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Three planned experiments in environmental education in rural sectors of southern Chile

Andrés Muñoz-Pedreros [I]
Jorge Pantoja [II]
Ximena Morandé [III]
Patricia Möller [IV]
Jorge Morales [V]

Abstract: Environmental education (EE) must be carried out following a permanent programme, and should be a source of inspiration to encourage the incorporation of an 'environmentalist' line in other cultural and educational materials. EE has developed in Chile since the 1970s, but slowly, and unconnected with three important actors: the State, the universities, and non-governmental organisations. We implemented an EE programme across a set of other programmes (e.g. rural development, wetland management, biodiversity, and biological pest control), with the following objects: (a) to develop applied research in the field of EE; (b) to produce teaching materials; (c) to develop formal and informal training in EE. The object of the present work is to present three planned experiments in environmental education carried out since 1991 in different ecosystems and with different social actors.

Keywords: Environmental education, methodologies, planned programmes, rural areas, Chile.

[I] *Núcleo de Estudios Ambientales NEA, Departamento de Ciencias Ambientales, Universidad Católica de Temuco, Temuco, Chile*

[II] *Programa de Educación Ambiental, Centro de Estudios Agrarios y Ambientales CEA, Valdivia, Chile*

[III] *Programa de Educación Ambiental, Centro de Estudios Agrarios y Ambientales CEA, Valdivia, Chile*

[IV] *Programa de Educación Ambiental, Centro de Estudios Agrarios y Ambientales CEA, Valdivia, Chile. Centro de Humedales Río Cruces, Universidad Austral de Chile, Valdivia, Chile.*

[V] *Programa de Educación Ambiental, Centro de Estudios Agrarios y Ambientales CEA, Valdivia, Chile*

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Introduction

Environmental Education has been defined as: *the result of a re-orientation and coordination of various disciplines and experiences to facilitate an integrated perception of environmental problems, allowing more rational action capable of responding to the needs of society* (UNESCO; UNEP, 1978). In Chile, Law 19.300 defines Environmental Education as: *a permanent, interdisciplinary process intended to: educate a population able to recognise values, clarify concepts and develop the competences and attitudes necessary for harmonious coexistence between human beings, their culture and the surrounding bio-physical medium*.

After repeated attempts to place EE in an integrating context, three decades ago the world recognised that EE is only one of the possible ways of achieving the objects of environmental conservation (IUCN, 1980). It is not a branch of science or a subject that should be studied and taught separately. Consensus exists that EE must be carried out following a permanent, integrated programme, and should be a source of inspiration to encourage the incorporation of EE in other sociocultural and educational materials.

EE in Chile has developed slowly, and unconnected with three important actors: the State, the universities, and non-governmental organisations. The lack of interest in promoting EE appears to result from the post-modern paradigm that permeates a part of Chilean society, and the dominant development model which relegates environmental matters to a secondary role (SQUELLA, 2000; MUÑOZ-PEDREROS, 2014). The golden age of EE occurred during the 1970s and 80s; since then, it has been seriously questioned, following proposals for its reconceptualization. For example, in the United Nations *Agenda XXI*, issued by the UN Conference on Environment and Development in Rio de Janeiro in 1992, the term Environmental Education is replaced by Education, Training and Public Awareness (GONZALEZ, 2001). Later, in 1995, UNESCO terminated the International Environmental Education Programme and tried to replace it by Education for a Sustainable Future, as discussed in the International Conference on Environment and Society: Education and Public Awareness for Sustainability, held in Greece in 1997. These proposals were confirmed in Johannesburg in 2002 at the World Summit on Sustainable Development, at which the United Nations Decade of Education for Sustainable Development (2005-2014) (UNESCO, 2006) was announced; this established the term Education for Sustainable Development. However, many environmental educators continue to use the concept and the term of EE (see BRAVO, 2012). There is consensus in Latin America in linking the environmental crisis with the dominant development model, which assigns to the environment the role of provider of raw materials through unsustainable exploitation of natural resources (see BIFANI, 1997; GLIGO, 2006). For further information on the concepts, history and perspectives of EE, see Gónzález (1997, 1998), Caride and Meira (2001) and Hernández and Tilbury (2006).

