we reside, as mentioned by C. Walsh (2006), as expressions of a dominant and oppressive sector, political and cultural heir of those conquering and colonizing groups, and another original sector, subordinated, discriminated and oppressed.

Interculturality, seen from this perspective, should then be defined as the historical relationship between groups or persons from different cultures, who may or may not share cultural traits and who maintain a dynamic and/or static interaction of mutual influence; therefore, in the intercultural and *sustainable development* university environment, interpersonal and group relationships, as well as attitudes, behaviors, and exchanges, are the elements that articulate and carry out *interculturality*.

FROM *SUSTAINABILITY* TO THE EDUCATION OF PROFESSIONALS IN *SUSTAINABLE DEVELOPMENT*

It should be considered that we start from a concept -*Sustainability*- that has alluded, historically, to diverse perspectives and interpretations that have attended to different scales of application and that have derived in the formulation of different methodologies to make these recognitions (Sarandón and Flores, 2009), which are presented as reliable, opportune, and truthful from their perspective, which, it should be said, depends to a great extent both on the intentionality of the study (understood as what the researcher wants to understand, discover and/or know), and on the eye of the observer and the position in which it is located when it describes how a certain surface or space is found, that is, the position or volume in a certain situation (Martínez & Figueroa, 2014).

Therefore, perspective is key to understand the Sustainable concept, which leads to the need of pondering the concept in the context of research, and also in the planning of curricular maps, as it is the case of *Sustainable Development*, in intercultural universities, which must be approached with great care and interest and understand precisely what it refers to.

In this context, in my opinion, we have to recognize that the concept of *Sustainable Development* has three key elements: 1.- It explains the recognition and analysis of the use of resources (natural, human, cultural), in the present and its effect on the preservation for the future and 2.- the quality of life of the human communities now (and also in the future), but, attention! because they are culturally diverse communities (Dietz G, 2009), participating in the same territory and permanently interrelating, influencing each other, and such element introduces a situation of greater complexity to understand and apply the concept of *Sustainable Development*, therefore the third central element that permeates the professional training path is *Interculturality*.

The relationship of interest between those key elements and *Interculturality* is found in the effect or impact that they exert on each other, that is, the exploration of the quality of life is connected to the exploration in the use of resources in a given cultural context, which in turn affects the relationships that occur between cultures and which necessarily derive in the making and construction of proposals that should take into account the cultural context of origin, and propose, as mentioned by Sarandón and Flores, (2006), a development with sustainability.

According to the above, then, a professional in *Sustainable Development* is a person dedicated to the study and analysis of how human beings relate to their environment, in terms of the usefulness, use, and management of resources, but also how they relate to other different cultural groups, and their effect, on the one hand, on the quality of life of human communities

and the other, on their impact on the natural environment; whose explorations integrate into a first stage scientific investigations, which derive in diagnoses that sustain the planning of sustainable alternatives of a solution either in the design of development projects or in plans and programs for public policies.

Such a definition implies that the study and analysis must have a sequence that begins with the identification and organization of data that allows for a recognition of the territory and the cultures that coexist in it, and then a description of components (structure and function of the agro-ecosystem) or events (chronology and milestones), social actors (who and how is the social subject?), processes and contexts of experiences (Sánchez, 2010), and then establish their meaning, i.e., critically systematize what is thought and understood of that situation, what value and relevance do the community give to its reality? What are its prospects? (Bonilla *et al*, 2009).

The sequence leads the diagnosis to the identification of problems and needs (Ander, 1998), based on the relationship that has been established between human communities with a specific culture and the use of resources, how have human communities, from the particularity of their culture, appropriated these resources? How does the dominant culture, in this intercultural relationship, impact others and transform them? It is necessary to respond to questions that, it is assumed, will recognize relevant aspects of the daily life of the community (Bonilla *et al*, 2009), aspects that recreate how people's daily lives are with each other and their environment, to elucidate how they interact, communicate or interrelate as cultural groups.

Finally, the diagnosis must support planning, in other words, the sequence entails measuring the impact that the communities' relations with their environment have had on the quality of life and on the resources that lead to the construction of solution proposals and their planning, from a sustainable perspective.

PROFESSIONALS IN *SUSTAINABLE DEVELOPMENT* GRADUATED FROM INTERCULTURAL UNIVERSITIES

The profile of the professional in *Sustainable Development* in the universities that promote it, in particular intercultural ones, depends on the so-called formative areas, the group of subjects inserted in the study plans, which condition an area of expertise and this, in turn, projects the field in which the professional will be competent (Academic Program, 2013), therefore, the profile should, above all, correspond to the territorial reality where the major is located.

This premise is based on the fact that the territory of the university environment has a strong impact on the professional training of its students,

due to the diversity of cultures found there and the interactions they generate, which shape, modify, and maintain a vital influence on behavior, since they tend to strengthen their cultural identity, developing, in particular, their confidence in the use and application of cultural features of great interest such as mother tongues. This is precisely where the role of *community bonding* makes the most sense since it is the force that encourages and fosters intercultural relations in a positive sense.

Therefore, the subjects of the training area and the weight they exert in the educational plans should derive from the professional profile that is based on a reality of the territory in question and of the cultures that exist in it, considering their activities to use the resources and the agro-eco-cultural practices that they promote and the effect that these have on the quality of life of the human communities, in particular, those related to the problems and needs that this trigger.

On the other hand, the professional profile also results in "major" areas, that is to say, that they put greater emphasis on some topics of sustainability and that depends in this sense on the formative areas that are studied, for example, one can have a major focused on agro-ecological elements with a minor on the industrial area, therefore, the topic that touches the formative areas becomes substantial to reach the wished profile in the graduates.

In this sense, the concept of *Sustainable Development* implies taking into account the three dimensions of sustainability, which must be the source that nourishes the subjects of the basic, formative, and specialized areas, intimately joined to the axis of *community bonding*, whose practice promotes the attributes and qualities of the researcher, of the diagnostician and designer of integral proposals of a solution, sustained in the respect, responsibility, care and knowledge of the natural environment, basic ethical principles to affirm a relationship of harmony.

COMMUNITY BONDING IN THE TRAINING OF *SUSTAINABLE DEVELOPMENT* PROFESSIONALS.

In the training of professionals in *Sustainable Development*, from intercultural universities, the bridge that allows connecting community development and sustainability, and in turn sustainability with interculturality, occurs between the subject of study and the researcher through a pedagogical axis called *Community Bonding*, training foundation of great importance in the professional curriculum from a normative perspective (Casillas and Santini, 2009), since it forms a line or axis that crosses the curriculum of this career, as well as from real practice, in the relationship university-communities.

