

Learning to Take Care of Water — We Are Caring for All Life*

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Abstract: The awareness of environmental challenges today is especially urgent. The human being needs to rethink his way of being and living on the Planet; think about himself from another biocentric-ecocentrism worldview to build paradigms that allow him to live in the Biosphere with another logic, with a sense of belonging and responsibility for caring and not for mastering and submitting things. The knowledge and approach to the environment where we move and coexist is a concrete way to start that path. This is how environmental education becomes a fundamental tool for raising awareness, changing lifestyle and citizen participation that promotes responsible and democratic decisions. The transfer of scientific knowledge in a simple and practical way to the community, will allow us to make the world visible and to watch oneself in it, recognizing people as the protagonist for the care and safeguarding of Life. Water, the nearby aquatic ecosystems, are themes-spaces in favour of these attempts to “stand” with another consciousness in our House that is the World. The school is a privileged area for these proposals that go far beyond the development of specific topics and practices, it is about moving from a critical view of reality towards a re-signification of educational projects at all levels, to train people as protagonists in the construction of a Culture that puts Life at the centre of all human beings and tasks. The didactic guidelines of the work that began 10 years ago in schools in the rural area of Raco (Tucumán, Argentina) and the expansion of the project with teacher training spaces and the participatory formulation of solutions for the environmental problems of the area are presented (bioindication, purification ditches, composting toilets, waste separation). Achievements and difficulties are made explicit.

Key words: environmental education, natural sciences, rural schools, aquatic ecosystems, bioindicators, Argentina, knowledge socialization

1. Introduction

1.1 Motivation-Justification

The awareness of environmental challenges today is especially urgent. The human being needs to rethink his way of being and living on the Planet; think about

himself from another biocentric-ecocentrism worldview to build paradigms that allow him to live in the Biosphere with another logic, with a sense of belonging and responsibility for caring and not for mastering and submitting of Nature.

We understand that we are disconnected from the Earth and the urgent challenge is to set ourselves in it, building an aware ownership. The one is referring to biological beings. This matter, that seems to be evident, is not, at a conscious level, in a large part of the humankind [1]. The proximity and the knowledge about the environment where we transit and coexist is a concrete way to start off.

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Thus, the environmental education makes a main tool to the awareness, the changes of lifestyles and a citizen enrolment and engagement lead to responsible and democratic decisions. The exchange of scientific knowledge with the community in an easy and practical way, will allow to view the world and see ourselves in, recognizing the humankind as a main actor in the care and life preservation. For example, the water, the near aquatic ecosystem and the surroundings are issues and places that promote this intention of existing with another awareness of this world that is our home. The school is a privileged scenery for this proposition which goes further than the mere development of subjects and specific practice, it is about to move on towards a new significance to the educational projects, in other words, rethink the education in all levels, to train capable people for protagonism in the development of a culture that locates Life in all human beings and their affairs.

Our main aim is socializing those things that we know from science we perform, and share this knowledge in poor and rural areas. At the same time, we try to motivate and encourage teachers to transmit to their students a variety of tools related to bioindication, river forest restoration, forest greenhouses, and the handling of urban solid waste, and mainly general environmental issues. Doing this from a point of view that see us as a FRAME; a FABRIC, interdependent with all the livings, capable of care and compassion.

1.2 Social Context

The working place is a mountainous area characterized by a subtropical weather with wet summers. The access to the different zones is relatively easy due to the national and provincial routes, two of them are in a good state: the highway to Salta Province (RP 341) and the route to San Javier (RP 340).

In the project area there are 13 State Schools, with a total of 2.279 students and 232 Teachers. The educational population belonging to this zone occupy a

vast area in the North west of the province, in the foothills and mid-mountain in the Northwest of the province in Los Nogales, Las Cañitas, El Cadillal, Ticucho, Tapia, Vipos, Choromoro, San Vicente, Chuscha, Raco, San José de Raco and Sambón Towns.