Experiments in EE in Chile are carried out mainly by NGOs which have known about, practiced and developed informal environmental education since the end of the 1970s, and by social NGOs which vigorously promote popular education in marginal population sectors. These organisations have an abundance of magic, creativity and emotion, but they lack systematisation and – what the universities could supply – information. Very

few NGOs systematise their results; their projects and programmes depend on their funding sources. The NGO proposes, but the donor (now called the mandator) disposes, and NGOs are at the mercy of the fashions which dictate the issues which the international agencies want to fund (for exceptions see for example ROSALES *et al.,* 1996; ITURRIETA, 1998; MÖLLER; MUÑOZ-PEDREROS, 1998; MUÑOZ-PEDREROS, 2017).

We applied an EE programme across a set of other programmes (e.g. rural development, wetland management, biodiversity, and biological pest control), with the following objects: (a) to develop applied research in the field of EE; (b) to produce teaching materials; (c) to develop formal and informal training in EE. The object of the present work is to present three planned experiments in environmental education carried out since 1991 in different ecosystems and with different social actors.

1. Environmental education in an estuary with artisanal fishermen

We executed a rural development programme starting in 1988, with components that included projects in aquaculture, cooperativity, wild fauna and restoration of native forest. Formal and informal EE was a line applied across all the projects. The programme was carried out in four fishing creeks in the Valdivia River estuary and Corral Bay (now Los Ríos Region, Chile), between 1991 and 1999. The target population consisted of teachers, pupils, and parents of rural schools; the majority of the families lived by artisanal fishing (MUÑOZ-PEDREROS *et al.* 1991).

The environmental problems in the study area were: (a) over-exploitation of hydrobiological resources; (b) biological contamination by discharge of sewage from the city of Valdivia; (c) forest monocultures that reduced biodiversity, the availability of fresh water and firewood, and caused deterioration of the visual landscape; (d) invasive species (e.g. gorse *Ulex europaeus*). The main causes of these problems were the existence of an economy based on unsustainable extraction of hydrobiological resources, the loss of native forest, and lack of adequate treatment of urban sewage (CEA, 1988). In 1986, only 5.9% of the artisanal fishermen were organised (e.g. union members) (Muñoz-Pedreros *et al.* 1991).

The general object of the programme was to improve the quality of life of the inhabitants of the Valdivia River estuary, using existing resources and respecting the interests and cultural elements of the beneficiaries. The actions undertaken to achieve the object were: (a) train rural and urban teachers in environmental education; (b) develop locally adapted teaching materials for formal and informal EE (e.g. textbooks, manuals, books, posters) and supply them to teachers and schools; (c) stimulate the participation and organisation of the artisanal fishermen in unions and cooperatives; (d) train the artisanal fishermen in aquaculture and the management of natural resources to reduce the extractive pressure on the hydrobiological resources of the Valdivia River estuary.

Methodology of the intervention

Diagnostic studies of the physical-biological and socio-economic resources of the study area were carried out between 1986 and 1988 (CEA, 1990); these showed that rural teachers worked in a medium where the quality of life was low, characterised by economies guided by a short-term, extractive mentality. The pupils reproduced this pattern due to their lack of education related to the local situation, and the unavailability of pedagogical and didactic resources addressing environmental topics. The proposed future model was for rural production based on sustainable, more mutually supportive economies, with pupils at a school that incorporated productive activities and EE. This would facilitate comprehension of local environmental problems and motivate solutions developed from an organised base. The methodological flow is shown in Figure 1

Figure 1 here

Strategy

The strategy of this programme was to work with the teachers at both formal and informal levels: (a) Formal EE. Theoretical-practical courses (accredited by the Education Ministry) were developed to teach concepts, procedures and techniques in order to train teachers to develop environmental activities in their work. The practical activities were carried out on the seashore and river-banks, in forest regenerations and parks, etc. The face-to-face classes and the programming were agreed in common with the participants, including weekly classes and intensive residential courses. A preliminary version of a textbook was handed out in each course; this was validated by the teachers and finally corrected and printed. It was subsequently made available to the teachers and in the libraries of all the schools. Some teachers took a postgraduate course in environmental education in the Catholic University of Temuco, under a specific agreement with the programme. We structured the curriculum in three areas: one was based on nature (excursions to observe fauna and flora, different aspects of ecology), the second was pedagogical (theoretical and practical EE), and the last addressed environmental management (conservation of natural resources, sustainable development and formulation of education projects); (b) Informal EE. Short training workshops, talks, campaigns, posters, radio programmes, conservation clubs, etc. were organised. They all focused on a single topic, which changed annually (e.g. in 1993 it was marine resources, in 1994 wildlife, in 1995-96 native forest and in 1998 theatre and environmental education). In this way we tried to develop a local EE programme linking three actors: non-governmental organisations/the State/universities.