Of the multiple qualities that this axis has, there are two that stand out: The first, promotes the formation of professional skills in scientific research,

in the elaboration of community diagnoses, in community development planning, in the design of development projects, and management capacity. The second promotes an ethical formation, based on values that encourage *interculturality* based on respect, responsibility, care, and knowledge. In this sense, *community bonding* can be seen as a platform that allows not only a deep approach to the subjects of study, from a technical point of view, but also as a positive force that encourages those connections or relationships, that is, that dynamizes the process of socio-cultural relations in which subjects participate with their own "...cultural, economic-political structures and power relations..." Baronnet and Bermudez (2019), and who find ways to relate.

How is this community bonding bridge in practice? In other words, how is community bonding implemented? A necessary question that appears in the reflective process and that leads us through a research route. *Community Bonding* is the union of two equally *sui generis* terms, which it is appropriate to clarify and comment on. We refer, first, to the term of *Community*, which according to some researchers such as Montero (2004), "...is a polysemic, complex, and confusing term..." that is to say, it finds different purpose according to the topic in which it is involved. Whereas *bonding* is defined by the RAE as the action and effect of bonding, defined as well as: (1) To bind or found something in something else, (2) To perpetuate or continue something or the exercise of it, (3) To subject the fate or behavior of someone or something to that of another person or thing, (4) To subject to an obligation, (5) To bind or encumber property to a perpetual bond, and (6) To secure, bind with prisons. We then have a word that is used to explain various actions, so its use depends on the context where we place it.

Considering our experience in the exercise of *Community Bonding*, it is feasible to consider four basic issues: (1) who is the linker, (2) who is the linked one, (3) what do you want and why you want to link, and (4) the site or destination of the link. Located under a route of action, a first stage is recognized with two important elements, the first is the connection between the binding and the linked, for which the concept of 'first contact' is recognized (Freire, 1970), which becomes important by facilitating access (Hammersley and Atkenson, 2001) and/or introduction of the linker to the community that is the subject of the study, which will influence the future actions that will be followed, above all with the social actors, with whom we will have a relationship, and secondly, with the linkers, in their characterology and their way of acting in intercultural relations.

The next stage of the exercise involves the creation of links of social and economic interest that are established in action, through the interweaving of mutual interests, but also, and more importantly, in the creation of emotional ties. Therefore, we have to consider that this is an experiential process, that

happens between the involved parties, and that they build to establish a relationship of collaboration with clear, precise, and concrete objectives.

At this moment the *dialogue of knowledge* is essential, because it goes beyond the communication between subjects, since it involves diverse knowledge, visions, perspectives, and feelings in a horizontal relationship, of equals, and implies the recognition of those differences (Peña, 2017). In short, the objectives of the linker are combined with those of the linked one in a relationship where collaboration is very important for the relationship to be effective and to successfully achieve what everyone wants.

When the process has been achieved, a stage of completion begins, which may, in turn, be the beginning of a qualitatively higher stage, such question depends on the scope of the research and what the studied community limits. The evaluation of the process at this time is key to consider the results and propose, if necessary, new actions (Peña, 2017).

RESEARCH IN THE EDUCATION OF *SUSTAINABLE DEVELOPMENT*

Research, from intercultural contexts, has two essential questions that contribute to defining the *Sustainable Development* professional:

(1) In the exercise of *community bonding*, the professional is induced to use the scientific method, to make recognitions and analysis of the conditions of life of the communities under study, and their links with others, in an attempt to discover their intercultural relations.
(2) These studies, among other issues, propose both to relate the concept of Sustainability from the communities of study, and to measure the scope of sustainability in these communities, supported, the latter, in the demands of society arising from environmental problems, as well as in the commitment made by our country in favor of *Sustainability* (since it has signed several international agreements, at least at the institutional level), which means that it will impact on public policies aimed at achieving this objective, therefore, it is necessary to operate research of such complexity.

At this point, it is convenient to reaffirm that the term *Community* is more appropriate as a concept associated with the territory, or space, occupied by human groups, since it is the place that gives them a sense of belonging or "sense of community" (Montero, 2004), where they interrelate or interact, share a common culture and history, which has a dynamic and changing sense, in a holistic sense.

Likewise, the term *development*, associated with the improvement of people's quality of life, does not refer to quantitative economic growth, but rather, as proposed by Martínez and Figueroa (2014): "...to the deployment of potentialities in an environment of growing complexity... immersed in... the search for collective and individual welfare, through the use of the goods and services offered by nature, in multiple spatial-temporal scales of co-evolutionary systems".

Considering what has been written, it is pertinent to delineate the investigations based on three axes of analysis: (1) socio-cultural, (2) production systems, and (3) biodiversity. It should consist of an ordered series of studies, under a mixed research approach, to evaluate diverse components of the community system that locate the development of the subject of study from a sustainable perspective (Sarandón & Flores, 2006), but also their intercultural relations.

Finally, these investigations should take into account three issues: the first is to be oriented towards the recognition or characterization of the units of analysis, the second is to analyze the progress or evolution of the units of analysis towards sustainability, considering the use of indicators, as well as general sustainability indexes (Gravina & Leyva, 2012) and the third, is the study of community relations, which contributes to understanding the dynamic, static, and historical relations of the communities under study, and therefore seeks to understand how they interact, how they are influenced, and what results, problems, and needs arise.

CONCLUSION

From an intercultural university perspective, *Sustainability*, beyond being a concept both controversial and hopeful, is the core part in the search for a new paradigm of development of human communities and their ways of relating to their environment, which is lived and felt from diverse cultural contexts in a given territory, so that *intercultural* relations play an increasingly important role, becoming a central element for the training of *Sustainable Development* professionals.

The confluence of the *Sustainability* concept, with two other equally powerful concepts such as *Development* and *Interculturality*, are the basis for the formation of a professional in *Sustainable Development*, called to carry out studies and analysis about the relationship of human communities with their environment, from understanding the historical, dynamic, and static relationships that are established between different cultures that share the same territory, to recognize how these communities use and manage their resources, under a logic of measuring the sustainable development achieved, whose effects will impact on planning that promotes alternative solutions

under basic ethical principles, which contribute to an intercultural relationship of harmony and coexistence that are respect, responsibility, care, and knowledge.

Under these premises, a career in *Sustainable Development* follows research and a mixed approach, which analyzes the situations in which the subjects of study are and recognizes how much they are heading towards a sustainable life, and the diagnosis and design of solutions, hand in hand with a key axis that is the *community bonding*, because their actions can modify ideas preconceived by the people, ie, modify thoughts and acts of people, in the sense that they focus on the sustainable, in the context of the search for paradigms as new ways of relating to the environment.

Therefore, *development* and *interculturality* from the perspective of sustainability, are basic to propose public policies that strengthen in people a spirit of a harmonious relationship with their environment and promote, in turn, levels of quality of life without destroying the world around us.