Many of the inhabitants of the zone do not fulfil all their basic necessities, depending on social aids and temporary jobs during summer seasons like gardening and house work.

In addition to this, the young immigrates to the cities in the search for better working opportunities. A great deal of population work in the agricultural sector growing and harvesting vegetables, in the care of cattle and production of bovine meat, milk and cheese.

The educational level is quite diverse. Most of the adults have not attended or finished the High School and only some of them have finished the Elementary School.

The land ownership is precarious, located in the river banks, being public lands, they do not belong to them legally. Moreover, several families had to leave their houses because of the intense causing floods rains that destroyed their shanty living places.

It happened in all the Centre and North of the country and some new neighbourhoods for these families are being developed and built.

Furthermore, there are high rates of parasites and skin condition diseases as the result of poor hygiene conditions. One of the reasons for this is the lack of toilets, a main matter of our concern, on what we are working to give some kind of response. That is why we are starting off with some of the most urgent cases (all of them are important but some of them deserve a faster answer). For example through the development of a dry toilet building workshop where they learn how to frame and make the dry toilets work, supplying them with the necessary materials.

In Raco there are three zones where we know people are affected. In Yerbabuenita stream (3-4 families), in Raco river near La Toma (more than 5 families) and more than 15 families in La Quebrada.

Regarding the construction of dry toilets, we have started the setting up of one in Provincial School No. 107, with the aim of promoting this possibility in the zone. The idea is to invite every member of the family to work in the process of setting up and to make them undertake in the correct handling of the toilet. The volunteers are expected to cooperate but we are looking for each family actual commitment.

1.3 Objectives

- To build awareness in the community about the values of natural ecosystem goods with special stress in the water that impact significantly on people and community quality of life and the current possibility of sustainable use and preservation.
- To understand that the imposed model by the system of consumption is unsustainable, to discover its fallacies and how many times the educational system can be at its service.
- To encourage teachers to initiate a useful awareness path in the care, protection and preservation of Natural goods.
- To incorporate the nearby river, the streams and banks to their everyday universe.
- To understand that the community is the actual owner of the natural goods and therefore they must preserve and take care of them.
- To learn the aquatic organisms, wild flora and fauna related to the water currents as part of the inseparable ecosystem where we live. Value and understand them as indicators of ecological quality.
- To handle a simple biotic index (IBY4) Yungas Biotic Index in Spanish. And recognize its four main protagonists taxa [2].
- Identify the kind of polluters present in the area.
- To give teachers theoretical tools to fulfil the activities on environmental education with their students.

2. Methodology

Field work with Primary School Students, outings to nearby stream areas, landscape observation, collecting material and later doing classroom work, recognizing, classifying and identifying species with the help of a magnifier.

Talks-Meetings with different groups to give basic information about the issue.

Simple use of charts and forms about the living beings found, invertebrates for example and the registered observations.

Monitoring of the river pollution situation according to IBY4.

Guidance to teachers' planning in these issues.

Use the site offered by our institutions to share the information with the community in this matter.

Building of a native trees forestry greenhouse and promote the development of it as part of the activities performed by teachers and students.

Recovery of the community knowledge where the school is located remembering the past landscape through talks, surveys and meetings with older adults, working with the children the importance and relevance of the place where we live existential memory.

3. Results

3.1 Performed Activities

-Visits to the nearby rivers. Watching and describing with simple words the surroundings and making questions.

-Sample collecting and observation with the magnifier, identifying with the popular and scientific name and level of organization.

-Ambiental quality evaluation through the presence of indicator organisms both aquatic and terrestrial.

-Chart designing with the biotic index (IBY4) for the children's water evaluation according to the organisms found. This is part of the school monitoring of the ecological stream health.

-Identifying direct and indirect polluting superficial water factors. It will be tested the knowledge and the community actions on the hydric goods.

- Greenhouse Farming with native trees in the school orchard to have renewable that will be used in the educational and awareness event with the community.

-Teachers courses with point concession and workshops about associated issues lecture by group members.