Principal achievements

We developed an environmental education module that included four themed books, three videos, 12 educational pamphlets and two teaching posters. We trained 45 artisanal fishermen in union organisation and in conservation of natural resources; and 35 rural teachers in specific environmental education courses (in both cases 100% of the

target population).

From the organisational point of view, we participated directly in the creation of eight artisanal fishermen's unions, a fishermen's federation (FIPASUR), a marine production cooperative, a citizen's association for the environment and three children's conservation clubs. Organisation of the fishermen (percentage in unions and/or cooperatives) rose from 5.8% in 1986, to 31.9% in 1989 and 38.4% in 1991. We assisted in the bureaucratic procedures for 13 marine concessions, and developed four technical training courses.

Evaluation by sector

Artisanal fishermen. Enrolling the fishermen in unions and cooperatives, when for decades they had been used to working individually and with a sort-term outlook, triggered new conflicts (e.g. power struggles, envy, authoritarianism) which threatened the existence of the organisations (more than once). Some of the beneficiaries found it hard to adapt to the change in mentality (from extractor to farmer). Despite this, shared interests prevailed; and 27 years later (2020) the majority of the artisanal fishermen are union members and operate marine concessions and management areas. One group works as a cooperative.

Rural teachers. Their enthusiasm was striking; however, there were two critical factors: (a) their very low salaries, which motivated them constantly to seek new, better-paid jobs; (b) the bureaucracy of some services provided by the Education Ministry, which made accreditation of the training courses slow, tedious and sometimes intolerable; (c) the scarcity of facilities of the immediate authorities. A similar situation was detected among the teachers of urban schools that participated; furthermore, most of the schools raised obstacles when the teachers wanted to carry out activities outside the classroom (e.g. they needed the permission of the parents/guardians or of the head teacher). This constituted a barrier to EE activities.

We also found that when we offered training to the schools, even though it was free, the information was not always passed on to the teachers. The head teacher sat on it.

Most of the teachers did not work with up-to-date study programmes. They repeated the same contents throughout their professional careers; some used study programmes that were ten years old. There was no effective way of updating the programmes and putting them into practice.

The openness of the head teachers to non-governmental institutions varied between schools. In some cases, it could not have been better; in others it was bad. This was a key factor, since if the head teacher did not support a programme or project, very serious difficulties arose. It is better to work with schools directly at a higher level. The vertical nature of authority in the school can do a lot to support a rural teacher who feels unprotected. Town mayors are also vital actors; in general, they raise few objections, and they normally support initiatives of this kind. It is a good idea to always invite them to functions and ceremonies, since if they see the potential to win votes, the programme will get over the hurdles.

When we evaluated the education model, the learning process involving the teachers turned out to be mutual, since the members of the work team gained a direct insight into how rural and urban primary school teachers live and work, the problems that they have to face every day, and their willingness to enrich their professional training with environmental matters.

Lessons learnt

Well-considered cooperation with local organisations. We recommend great care in working with local organisations (at least in southern Chile). However good the intentions of NGOs, they very easily fall into paternalism. When the project or programme is running, groups appear that show little motivation, but they are the first to complain when the NGO pulls out. The role of each kind of organisation must always be made clear. An NGO cannot be the voice-piece of local organisations, or become their technical team. Its role may be to coordinate action, decode information, act as a facilitator, etc. It must never be forgotten that every organisation has its own dynamics, leaders, weak points and interests (declared or otherwise).

Flexible study plans. Rural schools exist in a medium potentially rich in opportunities for sustained EE activities. The study plans must be sufficiently flexible to allow the teacher to complement or enrich them with contributions directly related with the local reality, since EE must by nature be specific and concrete.

