

Education to Action program

Pedagogy of Water / Citizen Science Project



Project overview

The project promotes citizen participation in the water governance of Eastern Cape through the development of a curricular proposal led by educators and high school students. It promotes the adequate generation and publication of information in its watersheds, the use of "open data" in decision-making and explores some alternatives for improvement based on dialogue, research and communication.

The teachers and students participating in *Education to Action* have been applying a participatory regional diagnosis and a Citizen Science project to understand the current water situation in the eastern cape region.

Background

The *Education to Action* program provides scientific information and outdoor experiences on project-based learning to high school students and teachers in the Eastern Cape region. Since the end of 2017, a team of eight teachers and principals from the main high schools in the region have been trained in the Monterey Bay Aquarium to develop science-based projects and BCI had supported them to participate in other professional development experiences with local organizations such as EPI, CIBNOR and Raiz de Fondo.

This group involved the rest of educators and staff from their schools and to date, 350 students have been trained in topics related to sustainability. 24 students have participated in expeditions, 42 students have developed and presented 17 projects focused on the well-being of their communities and the health of their environment. BCI has provided 12 tablets, teaching resources and support. BCI is currently developing a curricular program about sustainability with the support of the Ministry of Education who endorse the program and want to promote it to a broader level in the rest of the State and Mexico.

Context

The link between the school and communities is fundamental for transforming and shape the future of a region. Project-Based Learning is a teaching method that engages students by asking them to research a question, help solve a problem or challenge, and then develop a project to share beyond



the classroom community. Projects may vary in length; some can be completed in a week, others in months or years. They can be done individually, in teams or the whole class.

The problems and situations detected by the teachers and school staff from Santiago's High School that affect the scholar community are:

- Ignorance of water quality
- Lack of availability of fresh water
- Health problems from contaminated water.
- Inadequate waste and garbage management
- Absence of students due to health problems

Goals

Engage students effectively in their learning by asking them to research, provide information, and collaborate in addressing the environmental issues present in the Eastern Cape area.

Based on the principles of:

- Critical reflection.
- Mutual care and reciprocity.
- Solidarity work
- Respect for biodiversity

Specific objective: Determining the impact of the quality and availability of water from the Eastern Cape environment has on the health of the students of Santiago High-school.

Key questions

- The sustainability of water resources *How to achieve the balance between nature, economy, organizational and society?*
- *Where does the water come from?*
- *How much water is available?*
- *What is the quality of water?*
- *What problems are there around the water?*
- *How has availability and its uses changed over time?*

Educational strategy

During the school year students participated in inquiry based activities and field practices in which contents of physics, mathematics, natural sciences, social sciences, geography, philosophy and others were addressed.

The following are some of the activities that they did with the guidance of their teachers:

- 1) Creation of the directory of allies for the establishment of the network of collaborators in citizen science for the



collection and registration of information related to the derived subprojects and the general project.

2) Obtaining information about the students' prior knowledge about water in their region, availability, quality and the effects on their health.

3) Geolocation of study areas, impact areas, location of allies and collaborators participating in the citizen science project

4) Preparation of a catalog of water infrastructure found along the basins of the San Dionisio, Aguacaliente, San Jorge, Santiago, Las Cuevas, San Bartolo, Boca de La Sierra, Miraflores and Caduaño streams.

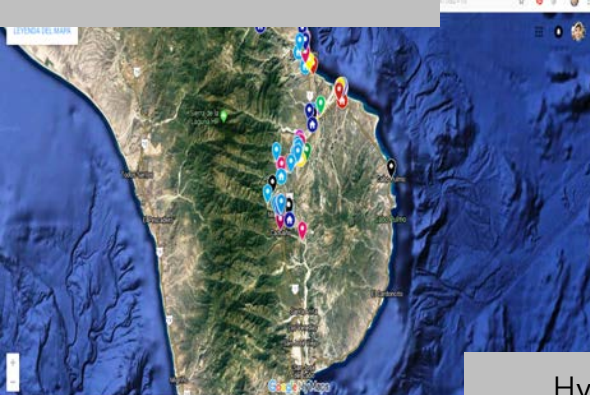
5) Registration of sightings and presence of flora and fauna; concentration and processing of the information obtained using applications for collaborative work and management and dissemination of information.

- Google earth, for geo-location and information gathering.
- Google Drive, for the development of collaborative work online.
- Classroom, to organize, assign, grade and monitor the process.
- Libreoffice, for online editing and collaborative work.
- Socrative, For the application of online surveys and organization of information.
- Aripuka gps, for the design of routes, trails and time and movement studies.
- Inaturalist, for register and consulting the presence of flora and fauna in the study areas.
- E-bird, for register and consulting of the presence of birds in the study areas.

6) Students develop projects in small teams and present them in different community forums.

