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Extracurricular Activities in Environmental Educational Clubs: A Way to Improve Learning and Anchor Environmental Culture In Qualifying Secondary

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ABSTRACT : The recent wave of reform in Education brought with it a lot of important changes to the teaching of science in secondary school, in particular by favouring the integration of new disciplinary and priority fields such as environmental education (EVE). However, it appears that, concretely, EVE actions are rather rare in our educational institutions given the lack of initial teacher training in this field. The context of this work is interested in showing how environmental education clubs can contribute to the improvement of environmental learning and education in qualifying secondary schools. The difficulty of combining environmental education with the teaching of life and earth sciences is associated with the difficulty of linking all school disciplines within a reformed national curriculum. However, it appears that, concretely, EVE actions are rather rare in our educational institutions given the lack of initial teacher training in this field. The context of this work is interested in showing how environmental education clubs can contribute to the improvement of environmental learning and education in qualifying secondary schools. The difficulty of combining environmental education with the teaching of life and earth sciences is associated with the difficulty of linking all school disciplines within a reformed national curriculum. The difficulties raised regarding the institutionalization of the EVE are very real and internationally encountered, but remain diluted through the sum of all the problems related to the new curricula. Despite all the socio-educational, political and economic constraints, it is important to insist that environmental education has its place in the fundamental education of young citizens today in a world they contribute to building.

The systematic integration of the environmental dimension in the Moroccan education system can be conceived in two parallel ways: the disciplinary contents that must ensure the construction of skills and solid theoretical knowledge on the environment in the learners by providing them with the necessary knowledge as well as the practical and extracurricular activities provided by the clubs of the environment, considered a crucial and compulsory field, which allows multidimensional teaching linked to the concerns of society.

KEYWORDS: Anchoring, EVE, Environmental clubs, Practical activities, Disciplinary content, Qualifying secondary

INTRODUCTION

The past few decades have been marked by the passage of a wave of major changes in the frantic pace of scientific discoveries and technological development. In retrospect, significant progress has undoubtedly been made, allowing mankind to flourish a little more with each progress. However, this growth has manifested itself with its share of inevitable collateral damage. Indeed, as a corollary to this latest development, we are witnessing the emergence of various worrying environmental issues.

We are gradually becoming aware of the magnitude, severity and complexity of the various environmental problems affecting our planet **[1]**. In this context, science and technology can paradoxically be seen as the key gear of a development mechanism unsuited to our living environment and as the master to think of an inevitable social transformation, sometimes origin and sometimes solution of the same problem. Within this polemic, education is perceived by the various actors of governance organizations and civil society as one of the ways that will lead to improvement, both environmentally and educational and social **[1-4]**.

In response to this, policy makers and programme developers have been called upon to review the foundations of education, particularly those related to science. For several years, the desire to raise students' awareness of environmental problems has led to the development of several educational strategies and programs. Awareness of ecological and social (socio-ecological) issues has required the integration of notional content from environmental education (EVE) into science curricula **[5,6]**. For the purpose of this synthesis article, we will define the latter discipline with the original definition proposed by UNESCO-UNEP:

Environmental education is conceived as an ongoing process in which individuals and the community become aware of their environment and acquire knowledge, values, skills, the experience and willingness to act, individually and collectively, to solve current and future environmental problems **[7]**.

After a myriad of research on the subject, it is clear that there is still today a significant divide in EVE-related teaching, particularly between the expectations conveyed by the teaching program and the reality observed in schools **[8-13]**. One way to assess the neglected parameters of EVE among teachers is to highlight the teachers' social representations of the concept and the resulting educational practices.

With this in mind, the following research question was formulated:

To what extent do activities within environmental education clubs contribute to the improvement of environmental learning and education (EVE) among qualifying secondary students?

Because of reaching out to citizens in their daily lives, Morocco declared during the educational reform linked to the national charter of education and training **[14]**, the systematic integration of the environmental dimension into the education system while redefining the missions of the school and ensuring its openness to its surroundings. This basic integration of the environmental dimension in the training courses, is designed on two parallel tracks: the disciplinary contents that must ensure the construction of skills and solid theoretical knowledge on the environment in the learners, providing them with the necessary knowledge, practical and extracurricular activities, considering them as a crucial and compulsory field **[14]** by establishing, at school level, educational structures in the form of spaces for exchange and open learning around environmental issues.