Adapted teaching materials. Teaching materials are required that can be used on an everyday basis. The official material issued to schools was – and remains almost three decades later – unrelated with the environmental and cultural context. Rural schools located on estuaries and seashores required, and require, material that treats of this type of environment, and in particular the natural resources involved in local production systems.

Permanent teacher training. Rural teachers need to be trained to make creative use of the possibilities offered by the local medium, transforming them into enriching resources for the educational experience.

Conclusions

We made a decisive contribution to the transformation of artisanal fishermen into organised marine farmers, reducing the pressure on the hydrobiological resources of the Valdivia River estuary. We developed didactic material for EE, validated for the training of rural teachers (and still in use, in updated form, 29 years later), designed through collective praxis in the classroom and making use of the experience accumulated in NGOs.

2. Environmental education in wetlands with teachers and pupils at rural schools

Within our wetlands programme we have carried out several projects in wetlands associated with the Cruces River, the first Ramsar site in Chile. We also included private land within an area of influence of three kilometres from the principal navigation channel, and emerging land represented by eight islands.

The northern part of the area belongs to the District of San José de la Mariquina, and the southern part to the District of Valdivia (Los Ríos Region, Chile). The area includes important natural, historical and cultural resources, notably the colonial fort of San Luis de Alba, religious festivals to celebrate the Virgin of Candelaria and Saint Sebastian, and the local customs and products fair of Punucapa. We ran projects and prepared publications in this territory to improve wetland management and development initiatives for sustainable use. Formal and informal environmental education was applied across all these efforts.

Although we had developed formal EE training for teachers since 1988, we had never participated in a curriculum innovation plan. This opportunity arose out of new rulings by the Chilean Education Ministry. The curriculum reform promoted by the Education Ministry in 1996 allowed schools and colleges to draw up their own educational plans and programmes, to give pupils an integrated education that is directly related with the world they will live in as individuals. In this reform, however, environmental education is addressed only through a few basic, across-the-board objectives (Objetivos Fundamentales Transversales – OFT) and through some of the compulsory minimum educational objectives and contents for the sub-sector, such as 'Understanding of the natural, social and cultural medium', in first year primary, and 'Understanding of nature' in second year primary.

Schools located in the area spent a decade in developing a rigid curriculum, in accordance with the textbooks provided by the Education Ministry that did not necessarily reflect the reality and the environment experienced by the pupils; they therefore fail to make use of this educational potential. This is in a context where the teachers responsible for schools had been working in the local area for a long time, in some cases more than 15 years, and so had acquired personal experience and knowledge of the wetland environment. However, they had no means of incorporating this knowledge into the formal school curriculum; they therefore repeated the traditional pattern of teaching, relegating the integration of their pupils into the environment to a secondary level. Our object was to design, implement and evaluate curricular innovation in five rural schools sited close to the Cruces River wetlands.

Methodology of the intervention

The fact that they are inserted in an environment highly valued for its natural beauty, and of natural, historical and cultural importance, offers schools located close to this wetland environment an enormous educational potential (MUÑOZ-PEDREROS, 2003, GÓMEZ-CEE; MUÑOZ-PEDREROS 2004; MORALES; MUÑOZ-PEDREROS, 2004; MUÑOZ-PEDREROS; QUINTANA, 2010). Promoting the value of these resources in the community implies giving people the tools for active, responsible participation ori-

ented towards sustainable use. School is a suitable framework for directing actions in line with environmental education. It offers the methods and tools required for the process of promoting new values and attitudes with respect to the environment in individuals and social groups; from a broader perspective, this can be seen as a complex dimension of education generally, addressing the pupils' conceptions of education, environment, social development and environmental education from different points of view (SAUVÉ, 2003 a, b).

Five locations were selected to the west and north-west of the nature sanctuary that embraces a parge part of the wetlands. Each location had a multigrade primary school covering years one to six of primary education. Curricular innovation focused on primary levels 1 (years one and two) and 2 (years three and four). All the schools had only a single teacher, although the number of pupils varied (for more details see MÖLLER *et al*., 2006).

Strategy

Curricular innovation followed the Educational Improvement Method (see AND-AUR, 1997). Before starting work on curricular innovation, we applied a questionnaire to both pupils and teachers to determine their level of knowledge about, and their attitudes to, the wetland. One of the objects of this survey was to use the results as guidelines for our activities and for designing the curricular innovation proposal. The questionnaire was self-administered and comprised a series of closed questions with non-exclusive, multiple-choice answers. To assess the levels of knowledge of pupils and teachers, non-exclusive, multiple-choice questions were included intended to measure their knowledge of the fauna, vegetation, and uses of wetlands.