REFERENCES

Albo X. S. (2003). *Cultura, Interculturalidad Inculturación*. Caracas: Ed. Federación Internacional de Fe y Alegría. ISBN: 980-313-017-X 70

Baronnet, B., y Bermúdez, M. (2019). *La vinculación comunitaria en la formación de profesionales indígenas en México.* Ciudad de México: ANUIES. Dirección de producción editorial.

Bonilla, C. E., Hurtado P. J. y Jaramillo H. C. (2009). *La investigación. Aproximaciones a la construcción del conocimiento científico.* Colombia: Editorial Alfaomega.

Brundtland, G. H. (1987). *Report of the World Commission on Environment and Development: Our common future* (Reporte A/42/427). Recuperado de http://www. un-documents.net/wced-ocf.html

Casillas M. L. y L. Santini (2009). U*niversidad Intercultural Modelo educativo.* México: Coord. General de Educación Intercultural y Bilingüe. SEP.

Freire, Paulo (1970). *Pedagogía del oprimido*. Montevideo: Tierra Nueva.

Fromm, E. (2006). *El miedo a la Libertad*. México D. F.: Ed. Paidós.

Gravina, H.B. y Leyva G.A. (2012). Utilización de nuevos índices para evaluar la sostenibilidad de un agroecosistema en la república bolivariana de Venezuela. *Cultivos Tropicales*. Vol. 33. No. 3 Pp. 15-22. Caracas.

Gunther D. (2009). Interculturalidad y diversidad cultural. Entrevista. Número 11 año 2. *Revista Tukari*. Guadalajara, Jalisco.

Hammersley M. y P. Atkenson (1994). *Etnografía. Métodos de Investigación. El acceso*. España: Ed. Paidós.

Harris, M. (1986). *Caníbales y Reyes. Los orígenes de la cultura*. Barcelona: Salvat editores. ISBN 84-345-8246-5.

Martínez, I., J., P. y Figueroa, C., A. (2014). Evolución de los conceptos y paradigmas que orientan la gestión ambiental ¿cuáles son sus limitaciones desde lo glocal? *Revista Ingenierías* vol. 13, No. 24. Colombia: Universidad de Medellín. ISSN 1692 - 3324.

Montero, M. (2004). *Introducción a la Psicología Comunitaria. Desarrollo, conceptos y procesos.* Buenos Aires: Paidós.

Peña, P.J. (2017). La formación de profesionales en desarrollo sustentable en un programa de educación superior intercultural. *CPU-e Revista de Investigación Educativa*. Jalapa, Veracruz. ISSN 1870-5308.

Quijano, A. (2004). Colonialidad del poder, eurocentrismo y América Latina. En Edgardo Landler *La Colonialidad del saber, eurocentrismo y ciencias sociales.* Perspectivas latinoamericanas. Buenos Aires, Argentina: Clacso. Pp 231-246.

Sánchez Upegüi, A. (2010). *Introducción: ¿qué es caracterizar?* Medellín, Colombia: Fundación Universitaria Católica del Norte.

Sarandón, J.S. y Flores C. (2009). Evaluación de la sustentabilidad en agro-ecosistemas: Una propuesta metodológica. *Agroecología vol. 4*. Buenos Aires, Argentina. Pp 19-28.

Universidad Intercultural de Chiapas (2013). *Programa académico de la Licenciatura en Desarrollo Sustentable. Actualización*. San Cristóbal de Las Casas, Chiapas: Academia de Desarrollo Sustentable-Universidad Intercultural de Chiapas.

Walsh, C. (2006). Interculturalidad y Colonialidad del poder: Un pensamiento y posicionamiento desde la diferencia colonial. En *Interculturalidad, descolonización del estado y del conocimiento*. Buenos Aires, Argentina: Ediciones del signo.

Walsh, C. (2009). Hacia una comprensión de la Interculturalidad. *Revista Tukar*i. Año 2. Núm. 11. Guadalajara, Jalisco. Pp 6-7

Walsh, C. (2009). *Interculturalidad crítica y Educación Intercultural*. Ponencia del seminario Interculturalidad y Educación Intercultural. Instituto Internacional de Integración del Convenio Andrés Bello. La Paz, Bolivia.

Reception: **April 28, 2019** | Acceptance: **August 4, 2020**

ESTABLISHING THE DIFFERENCES IN THE RESULTS OF TWO STANDARD PROCTOR TEST PROCEDURES

—

Joseín Hernández Córdova
ing.josein.hdez@gmail.com

René Sebastián Mora Ortiz
rene.mora@ujat.mx

Emmanuel Munguía Balvanera
balvanerae@hotmail.com

Universidad Juárez Autónoma de Tabasco, Department of Engineering and Architecture, Mexico

To quote this article:
Hernández Córdova, J., Mora Ortiz, R. S., & Munguía Balvanera, E. (2020). Determinación de las diferencias en los resultados de dos procedimientos de ejecución del ensayo proctor estándar. *ESPACIO I+D, INNOVACIÓN MÁS DESARROLLO, 9*(24). https://doi.org/10.31644/IMASD.24.2020.a08

RESUMEN

Compaction is a soil densification process in which its resistance and load capacity are increased. The degree compaction of soils is evaluated through two parameters: its maximum dry specific weight (γ_{dmax}) and its optimal humidit (w_{opt}), these parameters can be determined through many laboratory techniques. Globally, one of the most used is the Standard Proctor test. The standard process of this test established the definition of one compaction curve using values from a single soil sample after being compacted several times during the procedure. However, in the usual implementation of this test has emerged a variation of the process, to define the compaction curve using more than one sample soil. The goal of this investigation is to provide information about the discordance of the resulting values from the two different techniques of the Standard Proctor test. To accomplished this, over a fist group of samples, it was determined the optimal compaction parameter of two different soil types from the Mexican state of Tabasco after following the standardized process of the Standard Proctor test. These first results served as control values. Subsequently, the second group of samples of the same soil types from the first procedure was tested again with the Standard Proctor test, but now, over several soil samples instead of one (every soil sample was compacted once). All the tests were carried out in triplicate and the results were adjusted using a polynomial line. Comparing the results from the second group of samples against the control values, the second technique caused a 1% decrease in the maximum dry specific gravities, and optimal humidity increase close to 5%. These differences are caused by the process of preparing the soil samples in the Proctor test variant.

Palabras clave

Standard Proctor, dry specific weight, moisture content, re-compaction.