-Performance by a Switzerland actor (mime) who visited the schools with his family and performed two plays for children and adults which showed the relevance of Nature care. This artistic space was really appreciated by the educational communities.

3.2 Achievements

Meetings and workshops: Since the end of 2008

teachers have accomplished several meetings in schools (see Fig. 1 with the monitored rivers by each school). Some of them took these activities as main point in their planification, and since 2013 we have been making weekly meetings (Gaspar de Medina School in San Jose de Raco) and since 2015 monthly meetings in Provincial School n° 107 in Raco. As a result of this work the total number of students in each school from kinder garden to sixth year performed at least one educational outing to the rivers (in general each year went out more than twice a year). In other cases, with smaller schools (multilevel) the outings were made with the whole scholars once or twice (La Toma School in Vipos and San Vicente School) either once of some of the grades (Chuschas School, El Cadillal School and Yerba Buena School).

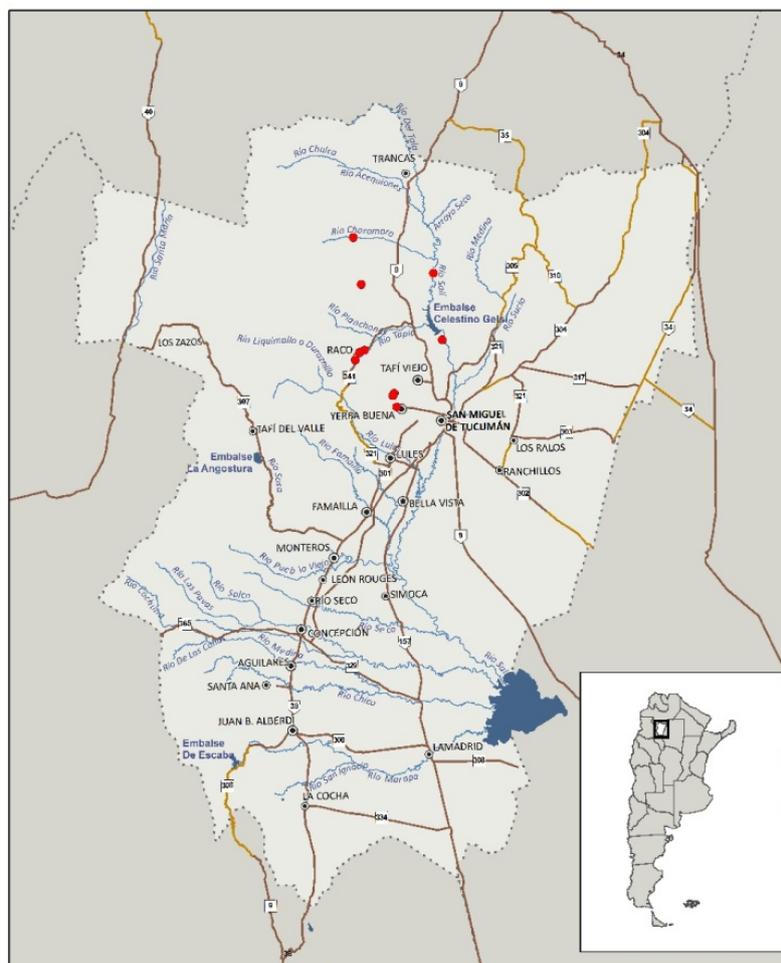


Fig. 1 Map of Tucumán (Argentina). Red dots indicate schools that worked in the program.

As part of an ongoing work [3], limnologists and psychologists made a survey aimed at two different schools' children (Gaspar School where talks and outings have been made and school n° 107 where they have not). The result of the survey showed attitudinal changes related to the river and an appropriation of concepts related to this ecosystem, above all the groups that accomplished at least one fieldwork. And it was evident a prevention attitude. On the other hand, the groups of students who didn't assist the workshops always related negatively the presence of insects and tree leaves in the rivers when they are actually indicators of good environmental qualities; the opposing students' attitude (even it is positive) was to remediate the problems instead of prevent them.