A majority (>65%) of the pupils recognised as wetlands those types traditionally considered as such (e.g. marsh), but only 46% considered rivers as wetlands, and only 43.7% estuaries. In the uses of wetlands, the only possible economic option recognised was tourism; 9.3% considered waste disposal to be a possible use, and 25% sewage disposal (MÖLLER *et al*., 2006). The teachers displayed a higher level of knowledge, but with serious gaps in their knowledge of wetland functions and characteristics. The perception found was mainly positive in both pupils and teachers, although the latter disposed of liquid waste and rubbish along the edge of the wetland.

To put the innovation into practice, the teachers were provided with: (a) a set of educational materials consisting of a guidebook on wetlands and environmental education, a video and 12 educational pamphlets for each pupil; (b) the environmental equipment of the project to develop this innovation was also used, especially an information stand about wetlands which included interpretative panels and a diorama of the Cruces River wetlands; (c) practical training in environmental education. The methodological flow is shown in Figure 2 and the open display stand in Figure 3.

Figure 2 here

Figure 3 here

We worked with each teacher individually to incorporate the objectives of environmental education into the formal curriculum; this allowed us to support the teacher directly in classroom work and operationalise the contents addressed in the workshop. In this way the pupils worked directly with the new material designed for the curricular innovation.

Principal achievements

The innovation was based on the OFT proposed by the Education Ministry in the compulsory curriculum: *(a) teach and educate the new generations completely for peace, respect for biodiversity and life in equilibrium with the environment; (b) provide elements for a strong cultural and environmental identity; (c) promote the knowledge necessary for responsible and supportive participation in the conservation of the environment*. Thus, all the activities proposed for implementation in the classroom were directed towards reinforcing the attitudes of the pupils to the wetland as an ecosystem.

The innovation was successful, as 80% of the teachers introduced the innovation according to the school calendar and 100% considered that they had achieved the educational objects more quickly and easily with the curricular innovation; 100% of the teachers also considered that the objectives and contents of the teaching material delivered were appropriate. All the teachers used the wetland as a teaching resource, carrying out activities directly in the ecosystem and incorporating new strategies in the classroom. All the teachers recognised that learning and the achievement of educational objectives are increased when the contents are contextualised, and the objectives and activities of environmental education are incorporated into the curriculum. The necessary starting point for this is a clear diagnosis of the teachers' and pupils' knowledge of, and attitudes to, innovation.

As a research team we have continued to collect and systematise information on the Cruces River wetlands, which we have published in scientific reviews and two books: one a guide to the wetland and the other a book on environmental education and wetlands (MUÑOZ-PEDREROS *et al*., 1993; MÖLLER; MUÑOZ-PEDREROS, 1998; HAUENSTEIN; FALCÓN, 2001; SANHUEZA, 2002; HAUENSTEIN, 2004; GÓMEZ-CEE; MUÑOZ-PEDREROS, 2004; MUÑOZ-PEDREROS, 2004; MORALES; MUÑOZ-PEDREROS, 2004, MÖLLER *et al*., 2006; MUÑOZ-PEDREROS; QUINTANA, 2010; MUÑOZ-PEDREROS *et al*., 2012).

Evaluation by sector

In practice the administrative process was complex, time-consuming and bureaucratic. Furthermore, the teachers believed that they knew more than they really did; and the municipal authorities hampered the innovation process by their ignorance of the procedures, and even more by their surprise that anyone should incorporate the wetlands where the rural schools were located as an academic subject. As a corollary of this, the process was regarded with suspicion, as it was the first curricular innovation in this subject

in southern Chile. Despite all this, the process enabled the participating schools to play a pioneering role in this area, improving the quality of their teaching through didactic material and curricular innovations adapted to the local situation. The quality of the teachers' work also improved, and their role in the formation of pupils connected with the natural environment in which they live, and committed to its conservation, was strengthened.

