

## **EXOGENETIC PROCESSES: A DIDACTIC GEO-ROUTE ALONG THE WESTERN SHORE OF LAKE MARACAIBO (VENEZUELA)**

Ramón José Labarca Rincón 

Centro de Formación e Investigación “Padre Joaquín” de Fe y Alegría, Venezuela.

[ramonlabarca31@gmail.com](mailto:ramonlabarca31@gmail.com)

Edith Luz Gouveia 

Centro de Estudios Geográficos

Universidad del Zulia, Venezuela

[edithgouveia@yahoo.com](mailto:edithgouveia@yahoo.com)

Geography, a science that studies the reciprocal relationship between human beings and the physical terrestrial environment, is a discipline that deserves to be approached at all educational levels to induce socio-environmental values in citizens towards the natural or urban geographic space. In Venezuela, this science is taught at all educational levels to a greater or lesser extent. In the case of General Secondary Education, its curriculum includes two areas in which topics of this nature are addressed: Geography, History and Citizenship, oriented to the socio-territorial order of space (processes of human and physical Geography); and Earth Sciences, aligned towards the study and understanding of the dynamics of the Earth (processes of Physical Geography).

In the specific case of Earth Sciences, its main task in education is for students to be able to describe, explain and predict natural phenomena on the planetary surface (Pedrinaci, 2013), which makes it clear that the purpose of this area Knowledge is to connect the learner with the processes that are part of the terrestrial dynamics, whose objective is achieved through the application of the natural landscape as a didactic resource. In the natural landscape, phenomena and geoforms are externalized that are

the result of geological and geomorphological processes, therefore they represent an open classroom in geoscientific teaching.

In this sense, the natural landscape becomes the epicenter of a geoscientific education that would take a leap from the traditional to the implementation of contextualized teaching. This aspect provides great validity to the pedagogical work of Earth Sciences in Venezuelan secondary education, since it allows students to intervene in real terrestrial processes from which they can describe, observe, compare and even quantify the phenomena that are part of its close environment. At this point, Lacreu (2017) assures that one way to favor the teaching of Earth Sciences is for the teacher to promote a dialogue between the student and nature.

However, even when the didactic potentialities of the natural landscape are evident, its inclusion in classrooms in countries such as Argentina, Spain and Venezuela encounters a series of epistemological and methodological obstacles. In the Venezuelan case, the teachers of the aforementioned training areas still retain a traditional pedagogical position, where the almost exclusive use of the textbook, the master exposition and the execution of written evolution tests prevail (Labarca, Barreto and Bernal, 2019 ), which prevents students from acquiring skills to identify and understand terrestrial processes.

This is a direct consequence of the absence of a geoscientific education contextualized from the natural landscape. This absence is due to factors of a pedagogical nature. One of those that stands out is that Earth Sciences teachers are unaware of the didactic benefits that the natural landscapes of their locality can provide, which comes from the education received in universities, where field work is often confused with trips or excursions and therefore do not acquire didactic skills in understanding the landscape.

Therefore, two aspects must be put into practice to eradicate traditional education in Geosciences: 1) Train teachers, through specialized workshops or courses, in reference to identifying theoretical content in the local natural landscape; and 2) Researchers in Earth Science didactics should offer contextualized educational materials that stimulate pedagogical practice.

In order to contextualize the teaching of Geosciences in secondary education, researchers in this area propose the use of geo-routes or field itineraries as effective means to link the theory with the natural landscape and thus encourage students to be motivated to know the physical environment that surrounds them. Along these lines, González (2012) made a proposal for a pedagogical itinerary through the landscape of Toas Island in the state of Zulia, Venezuela; and Labarca, Barreto and Bernal (2019) published a didactic geo-route based on the landscape of the Laguna de Las Peonías (Zulia state, Venezuela). Likewise, in other countries the inclusion of field itineraries is

relevant, as in the case of Gómez, Corrochano and Parra (2017) when proposing a field activity through the Northwest reliefs of Zamora, Spain.

With the correct planning, execution and evaluation of geo-routes or field itineraries, geoscientific teaching is dynamized, the student is trained in the identification of processes left to the earth and is induced in the management of geological tools and terminology, with the primary purpose of understanding the geographic space from the natural landscape. In this scenario, the most obvious processes are those that derive from external geodynamics because they are those that have a grip on the surface, that is, exogenetic processes.

In the state of Zulia, Venezuela, there are a variety of natural landscapes that keep evidence of various exogenetic processes, which is why they are classified by Labarca, Barreto and Bernal (2018) as “Zulian geomorphites”. Among them, the landscape of the depression of Lake Maracaibo stands out. On the western coast of this landscape, specific exogenetic processes can be visualized that serve as a didactic, scientific and tourist setting. Therefore, the objective of this study is to propose a geo-route along the western coast of Lake Maracaibo for the teaching of exogenetic processes in the Earth Sciences training area of the U.E. “Sierra Maestra” Adventist School, located at Av. 15 Sierra Maestra, San Francisco municipality of Zulia state (Venezuela).