Example of the data collected:

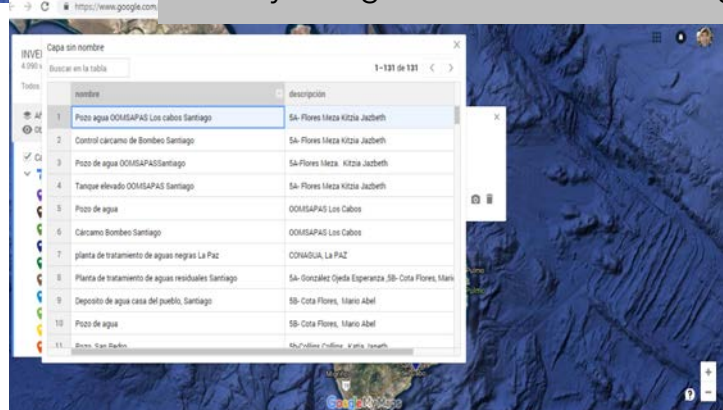
Citizen science allies



Availability of water in different communities

DATO NUMERO	Nombre aliado	comunidad	Comunidad	Ubicación geografica	Otro	pública	Lavapiastos	Lavamanos	Alcaldera	Tinaco
1	Salgado Higuera Carlos Vicente	S	Santiago	23.48911, -109.69927		0.023	0.012	0.034	0.067	0.05
2	Collins Collins Kallea Janeth	LT	Las Tinajas	23.363026, -109.795734	Pozo de agua	0.193	0.299	0.902	0.10	
3	González Collins Mauro	LT	Las Tinajas	23.362989,-109.796668		0.19975332	0.2994011976	0.9921063492	0.4166666668	
4	Almanza Meza Cesar	M	Miraflores	23.369689,-109.775152		0.024	0.030	0.031	0.050	0.081
5	García Cota Jessica Alberto	LB	Los Bariles	23.676159, -109.724580		0.211	0.018	0.042	0.084	0.08
6	Hirales González Diana Luibeth	LB	Los Bariles	23.722926, -109.709628		0.179	0.083	0.028	0.040	
7	Cota Castro Diego Armando	MAT	Matancitas	23.4654970, -109.7290920		0.176	0.133	0.125	0.111	0.105
8	González Garrigla Fabiola Yanelli	LC	Las Cuevas	23.52367, -109.6980		0.108	0.022	0.045	0.037	0.055
9	Cota Cota Yumireyda Myriam		Matancitas	23.467137, -109.727802		0.153	0.078	0.073		
10	Cota González Sofía Jacqueline	EC	El Campamento	(23.5422961, -109.6784620)		0.1087	0.04833	0.02187	0.0214	
11	Cota Silva Pedro Antonio	LR	La Ribera	23.591965, -109.581042		0.133	0.087	0.39	0.83	0.72
12	Díaz Gómez Diana	LB	Los Bariles	(23.6807157, -109.7097630)		0.164	0.092	0.030	0.075	0.040
13	Silva Cota Laura Abigail	LB	Los Bariles	(23.6932059, -109.7108629)		0.157	0.0733	0.028	0.059	0.0362
14	Cosío Cosío Axel Alejandro	B.V	Buenavista	23.6583578, -109.6997218		0.032	0.050	0.012	0.066	0.125
15	Hernandez Santiago Yael	SJ	San José	23.097213, -109.728078		0.128	0.068	0.038	0.84	0.132
16	Márquez Agudés David Alejandro	LR	La Ribera	23.599952,-109.585271		0.111	0.825	0.032	0.058	0.011
17	Silva Mancías Hayton	BV	Buena Vista	23.644536, -109.697999		0.294	0.9469	0.04592	0.04484	0.08312
18	Pobiano Sanchez Ziggy	M	Miraflores	23.345491, -109.780652		0.108	0.02272	0.108	0.03797	0.0555
20	Cosío Marouez Francisco Eduardo	BV	Buenavista	23.660001, -109.700201		0.294	0.9469	0.04592	0.04484	0.08312