Lessons learnt

This experiment enabled the participating schools to take a pioneering approach to the educational choices encouraged by the educational reform process. It helped to improve teaching quality thanks to the didactic material and curricular innovations adapted to the local situation. The quality of the teachers' work also improved, strengthening their role in the formation of pupils connected with the natural environment in which they live, and committed to its conservation.

The experiments in formal environmental education incorporating curricular contents in different subjects were evaluated as positive by teachers, because they facilitated learning and improved perceptions of the environment.

Conclusions

We understand this new mode of education (curricular innovation) as a process that should be strengthened with themed teacher training, exchange of experiences, and evaluations by teachers which will allow future improvements from year to year. It would be desirable to assess the effectiveness of the curricular innovation implemented, by means of analysis of the changes induced in the participants. Significant changes in these aspects can only be measured in the medium term.

3. Environmental education and biological control with birds of prey

Since 2001, we have been carrying out a programme for raptor conservation and biological pest control in agro-ecosystems, financed by several projects (www.ceachile.cl/lechuzablanca/). We have stimulated the use of certain raptors for the control of health, farm and forest pests, and as a resource in ecotourism initiatives. Across all the projects we have: (a) worked on a research line to increase knowledge of these birds as a basis for management; (b) used EE to teach the ecological, productive and cultural roles of raptors, improving perceptions and attitudes towards them in rural communities, and their use as teaching resources in schools; (c) trained professionals from different productive sectors, schoolteachers, social leaders and community monitors, in the competences taught in the programme's components.

The objects of the EE applied across all the projects are: (a) to establish the level of knowledge and perceptions regarding raptors in inhabitants of rural spaces, both adults and schoolchildren, in southern Chile, and the implications of these for biological control of the reservoir species for Hantavirus Pulmonary Syndrome, a highly lethal disease

produced by a RNA virus of the *Hantavirus* genus; (b) train professionals and technical workers of rural areas in raptor conservation; and (c) apply an education module (course and toolbox) to the target population.

Methodology of the intervention

To determine knowledge on the subjects 'birds of prey, hantavirus and biological control', we applied a questionnaire with closed questions; to determine perceptions we applied an instrument for measuring qualitative variables, consisting of a Likert-type attitude survey (see MUÑOZ-PEDREROS, 2007). The instruments were created for a homologation study in Southern Chile in 2003, and were subsequently refined and validated (MUÑOZ-PEDREROS, *et al*, 2018). Based on this information, we developed a toolbox containing the education and environmental communication material that was transferred to the target population, mainly through a theoretical-practical residential course lasting three days, and through permanent contact by means of a network administered from a webpage. The intervention areas were the towns of Peñuelas in the Valparaiso Region; Calera de Tango and Santiago in the Metropolitan Region; Retiro and San Clemente in the Maule Region; Lebu, Contulmo, Quillón and Florida in the Biobío Region; Huitag, Pocura, Traitraico, Milleuco, Relín, Chauquén, Coihueco, Coñaripe, Panguipulli, Valdivia, Punucapa, Curiñanco, Corral and Isla del Rey in the Los Ríos Region; and Huilma in the Los Lagos Region.

Strategy

The strategy was coordinated on the basis of four elements: (a) determination of the level of knowledge and perception of the target population (schoolchildren, teachers, health staff and professionals related with the rural space); (b) development of a toolbox of materials for education and environmental communication (a book on Chilean raptors, a DVD with four talks, six self-explanatory panels, two outreach posters, four demonstration kits, a DVD with recordings of raptors' calls, a video, and various stickers); (c) an intervention strategy based on training courses, interpretative trails, exhibitions and a webpage); and (d) making use of rural schools and first aid centres as multiplier focuses for the programme. The methodological flow is shown in Figure 4 and the open display stand in Figure 5.

Figure 4 here

Figure 5 here

Basically, the procedure consisted of monthly or bimonthly visits, depending on the site, to the first aid centre on the day of the doctor's visit, and subsequently to the local school. During these visits the toolbox was applied and the participation of those taking part in the training courses was managed.

Principal achievements

Formal training. The formal EE strategy involving teachers and pupils was successful. It involved a total of 17 schools, which together formed a school community of some 4,400 people, between teachers, pupils, parents and guardians. The training of professionals and communication agents is another aspect that we considered very important. We taught 14 courses for health sector professionals, teachers, heads of rural health consultancies, park wardens, agricultural science professionals, and farm owners, totalling 205 people.