The main objective of compaction is to improve the performance characteristics of the soil. With this technique, it is possible to decrease the compressibility of soils and increase their volumetric stability to changes in water content, in addition to obtaining an increase in strength, rigidity, and decreased in permeability (Abeyrathne *et al*., 2019; Zhang *et al*., 2018; Hossain & Yin, 2010; Yin, 2009). The compaction state of a soil sample is defined by two state variables: the dry specific weight (γ_d) and the moisture content (w). When water is added to the soil during compaction, it acts as a lubricating agent on the particles, sliding one over the other, leaving them densely packed. When the moisture content is gradually increased and the same compaction effort is maintained, the dry specific weight of the soil progressively increases to a maximum known as the maximum dry specific weight (γ_{dmax}). Beyond this limit, any increase in water content tends to reduce the dry specific weight (Image 1). The moisture content at which the maximum dry specific weight is reached is called the optimum moisture content (w_{opt}) (Das: 2015)

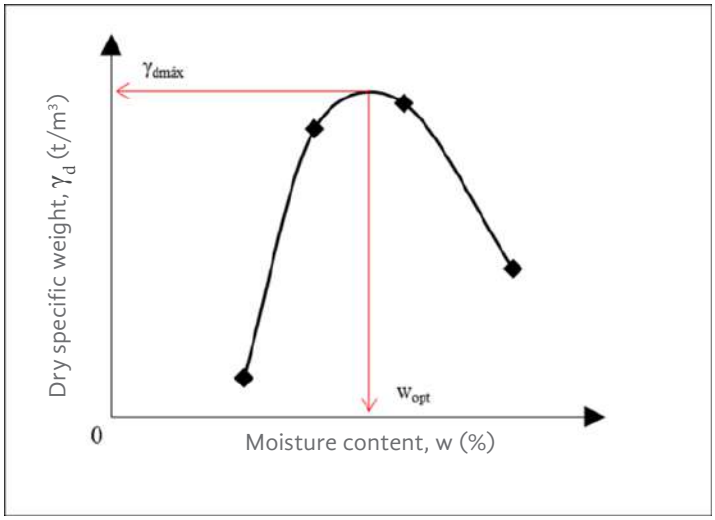


Image 1. Standard Proctor compaction curve. Source: Own elaboration

The classic methods for determining compaction parameters are those defined by Ralph R. Proctor (1933): Standard and Modified Proctor tests (also known as standard AASHTO and modified AASHTO, respectively) Regarding the first of these tests, the manual of Sampling and Materials Testing Methods of the Mexican Institute of Transportation, M-MMP-1-09 (2006), in its section 09 (compaction AASHTO), describes the procedure to determine using a compaction curve the maximum dry specific weight and the optimal humidity. The books published by Juárez-Badillo and Rico-Rodríguez (2005), as well as by Braja M. Das (2015) also describe the aforementioned procedure.

Overall, the procedure for performing the Standard Proctor Test can be summarized as follows: (*i*) a representative portion of approximately 4 kg of soil is separated by quartering; (*ii*) a quantity of water necessary to homogenize the soil is added to the selected portion of soil so that it has a water content 4 to 6% lower than the estimated optimum; (*iii*) this portion of soil is compacted within the test mold (Image 2) in three layers, applying 25 strokes to each one with a 2.5 kg rammer at a height of fall of 30.48 cm; and (*iv*) once the compaction of the layers is completed, the specific weight of the compacted material and its moisture content is determined. With this procedure, a point on the compaction curve is achieved. It is advisable to have at least four points to have a well-defined curve (Image 1).

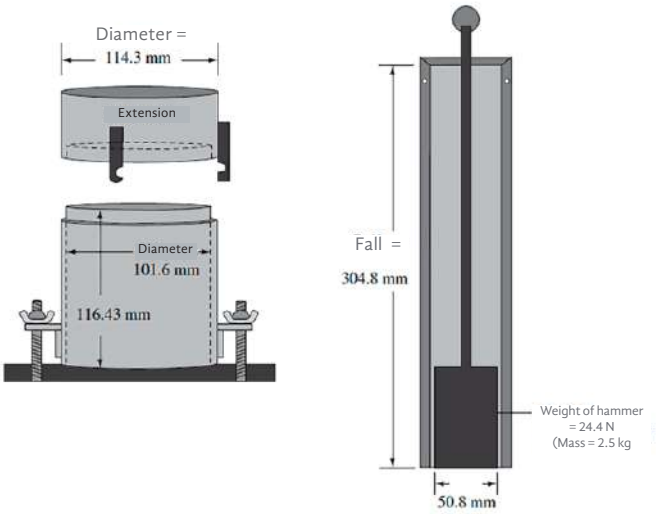


Image 2. Equipment for the Standard Proctor Compaction Test (Das: 2015). Source: Own elaboration

To achieve the next point, the manual M-MMP-1-09 (2006) states that the same portion of soil used on the first point is used and that approximately 2% of water be added to the initial mass of the test portion and steps (*iii*) and (*iv*) above be repeated. This procedure must be repeated for each point. That is, the same portion of soil is used several times. Optimal compaction conditions are determined by identifying the moisture content for which the maximum dry specific weight is achieved (γ_{dmax} and w_{opt}) (Image 1).

Several factors influence the compaction process, for example, Sivakumar and Wheeler (2000) studied the influence of compaction pressure, water content, and type of compaction on the mechanical and hydraulic behavior of white kaolinite clay. Other researchers have studied the effect of soil type (Mora-Ortiz *et al*., 2014; Izquierdo *et al*., 2011; Rico-Rodríguez & del Castillo, 1992), water content (Jiang *et al*., 2015; Duong *et al*., 2013), room temperature during the test and the level of applied energy (Heitor *et al*.,

2015; Mendoza: 1992). However, the possible effects of using the same portion of soil for the entire Standard Proctor Test are not mentioned in the literature.

In the usual practice of this test in materials laboratories, it is common to use several portions of soil instead of just one, that is, for each point of the compaction curve a portion of soil is used. With this, it is possible to reduce considerably the time of execution of the test. With the use of this variant in the Proctor Test procedure, a question arises, will there be any change in the result of the Standard Proctor Test if instead of using a single portion of soil as indicated in the manual M-MMP-1-09 (2006) to determine the compaction parameters, independent portions are used for each point of the compaction curve? This research aims to provide information about the variation in results obtained between these two ways of performing the Standard Proctor Test.

METHODOLOGY

To carry out this investigation, two different types of soils were used, which were obtained by the PCA method (open pit) at a depth of 1.5 m, below is their basic information:

Soil 1. This soil was obtained at the side of the Villahermosa-Teapa Federal Highway at the junction with the Playas del Rosario-Teapa State Highway, at km 020+285 (Image 3). The extracted material is color red and has no organic matter content. The basic characteristics of the soil are shown in Table 1.