Anchoring environmental education in schools is a necessary step to sustainably defend the interests of society, and its objectives that are not limited to the passive transmission of learning, but that they try to change the attitudes and behaviors of students to empower them as future citizens, goals set by the strategic vision 2015-2030 and the framework law 17-51. This process aims to allow the learner to understand his environment and behave positively.

I. THEORETICAL FRAMEWORK

The desire to integrate the environmental dimension into the Moroccan education system is part of an international perspective that was adopted since 1972 at the United Nations Conference on the Human Environment in Stockholm **[15,16]**. In order to achieve this objective, several initiatives have been taken by the Ministry of National Education since the educational reform of 1999 until the strategic vision 2015-2030. These measures have designed not only to ensure the introduction of this dimension in disciplinary programs, but also its institutionalization in schools through extracurricular activities held in environmental educational clubs, which must be created within schools.

To this end, the Ministry of Education paid particular attention to the establishment of these educational structures in schools by:

- Ministerial Circular 109/1999 **[17]**, which encouraged the Directors to create environmental clubs within their schools ;
- Axis 4 of the strategic vision 2015-2030 **[18]**, which refers to communicative skills and selfdevelopment, and which considers extracurricular activities as a vital and compulsory pedagogical component in the different stages of intellectual teaching;
- Bill 10 of the framework law 17-51 **[19]**, entitled Improving school life, which aims to support and diversify extracurricular activities in order to establish an inclusive citizenship school.

II. ISSUE OF THE STUDY: ENVIRONMENTAL EDUCATION AND SCIENCE TEACHING: THEORETICAL AND PRACTICAL PROBLEMS

Over the past thirty years, global awareness of the emergence of environmental problems has slowly led to the emergence of an educational field, environmental education (EVE). The purpose of this new dimension of education is to optimise the relationship with the environment **[20]**. So far, EVE has mainly taken shape in non-formal education settings.

In formal (or school) settings, very few governments have yet concretely formalized EVE in their school curricula in the form of learning objects within separate programs. In general, curricula refer only to them in the educational principles and foundations **[20]**. Some countries (for example, the United States, Canada, Britain and Spain) see the formalization of EVE in curricula as a cross-disciplinary theme **[20]**. Other countries (for example, Greece), in smaller numbers, favour the implementation of the EVE through certain projects on environmental issues, which are annexed rather incidentally to the official curriculum **[21]**.

In one way or another, because of the many problems raised and the many criticisms made, there is clearly a problem in the conjugation of EVE to formal education in general, and more specifically in science teaching. The following section provides a picture of the nature of the problems, which are theoretical and practical.

II.1. Theoretical problem:

Although science curricula are seen as places of choice for EVE integration **[22]**, some authors bring the idea that science education and EVE are different in nature, that they are somehow theoretically (or epistemologically) incompatible **[23]**. Environmental education would aim to develop attitudes and know-how towards environmental issues, while science education is mainly based on

the idea of scientificity (truth, rationality, objectivity, rigour, validity, reproducibility…) [23]. Science is often seen as accurate and not in the subjective domain. The EVE, through its goal of optimizing the relationship with the environment, promotes the development of attitudes or values and promotes behavior change with respect to the environment. Thus, the educational dimensions of EVE and scientific education have major divergences in their aims. There is therefore an axiological conflict between scientific education and EVE.

As long as the conventional vision of science education remains, reconciliation with the EVE will remain very difficult [24]. This indicates that science teaching is directly influenced by how science is perceived within its contributing disciplines. Bringing the EVE closer together will only be possible when positivist ideas of the quest for falsifiable truths and the eradication of social values within scientific research are no longer dominant. For example, in an instructional situation where a case study of a wildlife management problem situation is made, a traditional science teaching model would focus only on scientific facts, theories associated with the case, instead of broadening the perspective by also exploring, for example, the values associated with the historical, political, social and cultural context associated with the case itself.

On the other hand, other authors qualify this discourse by saying that the critical vision of a more social science, made by humans for humans with humans [25]. In the taxonomy of the cognitive domain, they show that it is possible to make a connection between science teaching and EVE by the idea of the development of attitudes and a knowledge to act with regard to science. According to Legendre [26], "an educational taxonomy is an organized and hierarchical classification of learning or development phenomena." (p.769). It mentions that the learner, at the maximum of his learning or cognitive development, is able to put into historical perspective a problem. It is also capable of links between science, technology, the economy (society) and is able to become aware of the moral and social implications of scientific research and its products.

In a completely different theoretical perspective, Sauvé [27] argues that the idea of an EVE as a simple cross-cutting theme, integrated into an overall curriculum or a science and technology program, is too simplistic. It sees environmental education as a separate educational dimension. According to the author, EVE is an essential dimension of fundamental education.