It is important to point out the positive impression made by the practical activity in the river with the direct learning of the biota and the processes that acting in the environment. Clearly the same result wasn't obtained about the learning and communion between the school children and the studied matter (water quality and aquatic biota) when the activity was performed in the field (direct experience) than when it was performed in the classroom (in a more theoretical way).

In the most frequently visited schools (Raco and San Jose de Raco) other activities were added. Apart from the river monitoring, the following activities we carried out: waste sorting, native trees greenhouse, tree plantation around the school and orchard. Some practical workshops about using and handling of microscopes and magnifiers as didactic resources in the teaching of the natural science were conducted.

3.3 Difficulties

There is no adequation in the educational system for outings of the school classes. Leaving the school even to walk around the square requires the teacher made a folder with parents' authorization, justifying the outing and school insurance. All this can stop the performing of these activities related to nature.

The completion of the workshops and the teaching of the children require a constant effort from the trainers. In general, very few teachers keep on the thematic without the support of the trainers.

The teachers are not prepared for using of lab and optical material in general. At schools there are magnifiers, microscopes and others things for studying natural science. However, they are not exploited as didactic resources.

3.4 Project Extension (*Dry Toilets, Teachers' Formation and Perfecting Courses-Workshops*)

3.4.1 Dry Toilets

(1) Objectives

- a) Giving answer to a basic necessity as it is the existence of a toilet in the house.
- b) Improving people health, especially of those children presenting different health problems related to the lack of sanitation (parasitosis, recurring diarrhoea).
- c) Encouraged adult's commitment towards the responsibility of improving their life quality.
- d) Teaching to build and handle a dry toilet.
- e) Require the commitment of each family to provide the labour themselves in a way that this practice contributes to value and care what is own.
- f) Empower the personal and collective development of the people who participate, promoting the basic capacities, the creative expression, the coexistence and tolerance.
- g) Performed activities

Two informative meetings were carried out (Raco and San Jose de Raco schools) with parents introducing the project of dry toilets. The building of a dry toilet in Raco school was started with the aim of educating and promoting this type of technology. More over some visits were made to design the toilets for four families who were interested in them.

(2) Difficulties

The dry toilets, very different in their using in comparison to the traditional one, are not easily accepted. It is because it requires users' change of habits which have been fixed in them since their childhood. The unfamiliarity about the working and the fears of smells, etc., can be motives that explain how hard the tries have been; persisting even after the workshops and explaining talks. It is deducted that it is not the reasonability of using a dry toilet but the habit what guide the families and even made them prefer the lack of a proper toilet by the poorer families.

3.4.2 Teachers' Training Space

(1) Objectives

- a) Raise awareness among teachers about the environmental emergencies and the necessity of signifying the educational projects based on socio-ecological challenges where each school is involved.
- b) Suggest and cooperate with the teaching community to incorporate the Ecology Natural Science to the annual school planning.
- c) Highlighting the importance of holistic-interdisciplinary approach in the teaching work (horizontal and vertical link contents, reformulating from the signification of contents in the subjects and levels; recovering of the knowledge and the community feelings related to the ecology where the school is involved.
- d) Offer training workshops in associated issues to the teachers.

(2) Performed Activities

In February 2008 we started a three days workshop, with points for Racó school teachers (Gaspar de Medina) what inspired and started the way that we are in, this received the name of Ecology, the urgent raise of awareness, in charge of Daniel Emmerich. Since then, supporting and constant monitoring have been performed in two schools (Racó and San Jose de Racó), backing and advising the process started on Environmental Education.

From April to June, 2014 a 90 hours Learning course for initial, primary and secondary school teachers and head teachers approved by Tucumán Province Ministry of Education (res.1805-2013) was dictated in cooperation with the Natural Science Faculty of the Technical National University. There were also shorter workshops (4 hours) concerning different teaching subjects immerse in the big universe of the teachers' environmental challenges, rotating in different schools. The ones specifically about biological indicators, were made twice in La Toma de Vipos, twice in San José de Racó School and once in Los Nogales.