Soil 2. This soil was extracted on one side of the Dos Bocas-Reforma Federal Highway, better known as the short road in the municipality of Comalcalco, Tabasco, close to the family restaurant Oasis (Image 3). The extracted material is color brown and has no organic matter content. Its basic characteristics are shown in Table 1

(a) Soil 1 (b) Soil 2

Image 3. Extraction areas of the soils understudy. Source: Google maps

Table 1
Classification and basic characteristics of the soils understudy

Property	Soil 1	Soil 2
Liquid limit (LL)	83%	34.9%
Plastic limit (PL)	17.33%	25.62%
Plasticity Index (PI)	65.66%	9.28%
Solid specific weight (Ss)	2.69%	2.58
Fine content (%)	97.44	96.52
Sand content (%)	2.56	3.48
USCS Classification*	CH (High plasticity clay)	ML (Low plasticity slit)

*Unified Soil Classification System

Source: Own elaboration

To determine if there is a variation in results between the two Standard Proctor Test procedures, the procedure described below was followed:

First, the optimal compaction parameters (γ_{dmax} and w_{opt}) for both soils were obtained following the conventional procedure outlined in the Manual of the Mexican Institute of Transportation (M-MMP-1-09): 2006), that is, using a single portion of 4.5 kg of soil for the entire test (Image 4). These results had the function of reference values.

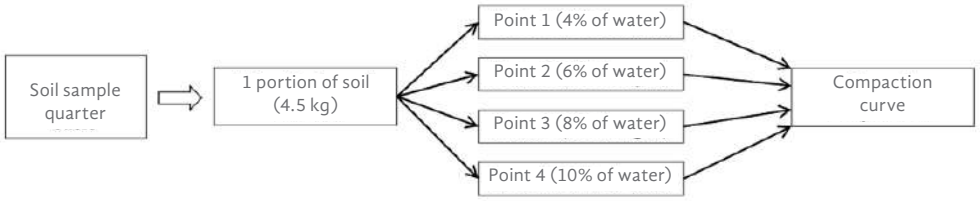


Image 4. Reference test (a portion of soil for the entire Standard Proctor Test). The % of water is relative to the initial mass of the test portion. Source: Own elaboration

All Standard Proctor Tests in this research were conducted three times and adjusted by a polynomial line. The tests were carried out in a temperature-controlled laboratory (24°C) ensuring that every aspect of their execution (increments of water during the test, the position of the rammer, distribution of the blows, etc.) was the same for all and according to the indications of the manual M-MMP-1-09 (2006). The optimal compaction parameters were determined according to the traditional method proposed by Proctor (1933): identifying the moisture content for which the maximum dry specific weight is reached.

1. With the reference compaction parameters obtained, the next step was to repeat the Standard Proctor Tests in both soils, following

the procedure outlined in the Manual of the Mexican Institute of Transportation (M-MMP-1-09: 2006), but with the variant of using a portion of 4.5 kg of soil for each point of the compaction curve (Image 5), that is, each portion of the soil was only compacted once to obtain one point of the compaction curve. Each of these portions was obtained by quartering. A percentage of water was added to each portion, concerning the initial mass of the test portion, and it was left to rest in hermetically sealed containers for 24 hours before compacting.

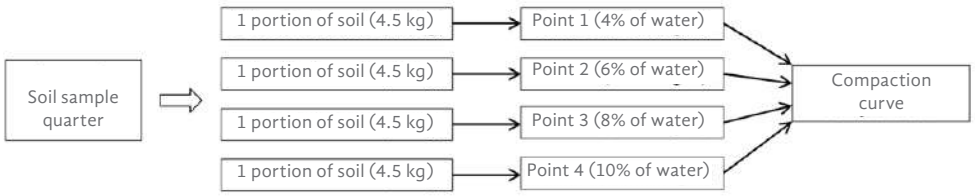


Image 5. Test with several soil portions (a variant of the Standard Proctor compaction procedure). The % of water is relative to the initial mass of the test portion. Source: Own elaboration

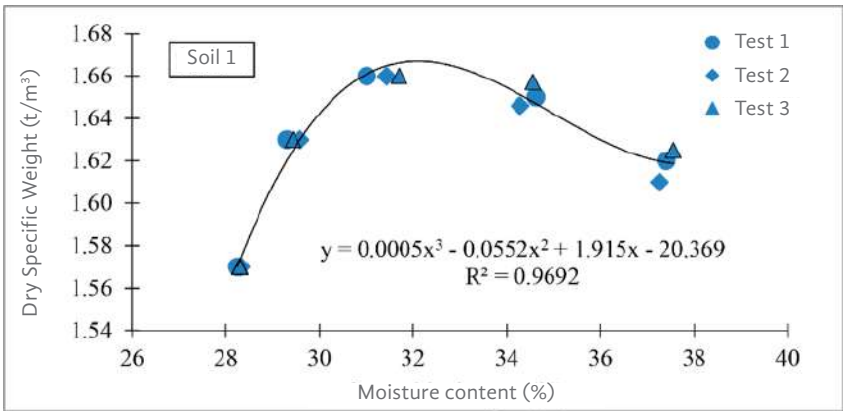
2. Finally, the results obtained with both procedures of the Standard Proctor Tests were compared and comments and conclusions were made.

RESULTS

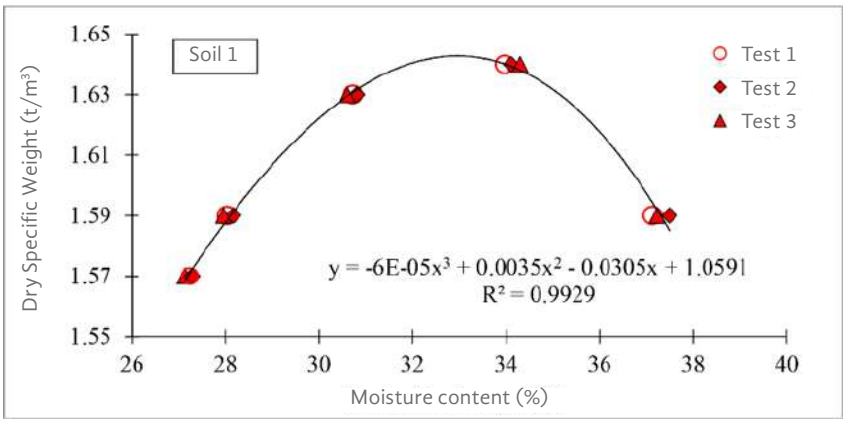
Image 6 shows the results of the Standard Proctor Compaction Tests performed on soil 1: a) conventional test with a single portion of soil; b) Proctor test using several portions of soil, and c) comparison of the compaction curves obtained with both procedures.