In this regard, Sauvé [27] adds that "the fabric of the environment is that of the network of life itself, at the junction between nature and culture; the environment is the crucible where our identity is forged, our relationships of otherness, our "being-in-the-world".

II.2. Practical problem

We have so far discussed the theoretical issues related to the conjugation between science teaching and EVE. I will now raise some issues related to the practical problems of this conjugation.

First, student-teacher relationships, imbued with the paradigm of instruction (i.e., the transmission of knowledge), were unfavorable to EVE in the classroom [29]. At that time, and probably still today in many schools, teachers avoided controversial situations in their classrooms at all costs. However, it is difficult to imagine an environmental education, without addressing the various environmental issues or controversies.

Non-controversial education then implies an EVE limited to the aspects of environmental education and environmental education; environmental education is therefore left behind [30].

The problem then lies in the fact that it is precisely this last facet of EVE that is centered on the ethical dimension, on the development of critical thinking and on the promotion of attitudes and behaviour change towards the environment.

In addition, in a study with various stakeholders in secondary education, Sauvé et al [27] report that many teachers are uncomfortable bringing certain dimensions of EVE into their science class. They see disciplinary teaching as well structured while most environmental issues appear to be far too complex for lower secondary students.

Also, in research with science teachers, Littledyke [31] concludes that teachers, who have some interest in environmental issues, will be the only ones to give EVE a place in their teaching. There seems to be a large gap between government demands and what is actually happening in the classroom.

In this regard, Papadimitriou [32] explains teachers' lack of interest in their culture or environmental literacy. A majority may be sensitized to environmental issues, but have not received any training in knowledge, skills and skills associated with environmental issues, let alone the EVE.

III. The integration of the environmental dimension in the Moroccan education system

Faced with the epistemological, axiological and pedagogical issues previously raised, we study in this part, a number of reflections on the reform of the science curriculum in Morocco.

First, despite the theoretical issues raised, I believe that EVE has a relevant place in the life and earth sciences curriculum. However, it is necessary to qualify this assertion, since the theoretical link (ontological and epistemological) between EVE and science teaching, is far from clear and defined. However, as stipulated by Papadimitriou [32] and Volk [33], I understand that the combination of these two educational dimensions has mutual advantages.

On the one hand, the ERA is concerned with science teaching since the EVE requires a minimum of scientific culture, especially since scientific knowledge is necessary for the exercise of critical judgment and informed decision-making.

On the other hand, the teaching of life and earth sciences is concerned by the EVE since the environment is undoubtedly a theme (or object) that promotes curriculum interdisciplinarity. To the extent that interdisciplinary science teaching is accepted as an interesting and relevant approach, I think it is inconceivable to foster scientific learning without addressing certain environmental realities and thereby, without asking certain ethical, moral, social and cultural questions.

Indeed, the analysis of the articulation of the program with regard to the general field of training Environment, makes it possible to note that the concept of environment is mainly defined and presented in the vision of an environment-problem or an environment-resource, according to the typology of social representations of the environment **[34]**. As Sauvé et al **[35]** reminds us, the way in which one represents oneself the environment determines how one views teaching and learning in EPR pedagogical situations. If we present teachers with a program that is essentially imbued with an environment-problem or resource-environment vision, it seems obvious to me that they will stick to that vision with their students. In my opinion, it would be just as relevant to present the environment as a real source of energy, a living environment to know or share, or as an environment to appreciate, respect, preserve, etc. Promote environmental education, about the environment, but also for the environment would be a much more coherent choice of curriculum for teachers in urgent need of environmental training or literacy.

Finally, in connection with the mentioned practical problem, I would like to issue some warnings in order to avoid some excesses in the conjugation between science teaching and environmental education: First of all, it is important not to confine oneself to the framework of a problem-environment, and to avoid addressing in the first place and exclusively hypercomplex global problems. The student can easily come to feel overwhelmed, disillusioned, powerless in the face of environmental realities for which his local actions will have no influence. It is also desirable to present issues that affect the student in his daily life and in which his actions can have a significant influence.