Toolbox. The education module that we called the "toolbox" was particularly successful, and a large number were purchased – among others by the Health Ministry, which gives them a strong multiplier effect. The toolbox can be used actively or passively. It offers the possibility of interaction with the public at a rate dictated by the subject, thus reinforcing the bidirectional nature of learning. The module is based on the working hypothesis that the teach-yourself capacity offered by the toolbox (operated with a monitor), and the development of awareness, motivations and skills offered by the training course, enables rural inhabitants to increase their knowledge of, and develop better attitudes towards, the target issues. It is of key importance to reach the target population with a clear message, and above all using attractive, stimulating, interactive teaching tools. These may be the decisive factor for breaking the ice and achieving the motivation needed to obtain high levels of participation. The toolbox was essential in achieving this (MUÑOZ-PEDREROS, 2019).

Evaluation by sector

Community organisations. At the start of the project, we formed links with a range of community organisations (small-scale farmers, neighbourhood associations, tourism committees, health committees, school parents' centres), as well as teachers at rural schools. It became clear that work of this kind, oriented towards raptor conservation, does not of itself generate interest in community organisations, which in general have a low capacity to motivate their members.

Teachers. Teachers immediately connected this initiative with their teaching work. However, in rural sectors there is a regular event in health provision – the doctor's visit – which brings the population together. This formed a very suitable space for outreach of our proposal. We therefore strengthened the health component involved in raptor conservation, using the angles of both human and environmental health. We highlighted the importance and the role of these birds as natural controllers of the rodent populations that transmit diseases to humans, especially Hantavirus.

Lessons learnt

How to integrate the knowledge, perceptions and attitudes of the target popula-

tion. The level of knowledge about raptors is low, and the perception is positive in around half of the target population; the negative perception in the remainder is due to superstitious beliefs associated with these birds (MUÑOZ-PEDREROS *et al*. 2019). A superstitious perception is present in the majority of both rural and urban schoolchildren, but more especially in rural inhabitants. Considering that perceptions are learnt and underlying, techniques could be applied to produce a change in perceptions, which translated into a change in attitudes. The rural inhabitants in the study area lacked specific knowledge; where this existed, it reduced the percentage of people who have a negative perception of birds of prey and their role. We were able to confirm this as we applied the instruments to measure knowledge and perception before and after use of the toolbox.

Thus we understand that environmental educators should balance contents, design suitable ways of transmitting them, and suit their language and time to the socio-cultural reality of the target population. The availability of professional environmental educators is very important (MUÑOZ-PEDREROS, 1998). Achieving a change in attitudes towards target species by effective, efficient communication and through public education campaigns requires a good understanding of belief systems and basic issues that affect attitudes. These are not self-generated psychologically – they are formed or learnt by means of identifiable references, which in turn are acquired from people, groups, institutions, objects, values, social issues or ideologies.

In this study, no contradictions were detected between the known and the perceived, although these two dimensions are not always in agreement. Thus, a diagnosis of the knowledge and perceptions of the inhabitants enables us to better sustain the development of conservation campaigns for the target species. To this end it is important to have conceptual frameworks which incorporate the ecological dimension with the social, economic and cultural dimensions, in order to resolve the conflicts between human beings and certain species of wildlife.

Focusing the programme on multiplier agents. To strengthen the role played by key actors in the rural communities, we identified a need to orient our educational work towards the formation of multiplier agents, people familiar with the culture and existing relations in each location, such as teachers and the heads of first aid centres. In this way, clear educational pathways can be established to schoolchildren, through teachers in the formal educational framework; and to rural inhabitants, through the workers in rural first aid centres. Park wardens were also included in this role, as they play an important role – in an informal framework – as educating agents for visitors to protected wild areas. A number of these key actors were selected in all the areas of influence of the programme. They were trained using an education module which consisted of a theoretical/practical course intended to provide a common level of knowledge about the subjects covered by the programme, and the toolbox which they were given to facilitate the multiplier effect of their work (MUÑOZ-PEDREROS, 2019).