Image 6(a) shows the three repetitions of the Conventional Proctor Test performed on soil 1, each of the three tests were performed in the same manner. In each test, five points of the compaction curve were obtained. It is observed that point one in the three tests has approximately the same moisture content ($w \approx 28.3\%$) and the same dry specific weight ($\gamma_d = 1.57$ t/m^3). However, from point two there are slight variations between the same points of each test, for example, if point three of the three tests are compared with each other, a maximum difference of 1% in moisture content is observed. On the other hand, comparing point five in the three tests the maximum difference in dry specific weight between them is 2%. It is observed that the difference between the same points in each test is accentuated as the moisture content increases. These differences occurred despite running the Conventional Standard Proctor Test with the same procedure, under the same conditions, and with the same water increments

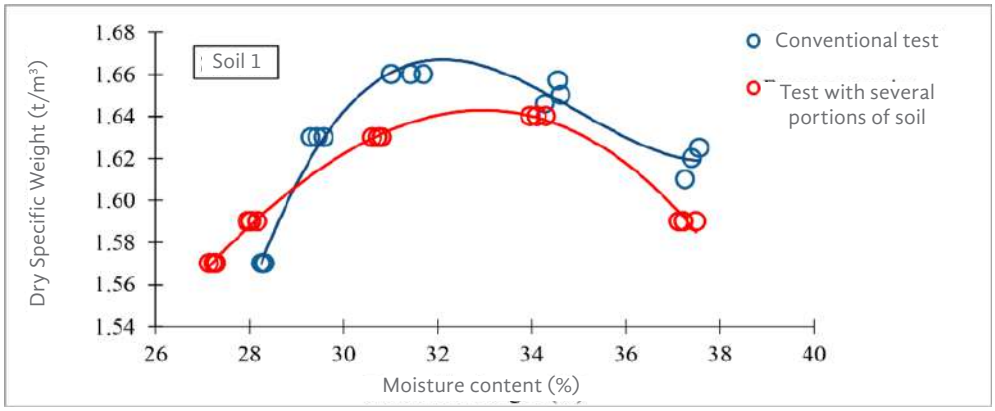
for each point (M-MMP-1-09: 2006). The above is evidence that variations in moisture and specific weight between the same points in the three tests are linked to the distribution of water in the only portion of soil used for each test, and that after each increase of water there is no rest time for it to be distributed homogeneously in the soil mass. This lack of time affects the uniform distribution of water in the sample, producing the variations shown in Image 6(a).



(a) Conventional Standard Proctor (1 soil portion per test)



b) Standard Proctor with several soil portions per test



c) Compaction curves with both variants of the standard Proctor test

Image 6. Standard Proctor Test on Soil 1. Source: Own elaboration

Image 6(b) shows the three repetitions of the Proctor Test on soil 1 but using a portion of soil for each point of the compaction curve. It is possible to observe a greater correspondence between the values of *w* and γ_d for the same points of the three repetitions. It is observed that all dry specific weights are equal to each other for the same points in the three tests. However, there were differences of less than 1% in moisture content between the same points in each test. This uniformity in the values of γ_d for the same points of the three tests is due to the preparation process of each portion of the soil. As explained above, in this variant of the Standard Proctor Test, a portion of soil is used for each point of the compaction curve. Each portion receives a different moisture content and is allowed to rest for 24 hours in hermetically sealed containers (Image 5) before compacting. The resting period for each portion of the soil ensures that the moisture is homogenized throughout the sample.

Image 6(c) compares the compaction curves obtained with both procedures of the Standard Proctor Test on soil 1, while Table 2 shows the values of the maximum dry specific weight (γ_{dmax}) and the compaction optimum moisture (w_{opt}) determined with both procedures.

The results show that the conventional procedure generated higher dry specific weights at lower optimal humidity, compared to the variant that uses several soil portions. The difference between the γ_{dmax} was 1.5%, while for the w_{opt} it was 1%.

Image 7(a) shows the three replicates of the Conventional Proctor Test performed on soil 2, each of the three tests was performed in the same manner. In each test, four points of the compaction curve were obtained. As in the previous case, it is observed that point one in the three tests has the same dry specific weight (γ_d = 1.73 t/m³) with slight variations in moisture content (1.31% maximum difference between points).

Table 2

Standard Proctor test results for both soils understudy

Compaction parameters	Soil 1 High plasticity clay		Soil 2 Low plasticity slit	
	Conventional test	Test with several portions of soil	Conventional test	Test with several portions of soil
Maximum dry specific weight (t/m³)	1.668	1.643	1.781	1.772
Optimal Humidity (%)	32	33	23.4	24.7

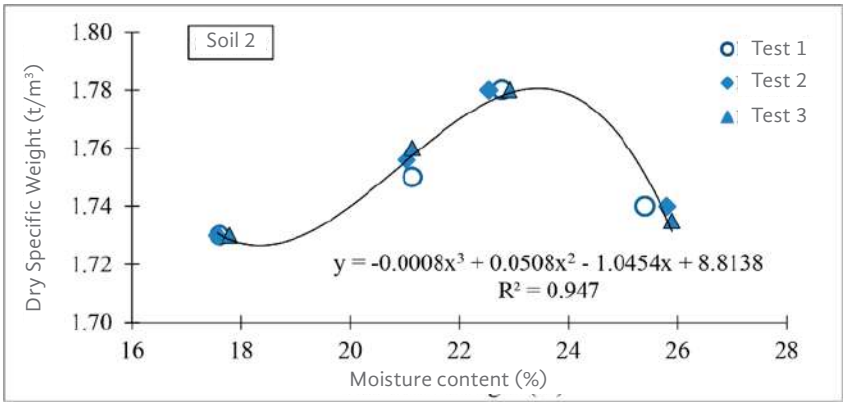
Source: Own elaboration

As in soil 1, it is noted that comparing the same points in the three tests, from point two there are variations in the values of dry specific weight and

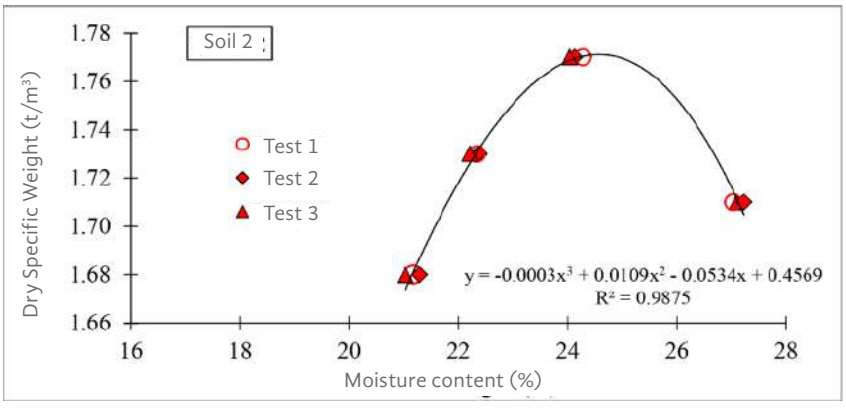
moisture content. These variations are accentuated by the increase in water content. The maximum differences are presented in points two and four, with maximum magnitudes of 2% in moisture content and 1% in dry specific weight.