1- We should also avoid focusing science teaching on the hyper-complexity of environmental issues, insisting on the "complicated" so that knowledge, knowledge-being and knowledge-make appear unaffordable and lose their meaning and significance in the sphere of the power-to-do of young people;
2- It is then essential that curriculum developers and teachers pay more attention to the knowledge, know-how and skills deemed essential. It would be a pity in an interdisciplinary science program that a student's learning is directly dependent on the interests of a teacher for some questions and not for others. For example, the program of the 2nd year baccalaureate 'Physical Sciences' option, promotes the chapter that deals with the solid fraction of household waste, concerning the disposal, treatment methods and reuse techniques and completely abandoned that of the liquid fraction filtered by percolation of waste, also called "leachates". These leachates are a major problem in landfills, and a source of surface water and groundwater contamination if not properly treated.

III. Integrating environmental education through extracurricular activities:

Extracurricular activities are an important part of school life. They are related to teaching and are made by schools to promote and develop students' knowledge and skills. They include various activities related to cognitive, emotional and psychomotor aspects. These are operationalized in educational structures located within schools forming educational clubs, whose purpose is to oversee the conduct and supervision of extracurricular activities. These clubs constitute a methodological framework and a way of activating school life through voluntary commitment by various operators: students, educational and administrative staff and the various partners making these spaces places of development of psychological and social skills, organizational skills, communication, collective work, values, citizenship and civic behaviour.

The work in educational clubs is a pedagogical necessity to encourage students to transmit and apply the different school learnings in the processes of daily life and to put them at the heart of the reflection and pedagogical action. Environmental education takes place within these extracurricular activities, at the level of environmental clubs. The latter, are educational clubs with extracurricular activities related to the environment and managed by volunteer teachers, motivated and having convictions on the importance of the environment and the need to contribute to its protection and preservation. These environmental clubs play an important role in inculcating environmental values and empowering learners with their environment. They help to institutionalize their activities, in concrete and practical actions, which promote large-scale cooperation between the different actors and partners of schools to build, in learners, contextualized knowledge about the environment, and a critical and experimental sense through the study of environmental problems by participating in the Eco-schools program and the Young Journalists for the Environment program.

III.1. Methodology

The adoption of a new transdisciplinary approach around the theme of the environment in schools is undoubtedly capable of ensuring a multidimensional teaching related to the concerns of society, while considering the links with development education, health, peace, risks,….

III.1.1. Field work through ecological tours and outings

Several educational activities can be carried out, for the benefit of the environment, in a rather close environment: in a water treatment or purification plant, in waste recovery sites and even in the services of institutions concerned with the environmental issue (water and forests, watershed agencies, drinking water boards and distribution companies...).

III.1.1.1. Visit of water treatment and purification plants

Visiting these stations and direct observation allows learners to estimate and become aware of the efforts made to feed on such a resource or to get rid of its waste, which will help them to build knowledge and actions that respect the environment.

III.1.1.2. Field work by ecological exit

The ecological outing makes it possible to observe and study natural environments directly in the field, in order to discover the components of these environments and understand the relationships that exist between living beings on the one hand, and with their living environments on the other. The ecological output also allows to understand how natural environments evolve and the effect of the negative impacts of man on these environments.

III.1.2. Activities by projects

Working through the project pedagogical approach applied to environmental education offers learners a privileged context to build cooperative learning. By working with students on a project basis as part of an “eco-journal of the school”, on topics related to: recycling of plastic, paperboard and glass materials, renewable energy, peaceful use of the sea, the preparation of a guide on environmental concepts, the embellishment of the school’s spaces with the installation of garbage cans to accustom students to preserve the environment, environmental law, climate change;

These are all projects developed through the personal actions of teachers and which show a wealth of variable and diversified practices that must be supported and enriched by motivating actors.

The pedagogical approach of project consists in designing, innovating, creating and realizing a production from a need to be satisfied. It always leads students to a real production, that is to say having meaning in relation to its usefulness either for the student or for a third person. This approach has several characteristics:

- It therefore has by necessity a strong emotional implication since useful.
- It develops behaviours justified by necessity: documenting, planning, communicating, organizing.
- It is often multidisciplinary and involves different types of knowledge.
- It leads to just-in-time learning, as opposed to school functioning, which means learning to use later, when needed.

The process is divided into these 6 steps for convenience. The student is led to go back and forth between these different steps:

1. Emergence of the idea;
2. Analysis of the situation;
3. Choosing a strategy;
4. Setup and Planning;
5. Implementation;
6. Assessment, assessment and possible readjustments.

The project is not an end in itself, it is a detour to confront students with obstacles and provoke learning situations. At the same time, if it becomes a real project, its success becomes a strong issue, and all actors, teachers and students, are tempted to aim for efficiency at the expense of learning opportunities.