Conclusions

(a) Before conceiving an EE programme, it is essential to know the level of knowledge and the perceptions of the target population, since this will ensure the coherence and viability of the programme; (b) the training courses must be tested with different audiences, to prove their relevance and arouse interest in different areas of work; (c) in this programme, the development of the toolbox proved to be the key element that facilitated the process, through a combination of different expressive resources (text, sound and images); (d) developing an environmental education programme in complex subjects (e.g. birds of prey, biological control, public health, negative perception of a target species) presents a challenge that can only be addressed from an interdisciplinary approach, with EE acting as the coordinating element of the programme's objectives; (e) the success of a long-term EE programme depends on alliances between different public services, municipalities and NGOs, which – through pursuit of their own interests – will work together to achieve common objects in wildlife conservation and management.

Final conclusions

The following are indispensable for carrying out EE programmes: (a) diagnostic studies of the physical-biological and socio-economic resources in the areas of work; (b) establishing the levels of knowledge about, and perceptions of, the target issues among the programme's beneficiaries. These two elements will guide the programme's activities, the development of teaching materials and possible curricular innovations.

Programmes involving teachers and other professionals should act, insofar as possible, at both formal and informal levels. Formal EE may include theoretical-practical courses tested with different audiences of local people; informal EE can be imparted through short training workshops, talks, campaigns, posters, radio programmes, conservation clubs, and – above all – up-to-date teaching resources adapted to the situation of the beneficiaries.

Teaching resources (e.g. modules packaged in a toolbox) promote self-training, contributing to the development of awareness, motivations and skills. Environmental educators should of course balance the contents, design suitable ways of transmitting them, and suit their language and time to the socio-cultural reality of the target population.

The success of a long-term EE programme depends on alliances between different public services, municipalities and NGOs, which – through pursuit of their own interests – will work together to achieve common objects (e.g. nature conservation and sustainable development).

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Andrés Muñoz-Pedreros

✉ amunoz@uct.cl

ORCiD: https://orcid.org/0000-0001-6363-6549

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Jorge Pantoja

✉ kokopantoja@gmail.com

Ximena Morandé

✉ ximenamorande@gmail.com

Patricia Möller

✉ patricia.moller@uach.cl

Jorge Morales

✉ moralesmiranda@gmail.com

AMBIENTE & SOCIEDADE 25 anos 25 años 25 years

SciELO

Três experiências planejadas de educação ambiental em setores rurais do sul do Chile

Andrés Muñoz-Pedreros
Jorge Pantoja
Ximena Morandé
Patricia Möller
Jorge Morales

Resumo: A educação ambiental (EA) deve ser realizada de acordo com um programa permanente, devendo ser uma fonte inspiradora para que outras disciplinas culturais e educacionais sejam orientadas em uma linha "ambientalista". No Chile, a EE se desenvolveu, desde a década de 1970, de forma lenta e sem vincular três atores relevantes: o Estado, as universidades e as organizações não governamentais. Um programa de EE foi implementado em outros programas (e. g., desenvolvimento rural, gestão de zonas úmidas, biodiversidade e controle biológico de pragas) e seus objetivos são: (a) desenvolver pesquisa aplicada no campo da EE, (b) produzir materiais didáticos e (c) desenvolver treinamentos formais e informais em EE. O objetivo deste trabalho é apresentar três experiências planejadas de educação ambiental desde 1991 em diferentes ecossistemas e diferentes atores sociais no Chile.

Palavras-chave: Educação ambiental, metodologias, programas planejados, zonas rurais, Chile.

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Resumen: La educación ambiental (EA) debe llevarse a cabo de acuerdo a un programa permanente, y debe ser fuente inspiradora para que otras materias culturales y educativas se orienten en una línea "ambientalista". En Chile la EA se ha desarrollado, desde la década del 70 del siglo XX, en forma lenta y no vinculando tres actores relevantes: el estado, las universidades, y los organismos no gubernamentales. Implementamos un programa de EA de forma transversal en otros programas (e.g., desarrollo rural, gestión de humedales, biodiversidad y control biológico de plagas) y sus objetivos son: (a) desarrollar investigación aplicada en el campo de la EA, (b) producir materiales didácticos y (c) desarrollar la capacitación formal y no formal en EA. El objetivo de este trabajo es presentar tres experiencias planificadas de educación ambiental desde 1991 en diferentes ecosistemas y distintos actores sociales.

***Palabras-clave*:** Educación ambiental, metodologías, programas planificados, zonas rurales, Chile.