To achieve the proposed objectives, a methodological framework based on quantitative research is used. Consequently, the research is descriptive and projective. The specific aspects of the dynamics of the variables referring to the didactic resources used by the teachers of the Earth Sciences training area and to the exogenetic processes that are evidenced on the western coast of Lake Maracaibo are described. With this information, it is necessary to specify a proposal for a didactic geo-route, so the research is also projective.

By the same epistemology of the variables, the design that is acquired is field and not experimental. Both scenarios that make up the study variables, the educational institution and the western shore of Lake Maracaibo, are visited by the researchers to obtain the information from the data and make analysis of them without any manipulation, that is, the data are treated from an unbiased shot. The subjects under study in the selected educational institution are represented by four (4) teachers with Bachelor’s degrees in Education, mentioning Social Sciences and / or Geography, in charge of the Earth Sciences training area for the 2017-2018 school period. Therefore, the population is considered census (Arias, 1999).

To collect the data of the variable on the didactic resources used by the teachers of the Earth Sciences training area, the survey technique is used and a questionnaire is selected as an instrument. This is self-administered, it is based on the classification

of teaching resources proposed by Arrieta (2000) and composed of fifteen (15) items, whose response alternatives are presented on the Likert scale (always, almost always, sometimes and never ).

For the variable related to exogenetic processes on the western shore of Lake Maracaibo, observation and field inspection are performed as data collection techniques. The observed evidence is recorded in an observation file, which has the following sections in order to guide the visit to the place under study: visited site, geographic location, coordinates, observed relief and exogenetic processes involved. The registration of photographs visually supports these elements to be included in the proposal (educational geo-route). These instruments were validated by four (4) experts in the areas of Physical Geography and Geography didactics.

Applying the diagnosis, it was possible to have an overview of the didactic resources used by the teacher in the Earth Sciences training area. In this sense, the general averages for each one of the indicators are the following: for the indicator “audiovisual resources”, the average of 33.33% always ensures that they are used in educational practice; In the indicator “directed resources” it is striking that 100% state that they never apply geo-routes, field itineraries or guided visits in teaching external processes of the Earth.

On the other hand, in the indicator “existing resources” it should be noted that the average of responses is located at 41.67% for the option “sometimes”, being the type of resources most used (blackboard, school supplies, libraries). Likewise, the trend reflected in the indicator “natural resources” is that 41.67% never use natural landscapes to teach exogenetic processes. And, finally, in the indicator “prepared resources” the average shows that 66.67% never produce contextualized teaching materials. These results are similar to those found by Labarca, Barreto and Bernal (2019), which corroborates the traditional approach to geoscientific teaching that exists in Venezuela, and specifically in educational institutions in the state of Zulia.

In general terms, these results make it clear that the teacher is immersed in traditional teaching and learning strategies, and therefore the use of field trips that allow them to present in a tangible way various geological and / geomorphological processes in the landscape is scarce. natural environment around them. In this sense, the western coast of Lake Maracaibo becomes relevant as a favorable landscape setting for students to observe, analyze, identify and describe various external geomorphological processes, for this a good pedagogical option would be a didactic geo-route based on learning by discovery.

When inspecting the western coast of Lake Maracaibo, in an approximate stretch of 17.4 km that goes from South to North from the Vereda del Lago to the Simón Bolívar Planetarium within the Maracaibo municipality, Zulia state (Venezuela), it is verified

that this setting is ideal to establish field trips and / or geo-routes. In these spaces you can see swamps, coastal lagoons, plains, fluvial reliefs and rocky outcrops that show the strength of the exogenetic processes that have configured the area. Specifically, in the aforementioned tour it is easy to observe three particular Zulian geomorph sites worthy of being considered for the teaching of Earth Sciences, namely: Lake Maracaibo itself, whose tectonic space serves as a natural setting to exemplify the processes of erosion, transport and sedimentation through illustrations, diagrams, diagrams and didactic manuals (Labarca and Gouveia, 2019).

On the other hand, there is the El Miagro Formation, a rocky outcrop dating from the Pleistocene of the Cenozoic era and which externalizes the various sedimentary events that gave rise to the genesis of the Marabino soil. In its escarpments the presence of erosive, sedimentary, stratigraphic processes and mass movements is noticeable. Likewise, at the end of the route, the Laguna de Las Peonías sits, in whose place coastal reliefs are tangibly manifested, such as arrows or marine bars, lagoons, beaches and coastal dunes, which are part of the characteristic morphology of the region.

Consequently, the aforementioned portion of the western shore of Lake Maracaibo integrates a cluster of scenarios where students can observe, analyze, compare, contrast and interact with the exogenetic processes that are available there. Therefore, these spaces as a whole are considered a true natural laboratory for the teaching of geoscientific contents, which can be made more dynamic with adequate and contextualized educational resources such as geo-routes.