III.1.2.1. Theoretical background of the projects

A. Production and recovery of organic waste

Biowaste (putrescible waste) represents two thirds of the contents of the residual waste bin of Moroccans, that is, two thirds of the waste that is not sorted by households. It is a significant deposit that must now be diverted from disposal for a circular economy of organic matter (**Figure 1**).

Figure 1. The components of the circular economy [36]

Organic waste can be degraded by microorganisms, so it is fermentable. For this reason, biological recovery is widely used for putrescible waste. The two biological recovery methods are composting (aerobic process) and anaerobic digestion (anaerobic process).

Composting allows the degradation of organic matter in the presence of oxygen for the production of compost. While anaerobic digestion or methanisation is a biological process that exploits the ability of certain microorganisms to degrade organic matter in the absence of oxygen to produce methane-rich biogas, which can be used as an energy source [36]. Methane production is mainly sought in anaerobic digestion even if digested waste, called digestate, can be used in agriculture to fertilize the soil. Organic waste streams entering the composting platform are overwhelmingly green waste (64%), but also household bio-waste (3%). The majority of waste entering the biogas plants are bio-waste and food products not consumed (71%) and green waste (25%) (**Figure 2**).

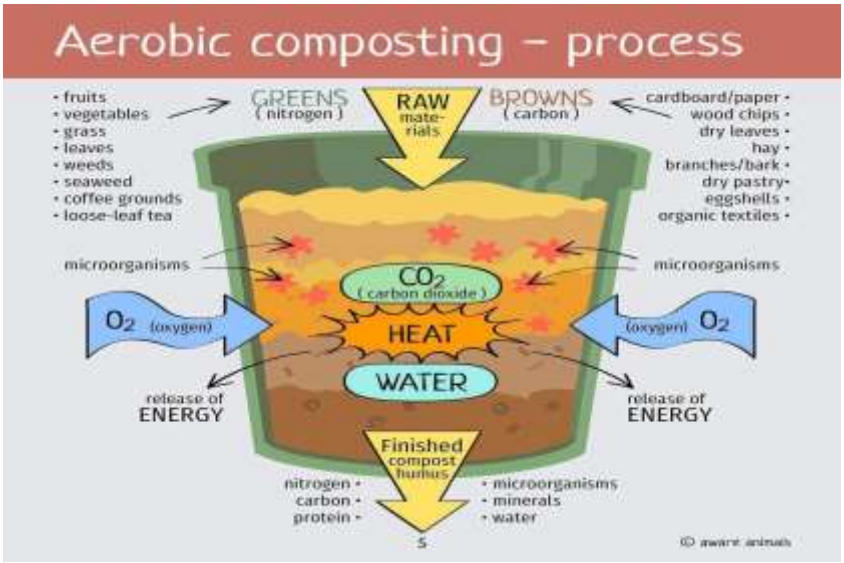

Figure 2. Composition of waste entering the composting platform [37]

These bio-waste treatment systems allow organic matter (compost or digestate) to return to the soil in both cases and produce renewable energy (electricity, heat or biofuel) through the recovery of biogas (methanisation only) (**Figure 3**).