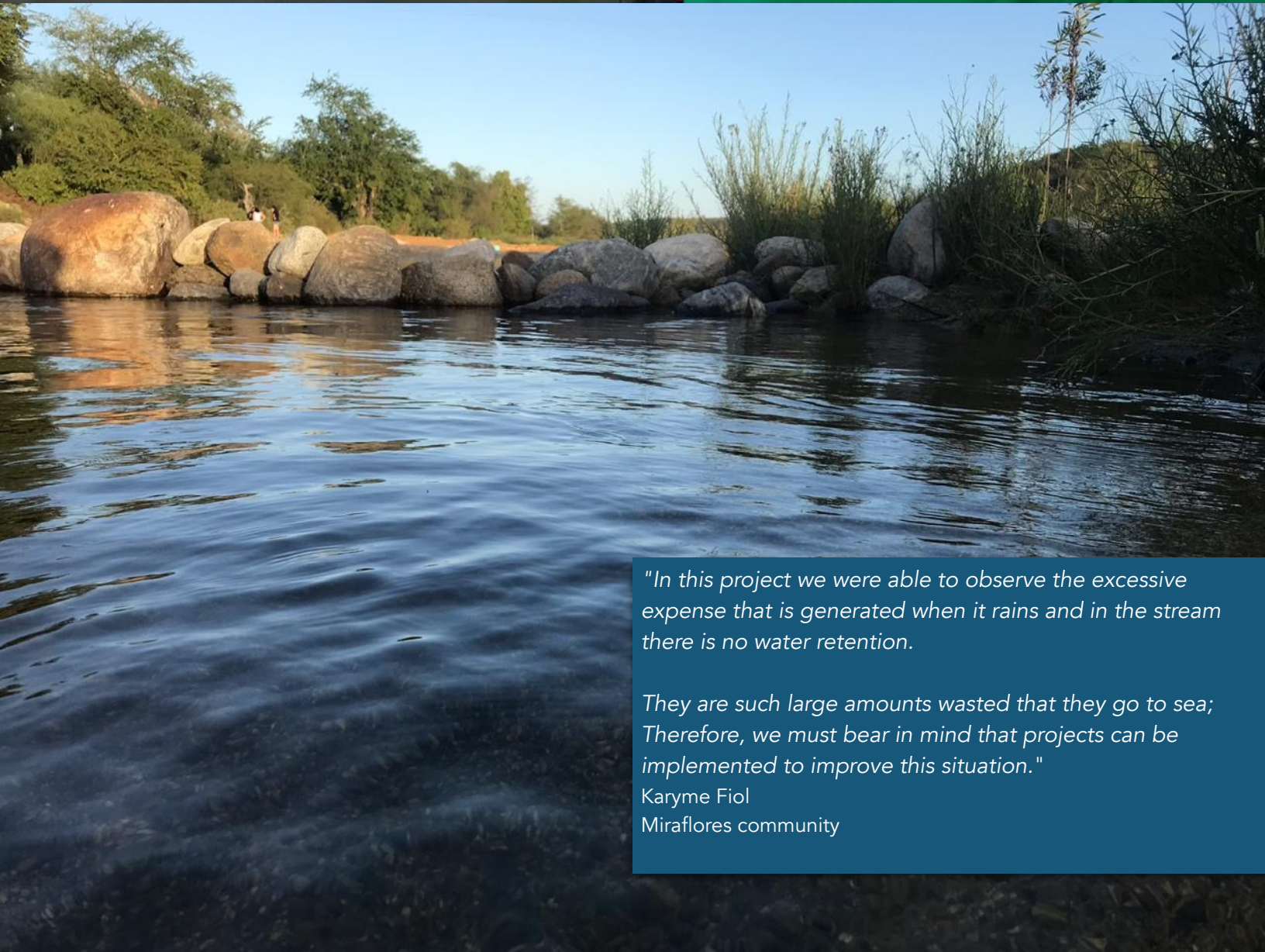
Hydrological infrastructure catalogue





"Thanks to this practice we understand the importance of caring for water. We learned an easy and dynamic way to measure the waste and flow of water from a natural source where we could take advantage of water to meet our needs in the proper way".

Nayeli García
Aguas Calientes community



"In this project we were able to observe the excessive expense that is generated when it rains and in the stream there is no water retention.

They are such large amounts wasted that they go to sea; Therefore, we must bear in mind that projects can be implemented to improve this situation."

Karyme Fiol
Miraflores community

Preliminary results

We learned a lot from the process. Among the most relevant information, it stands out that the majority of the students (65%) consider that the water problems in their community are due to inappropriate use and distribution problems. 20% do not know the origin of the water they use for their consumption and 45% have never taken any action to care for the water.

Besides all the new information that was gather from the region, students developed photo contest about their personal connection with water.

Together teachers and students started a school garden and the Desplastificate campaign and a recycling program.

Some of them developed projects related to water and biodiversity conservation. Projects where shared in their communities during different festivals and in the regional ExpoScience. Some of them traveled to present their projects at the National ExpoScience in other parts of Mexico.