Unifying the data collected, this study focuses on the proposal of a didactic geo-route through a portion of the western coast of Lake Maracaibo. This proposal is based on three important aspects: on the necessary updating of teaching resources within the Earth Sciences training area; in the physical potentialities that are manifested in the landscape of the study area; and in discovery learning. That is, with the didactic geo-route, the masterful explanation of contents is not sought, but rather that the student discovers the exogenetic processes in the places to visit during the tour.

As a directed resource, following the guidelines of Calonge, Fermeli, Meléndez, Carvalho and Rodrigues (2013), Carcavilla and Salazar (2014) and Labarca, Barreto and Bernal (2019), the geo-route has the following structural sections: presentation, educational objectives, general description of the route, instructions for the teacher guide and for the students, stops (which have location, specific objective, materials, theoretical references, evaluation activity and informative tips), didactic glossary and bibliographic references.

For the application of the didactic geo-route, the teacher and their students must comply with three phases: 1) Planning, in which the teacher visits the western shore of

Lake Maracaibo to detect exogenetic processes, verifies the stops that are proposed In this geo-route, he builds the necessary didactic materials and presents the whole set to the students; 2) Execution, once the school protocol is complied with, the departure date is set and the tour lasts from 6 to 8 hours is carried out; and 3) Evaluation, which consists of the delivery of the activities by the students, a dialogue of knowledge is applied as a closing of what has been learned and an explanatory table is elaborated from there.

In order to fully comply with the execution phase, the teacher must ensure that each team of students has a work package containing the following materials: physical map of the state of Zulia; map of the western coast of Lake Maracaibo that can be extracted from Google Maps ©; geological scale of the evolution of Lake Maracaibo, hosted in the didactic manual of Labarca and Gouveia (2019); work guide, theoretical methodological instrument for the interpretation of the exogenetic processes in each one of the stops; and various materials (notebook, photographic camera, satellite map of the Laguna de Las Peonías, binoculars, geological pick-up, colors, markers, among others).

The geo-route, entitled “Lake of Maracaibo. Coastal watchdog of exogenetic processes”, provides for Earth Sciences students a pedagogical space for direct encounter with local geodynamic landscapes; in situ observation of external terrestrial processes; and empirical testing of the content addressed in the classroom. In addition, it contextualizes geoscientific teaching according to the provision required by the Ministry of Popular Power for Education in reference to the Earth Sciences training area. This geo-route is made up of five (5) stops that are arranged along the 17.4 km indicated on the western coast of Lake Maracaibo, each of which includes location in the area, achievement competition, materials, theoretical references, evaluation activity and informative tips. These stops are:

- Stop 1. From the Jurassic to our days; sedimentary evolution of Lake Maracaibo. In this stop, the theoretical references related to the period and geological event of formation (Jurassic Opening), uplift or orogenesis of the mountain ranges that surround the Lake, and the processes of erosion, transport and sedimentation as formators of the depression of Lake Maracaibo are addressed. . The didactic techniques to be used are description of geological scales, interpretation of maps and elaboration of flow diagrams.
- Stop 2. A dynamic morphology on the western shore of the Lake: landslides loom. Students must build knowledge regarding the slope processes, landslides and collapses of the El Milagro Formation, through the use of geographic and pedagogical strategies, such as in situ observation, commented readings, interpretation of diagrams and application of diagrams. analytical (Glove of the 5 Reasons).

- Stop 3. Pleistocene relief on the western shore of the Lake: El Milagro Formation. During the time of this stop, knowledge about the sedimentation of the El Milagro Formation, composition of the sedimentary lithology of this formation and identification of sedimentary rocks are discussed. The techniques to be used for this purpose are commented readings, photo capture, sample extraction and PNI analysis (positive, negative and interesting).
- Stop 4. The beaches arrive to adorn the shores of the Lake. At this point of the route, the students in teams must define littoral drift and marine sedimentation as processes that give rise to the beaches, comment on the marine sedimentation on the shores of Lake Maracaibo and describe the beaches of the western coast of Lake Maracaibo . All this from didactic techniques such as dialogues of knowledge, interpretation of educational posters, capture of photographs and elaboration of spider maps.
- Stop 5. Las Peonías: spectacle of marine origin in the west of the Zulia lagoon. At this last point, students must reach an understanding of the geographical location of Laguna de Las Peonías, its formation as a lagoon (according to Labarca, Barreto and Bernal, 2018) and the coastal relief that makes it up, resorting to geodidactic strategies such as the management of satellite maps, interpretation of readings, comparison of illustrations and creation of illustrative diagrams.

Based on the main findings, this study concludes that: 1) The Earth Sciences training area teacher is satisfied with dictating from the textbook a concept or terrestrial process for subsequent memorization by the student; 2) On the western coast of Lake Maracaibo, various places of didactic interest are identified in which exogenetic processes (Zulian geomorphosites) are externalized; 3) The western shore of Lake Maracaibo is a first-order didactic scenario for students to discover, observe, interpret and make critical analysis of exogenetic processes, which can be achieved through didactic georutes; and 4) The proposed geo-route, entitled “Lake of Maracaibo. Coastal watchdog of exogenetic processes ”, is a didactic and scientific journey to encourage learning by discovery of the external processes of the Earth.