Image 7(b) shows the three replicates with soil 2 of the Standard Proctor test variant using several soil portions. Again there is a greater correspondence between the values of w and γ_d for the same points of the three repetitions. Note that all dry specific weights are the same for each point of the three tests. The moisture content between the same points in the three tests varies by less than 1%. As in the case of soil 1, it is observed that the variant of the Proctor Test shows more homogeneous results between the same points of the three tests. This is due to the sample preparation process, which, as explained above, allows homogenization of moisture within the soil portion.

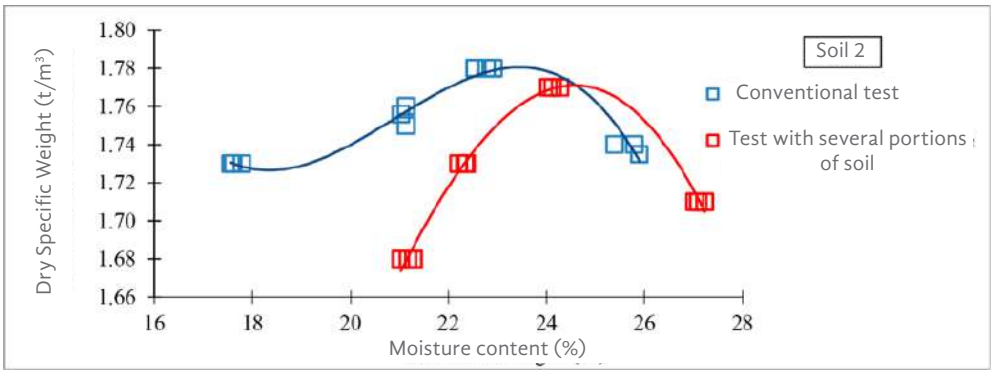
Image 7(c) compares the compaction curves obtained with both procedures from the Standard Proctor Test on soil 2. Table 2 shows the optimal compaction values (γ_{dmax}, w_{opt}) determined with both procedures.



a) Conventional Standard Proctor (1 soil portion per test)



b) Standard Proctor with several soil portions per test



c) Compaction curves with both variants of the standard Proctor test

Image 7. Standard Proctor Test on Soil 2. Source: Own elaboration

Comparing both compaction curves, it can be seen that the conventional procedure generated higher dry specific weights at lower optimal humidity, compared to the variant that uses several soil portions. The difference between the γ_{dmax} was 0.51%, while for the w_{opt} it was 1.3%.

CONCLUSIONS

The experimental results showed that, at least for the soils under study, performing the Standard Proctor Test with the variant of using a portion of soil for each point of the compaction curve, generates slightly lower maximum dry specific weights with optimal moisture contents, slightly higher than those that would be obtained with the conventional Standard Proctor test. It is interesting to note that although the differences between the optimal compaction parameters obtained with both procedures (Table 2) are small, they also show a constant behavior. That is to say, the Proctor tests carried out with several portions of soil always generated a γ_{dmax} lower than the one obtained with the conventional procedure.

During the execution of both procedures of the Proctor test, it was found that the variant that uses several portions of soil is performed faster than the conventional procedure, because it is not necessary to make water increments on the same portion of the soil, nor is it necessary to mix until homogenizing, since the portions of soil previously wetted are available and, with a 24-hour rest, the homogeneity of the humidity is guaranteed. The time saved in the execution of the test depends on the operator, but without a doubt, time-saving is a very important factor in the professional field. Besides, the difference between the magnitudes of the maximum dry specific weights obtained with both procedures could lose importance from the practical point of view, since this difference is less than 1.5% in magnitude.

More extensive studies on this topic are needed, a second phase of this research will be to test other types of soils with different sand contents, more repetitions of the tests, different compaction energies, and with other compaction methods, such as the miniature Harvard.

REFERENCES

Abeyrathne, A., Sivakumar, V., Kodikara, J. (2019). Isotropic volumetric behaviour of compacted unsaturated soils within specific volume, specific water volume, mean net stress (v , v w , p) space. *Canadian Geotechnical Journal, 56*(12), 1756–1778. https://doi.org/10.1139/cgj-2018-0230

Das, B. M. (2015). *Fundamentos de Ingeniería Geotécnica.* Thomson Learning (ed.); Cuarta edición.

Duong, T. V., Tang, A. M., Cui, Y.-J., Trinh, V. N., Dupla, J.-C., Calon, N., Canou, J., Robinet, A. (2013). Effects of fines and water contents on the mechanical behavior of interlayer soil in ancient railway sub-structure. *Soils and Foundations, 53*(6), 868–878. https://doi.org/10.1016/j.sandf.2013.10.006

Heitor, A., Indraratna, B., Rujikiatkamjorn, C. (2015). The role of compaction energy on the small strain properties of a compacted silty sand subjected to drying–wetting cycles. *Géotechnique, 65*(9), 717–727. https://doi.org/10.1680/geot.14.P.053

Hossain, M. A., Yin, J.-H. (2010). Shear strength and dilative characteristics of an unsaturated compacted completely decomposed granite soil. *Canadian Geotechnical Journal, 47*(10), 1112–1126. https://doi.org/10.1139/T10-015

Izquierdo, M., Querol, X., Vazquez, E. (2011). Procedural uncertainties of Proctor compaction tests applied on MSWI bottom ash. *Journal of Hazardous Materials, 186*, 1639–1644. https://doi.org/10.1016/j.jhazmat.2010.12.045

M-MMP-1-09/06. MMP. (2006). *Métodos de muestreo y prueba de materiales. Suelos y materiales para terracerías: Compactación AASHTO*. Secretaría de Comunicaciones y Transportes. Instituto Mexicano del Transporte, IMT. https://bit.ly/30JRc0q

Jiang, H., Bian, X., Chen, Y., Han, J. (2015). Impact of Water Level Rise on the Behaviors of Railway Track Structure and Substructure. *Transportation Research Record: Journal of the Transportation Research Board, 2476*(1), 15–22. https://doi.org/10.3141/2476-03

Juárez-Badillo, E., Rico-Rodríguez, A. (2005). *Mecánica de Suelos. Fundamentos de la Mecánica de Suelos. Tomo 1* (E. L. S. A. de C. V. G. N. E. México. (ed.)).

Mendoza lópez, M. (1992). E*nfoques recientes en la compactación de suelos.* Publicación Técnica No. 33. Secretaría de Comunicaciones y Transportes. Instituto Mexicano del Transporte. Querétaro, Qro. https://bit.ly/3fNSrHD

Mora-Ortiz, R. S., Romero, E., Baptista, A. (2014). *Evolución de la microestructura de un suelo limoso compactado a lo largo de trayectorias hidro-mecánicas*.X. R. N. de M. de S. e I. Geotécnica ed. http://hdl.handle.net/2117/99958

Proctor, R. R. (1933). Design and Construction of Rolled Earth Dams. *Engineering News Record, 3,* 245–248, 286–289, 348–351, 372–376.