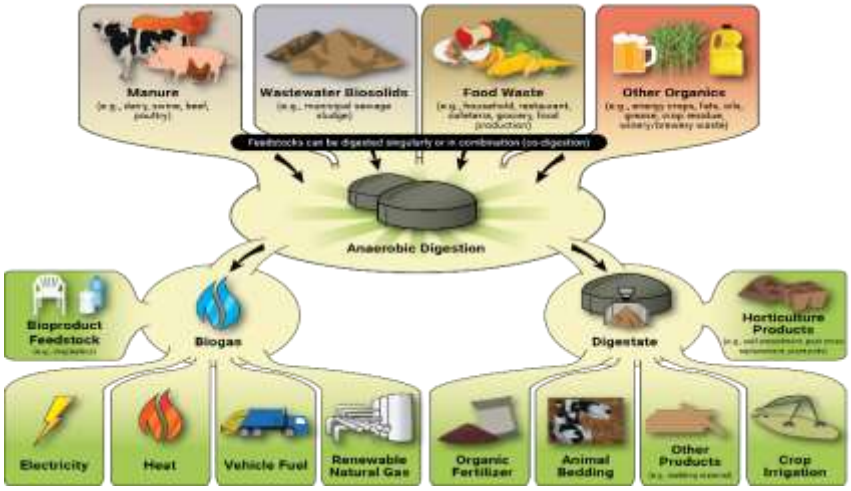

Figure 3. Methanisation: inputs and recovery of biogas and digestate **[37]**

B. Méthanisation or anaerobic digestion

Anaerobic digestion or methanisation is a microbiological process of degradation of organic matter in the absence of oxygen to produce digestate that has agronomic value and biogas rich in methane (CH_4, 50-70%) and carbon dioxide (CO_2, 20-50%) **[37]**. This renewable energy can be used for electricity and heat generation, fuel production, or injected into the natural gas network after purification. Methane, if not recovered and recovered, is a significant greenhouse gas with a global warming potential 25 times higher than CO_2. More than 60% of methane emissions are man-made (agriculture, energy, waste) **[37]**. In recent years, interest in biogas production has been growing as an alternative to fossil fuels in both industrialized, emerging and developing countries.

III.1.2.2. Background Project Practice

III.1.2.2.1. Recovery of organic waste by application of the composting technique

The theme of composting allows the student to maintain a dynamic relationship with his living environment and to keep a critical distance with regard to the exploitation of the environment, technological development and consumer goods. This offers great educational potential (biology, chemistry, ecology courses).

In this context, students can set up a composting system within the school according to the following steps:

a. Assess the feasibility of the composting program by:

- The determination of the main collaborators in the implementation of the project;
- Target environmental groups or committees, seek support from stakeholders (management, support staff, teachers, students, etc.) to contribute to the implementation and success of the project;
- Identify a person or group responsible for the composting project ;
- Engage cafeteria and kitchen staff in the recovery of organic materials provided by kitchen staff following meal preparation.

b. Choose a composting technique suitable

For this reason, we have:

- Conventional composting in a compost parcel, in direct contact with the land;
- A vermicomposting (composting done by earthworms, in a container that can be put in classes inside). This allows only a small amount of material to be composted.

c. Implementation of the recovery program

All operations are carried out by the recovery team who will, after preparing the dinner, recover the kitchen waste at the composting site and put it in the composter, by warning the following: recovery schedule, recovery methods and equipment, storage, monitoring during the summer and vacation periods, and maintenance of the composting site.

III.1.2.2.2. Recycling of plastic, paper, glass and metal materials

Recycling is a process for treating waste (industrial or household) of end-of-life products, which allows some of their materials to be reintroduced into the production of new products.

Recyclable materials include certain metals, plastics and cardboard, glass, rubble, etc. Recycling has two major environmental consequences:

- Reducing the volume of waste, and therefore the pollution it would cause (some materials take decades or even centuries to degrade);

- Preservation of natural resources as recycled material is used instead of what should have been extracted.

III.1.3. Use of Information and Communication Technologies (ICT)

Considering the objectives set by «the Digital Morocco strategy», which gives the school a role and essential functions in the dissemination of information and communication technologies, and in consideration of the induced effects of the integration of these technologies on the renewal and progress of the Moroccan School, strengthening the systematic integration of the environmental dimension into the Moroccan education system through these technologies seems to be a requirement in the sense of promoting the quality of learning, in particular:

- In the design, preparation and implementation of environmental curricula, programmes and subjects;

The use of software and interactive digital resources throughout the educational process by targeting self-learning, research and diversification of learning sources;

- The development and promotion of distance learning as a complement to the face-to-face course.

CONCLUSION AND PERSPECTIVES

Work in environmental education clubs plays a key role in anchoring environmental education. Indeed, environmental education is practiced according to a symbio-synergistic vision and essentially uses innovative pedagogical practices based on the engagement of students in projects they set up, in which participate, think, confront and question. It also involves the active participation of other actors whether internal (teachers and management) or external (professionals, associations...), by pooling resources and know-how to achieve the desired objectives. These are achieved by the implementation of various achievements, ranging from the organization of conferences, debates or exhibitions on topics related to the environment. As well as the adoption of different approaches and methods (work by project, ecological outings, field work by visit, partnership,...).

For this, environmental education must necessarily rely on the pooling of various approaches and approaches in order to ensure a complementarity between the contributions of school programs and extracurricular educational activities within clubs the environment.

With a view to improving the anchoring of the environmental dimension by schools in its educational activities, I present the following recommendations:

- Lighten school curricula and free students by diversifying learning modes and places and by dedicating in learning schedules a time slot for the activities of environmental clubs by integrating their actions into the processes learning;
- Capitalize on good practices and initiatives in environmental education and work for their sustainability within schools, by innovation of local solutions of financing and pedagogical supervision of activities initiated by the environmental clubs as educational structures of common and collective interests of all the actors concerned in education.

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