In February 2015 a two days workshop took place in Gaspar de Medina de Racó, with the participation of El Siambón School, about the annual planning and its resignification from an ecological point of view, as it is posed, and the horizontal and vertical linkage of contents.

During this year 2018, as teachers had requested, we have started some short and practical workshops about the handling of optical instruments in the classrooms.

(3) Difficulties

The constant teachers' training in workshops need a formal framework with permits emitted by hierarchical structures (supervisors, secretaries, ministry). This regulatory framework takes time and the permits are only temporal and must be renewed every year. In the practice they cannot be performed, so we tent to give the workshops informally without the proper recognition for the teachers' curriculum.

The attending to workshops depends to a great extent on each school headteachers' dispositions, and many times teachers are motivated by themselves to do the courses.

4. Conclusion (A Look Towards The Way...)

The matter has been, till today, finding ourselves in the common task of caring and preserving The Earth, our home. The *Homo sapiens*, as a species capable of transforming the facts, has pressed with a singular depict the biosphere in the last 200 years, in a race that

seems not to have limits. The self-understanding as interdependent beings, as cohabitants with the rest of the living universe, will replace us existentially with other paradigms. As Boff said [4]: “We must go from the conquer paradigm to the care paradigm”. We, the ones who are in the academic world, knowledge generators, cannot ignore the urgency of reviewing our role in this present time, as it was clearly expressed by José Mujica [5]: “*There is no future without committed intellectual*”. Going out to meet the society, to which we belong, and specifically to the formal educational spaces that this owns, is to start the dialogue with it, with its knowledge (which is ours too) and fulfil what Chevallard [6] calls Didactic Transposition which means: humbly help to build, from the academic knowledge, a didactic conversational one, a know how to understand the humanity (*Humus humilis*) as an existence that place de life in the centre and find us questioning the excessive anthropocentrism that leads to an inexorable and unsustainable future for us, for our biotic friends, and for our landscapes [1]. The living beings in fact have preceded us for billions of years and they have never needed us, however, they haven’t broken the bond and turned us in to a Frame with all that exist. The rational and emotional capacity that appeared with species evolution giving origin to us, should take us to recover the fraternal link with the biosphere and the ancient knowledge that lead us to the well fare living.

Finally, paraphrasing the great pedagogue Paulo Freire [7], literate us in the things is not to learn to repeat words, it is to build our owns, the common ones, the vital words -actions, without fallacies. Words and options that finally decolonize us, that put us in

dialogue among us and the nature and free us from a fatal destiny that seems not to have a turn back. We believe that build a relational paradigm from the beautiful epithets (human = humus) will be the only way of learning to live and coexist.

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References

- [1] Emmerich, Daniel, Hermana Madre Tierra. Ecología desde una mirada franciscana, Fundación Franciscana Argentina, Ciudad Autónoma de Buenos Aires, 2015, p. 64.
- [2] D. A. Dos Santos, C. Molineri, M. C. Reynaga and C. Basualdo, Which index is thebest to assess stream health? *Ecol Indic* 11 (2011) 582-589.
- [3] H. R. Fernández, Carreras P., Dos Santos D & C Molineri, unpublished results.
- [4] Boff Leonardo, Paradigma del cuidado, 2003, available online at: <http://www.servicioskoinonia.org>.
- [5] Jose Mujica (President of Uruguay), Welcoming words to Dr. Noam Chomsky previous to the conference dictated by him in Montevideo Municipal Townhall on the 17 July 2017
- [6] Chevallard Yves, La transposición didáctica: del saber sabio al saber enseñado, Tercera edición, Aique, Buenos Aires, 2005.
- [7] P. Freire, Pedagogía de la esperanza: un reencuentro con la pedagogía del oprimido, Siglo xxi, 1993.