Rico Rodríguez, A., del Castillo Mejía, H. (1992). *Consideraciones sobre Compactación de suelos en Obras de infraestructura de Transporte*. Documento Técnico No. 7. Secretaria de Comunicaciones y Transportes. Instituto Mexicano del Transporte. Sanfandila, Qro. https://bit.ly/3fNiGoX

Sivakumar, V., Wheeler, S. J. (2000). Influence of compaction procedure on the mechanical behaviour of an unsaturated compacted clay. Part 1: Wetting and isotropic compression. *Géotechnique, 50*(4), 359–368. https://doi.org/10.1680/geot.2000.50.4.359

Yin, J.-H. (2009). Influence of relative compaction on the hydraulic conductivity of completely decomposed granite in Hong Kong. *Canadian Geotechnical Journal, 46*(10), 1229–1235. https://doi.org/10.1139/T09-053

Zhang, T. W., Cui, Y. J., Lamas-Lopez, F., Calon, N., Costa D'Aguiar, S. (2018). Compacted soil behaviour through changes of density, suction, and stiffness of soils with remoulding water content. *Canadian Geotechnical Journal, 55*(2), 182–190. https://doi.org/10.1139/cgj-2016-0628

A C A D E M I C S
P A P E R S

BOOK REVIEW

THE DISCOVERY OF STARS: HOW WE CAME TO KNOW ARE

—

Joaquín Bohigas Bosch
jbb@astro.unam.mx

Instituto de Astronomía
Universidad Nacional Autónoma de México, Mexico

To quote this article:
Bohigas Bosch, J. (2020). Reseña del libro El descubrimiento de las estrellas: su génesis, evolución, muerte y transfiguración. *ESPACIO I+D, INNOVACIÓN MÁS DESARROLLO, 9*(24). Recuperado a partir de https://espacioimasd.unach.mx/index.php/Inicio/article/view/237

The Discovery of the Stars (Bohigas, 2020) is a popular book accessible to people with an intermediate or higher educational level. It uses a historical narrative to facilitate the presentation of the most modern and reliable results about the nature, origin, evolution, and end of the stars.

This text presents the most outstanding facts in the history of astronomy until the end of the 19th century. It then describes how we began to know the Earth's size and the distance to the Moon and the Sun until it shows a map with the spatial distribution of stars that are up to hundreds of millions of light-years away. The third chapter relates how we determined the intrinsic luminosity, temperature, and chemical composition of the stars after we knew the nature of light and the structure of matter. Next, the work presents the tools we use to measure the size and mass of stars. The combination of these five parameters indicates that they are composed of a plasma that reaches a central temperature of 15 million degrees in the Sun and one billion in higher mass evolved stars.

The next three chapters talk about the origin, evolution, and end of the stars. It begins by mentioning that its formation is a process in which rotation and gravity are the main agents, as Immanuel Kant said in the 18th century. We can see that the evolution of stars is determined by reactions of nuclear fusion that take place in their interior and that the possibility of these reactions depends on the stellar mass. It describes the evolution of stars of different mass until they end their existence as white dwarfs, neutron stars, or black holes. The book ends with some reflections on the future of research in stellar astrophysics.

REFERENCES

Bohigas Bosch, Joaquín. (2020). *El descubrimiento de las estrellas: su génesis, evolución, muerte y transfiguración*. Disponible en: https://www.amazon.com.mx/EL-DESCUBRIMIENTO-LAS-ESTRELLAS-LLEGADO-ebook/dp/B0892W6DFS

Bohigas Bosch, Joaquín. (s.f.) *El descubrimiento de las estrellas: su génesis, evolución, muerte y transfiguración*. Disponible en: https://muertetransfiguracion.wordpress.com/2020/05/30/advertencia/

BOOK REVIEW

SCENARIOS ON VIOLENCE, COMMUNICATION, AND ORGANIZATIONS. AN OPEN DISCUSSION IN THE IBERO-AMERICAN CONTEXT

—

Fernando Daniel Durán Ruiz
fernando.duran@unach.mx

Universidad Autónoma de Chiapas, Mexico

To quote this article:
Durán Ruiz, F. D. (2020). Reseña del libro Escenarios sobre violencia, comunicación y organizaciones. Una discusión abierta en el contexto Iberoamericano. *ESPACIO I+D, INNOVACIÓN MÁS DESARROLLO, 9*(24). Recuperado a partir de https://espacioimasd.unach.mx/index.php/Inicio/article/view/238

One of the meanings of discussion is to examine, analyze, and compare the derivations of research, at the side of other existing or potential ones. Joan Corominas, in his *Brief Etymological Dictionary of the Spanish Language*, points out its Latin origin: *dĭscŭtĕre*, decide, break, dissipate. The coordinator of this book proposes, rightly so, to carry out this exercise of understanding, of breaking point, in the sociological space and the field of communication. Following this intent and trail, the book *Scenarios on violence, communication, and organizations. An open discussion in the Ibero-American context*, an academic effort that provides continuity to studies that address these issues with a collective and comprehensive approach.

In this coordinated and multidisciplinary work, within the framework of the development of scientific research and significant experiences, of the Iberoamerican Committee of Research in Organizations and Communication (AISOC) and the Institute of Legal Research of the UNACH, they seek to carry out an extensive interpretation of the different scenarios and forms of representation of violence, communication, and organizations and their most significant collective references. The first of these is that of society, through physical or moral transgression, political interactions, and the

media; on the other hand, that of business, through entrepreneurship, innovation, as well as sustainability.

In its fifteen chapters, the book offers a broad overview of the most emblematic topics of the sociological and communication environment, simultaneously providing an approach to the Ibero-American context. In this sense, the works address various topics that occur in our societies, for example, soccer, violence, and media; political parties, crisis, and opportunities for political transformation in Mexico; social interactions and citizen empowerment; social micro geographies; ways to make visible and raise awareness of social and political problems; scenarios of dissent; contributions against violence in children; communication and sustainability; challenges of social entrepreneurship; entrepreneurship and innovation in organizations; other forms of union representation; the power of social campaigns on the radio; institutions and local productive systems; social dimensions in tourist destinations.

Finally, without writing a summary of the research works that make up the publication, in the sections described it is possible to appreciate the enormous complexity of the social phenomenon and corporate responsibility. Thus, this collegiate document represents a great contribution of observation, interpretation, and analysis for those interested in approaching the understanding of the Ibero-American environment and its contemporary and future challenges.

REFERENCES

Alberto Zuart Garduño (Coordinador). Escenarios sobre violencia, comunicación y organizaciones. Una discusión abierta en el contexto Iberoamericano. Chiapas: IIJ-UNACH, 2020, 678 pp. ISBN: 978-607-561-046-7. https://iij-unach.mx/index.php/es/publicaciones/libros-2