STUDENT PROJECTS IN EXPOCIENCIAS



Gray water collection system and drip irrigation



Filter system



Hydroponic forage



Water level sensor in storage systems



Use of medicinal plants

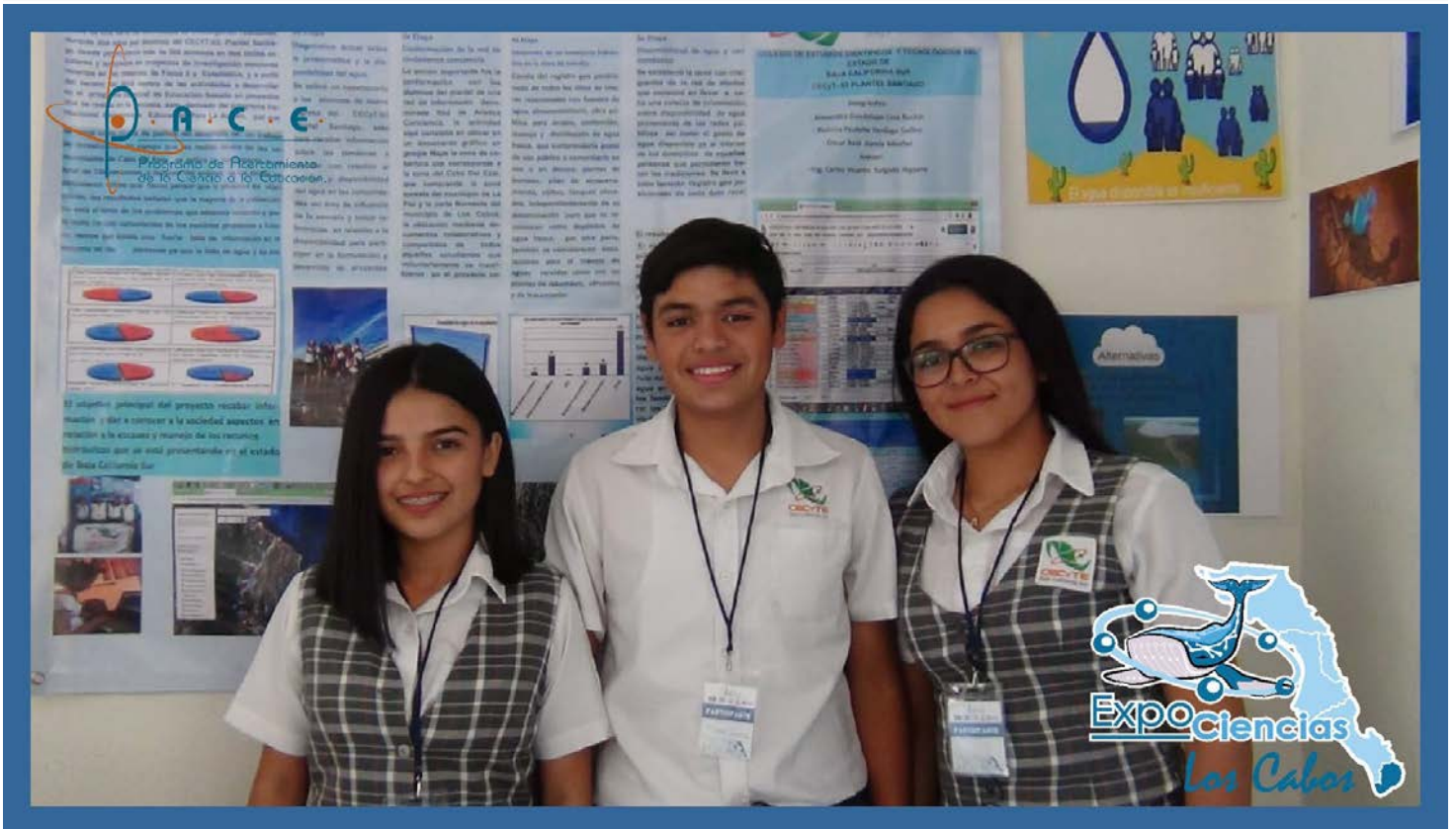


Rainwater collection system

42
17 STUDENTS
PROPOSING
PROJECTS

The Citizen Science project was presented in different communitary forums and was winner of the State Expociencia, reaching the National (Mérida 2018 and Monterey 2019) and the International Expociencias (Chile 2018). BCI is working now with the teachers involved, the Monterey Bay Aquarium and the Secretary of Education in systematize the methodology used in this project so that it can be replicated in other schools.

FIRST PLACE IN BCS EXPOCIENCIAS 2019: STUDY ON THE AVAILABILITY OF WATER IN THE EAST CAPE AREA



Teacher leading: Carlos Vicente Salgado Higuera



Education to Action endeavors that in the near future there's will be more stewards of conservation for a sustainable eastern cape.

*"Tell me and I forget.
Teach me and I remember.
Involve me and I learn."*

B. Franklin



This project was led and implemented by Santiago's highschool (CECYT 03 SANTIAGO) with the support of the Secretary of Education BCS

Rosario Guadalupe Hernández Estrada / Principal

Carlos Vicente Salgado Higuera / Teacher

Ana Luisa Corona Pérez / Teacher

Adriana Avilés Sánchez / Teacher

students and the whole educational and administrative staff that was committed to it

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