

BIO-EDUCATION AND ENVIRONMENTAL LITERACY

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The role of education is to "unlock" the inner human potential by using different methods and approaches. Even the connection between physics and psychology, which at first glance is impossible, sounds reasonable. The idea for the development of integrated subjects, first mentioned by scientists such as A. Ness, F. Capra and J. Lovelock, although controversial at the start, has pointed out the trends for an interdisciplinary approach of science subjects and has opened up wide perspectives for the transformation of future science curricula.

"Sustainable development," according to The World Conservation Strategy - Caring for the Earth 1991, "means improving the quality of life whilst living within the carrying capacity of the supporting ecosystems." Sustainable development is all about four sets of values: protecting the environment; providing for the future; quality of life; fairness.

How do the content, the curriculum and the process of education have to be changed? Education must acquaint students with the deeper causes of the crises just ahead. This requires active management of the humanities. The problems of sustainability are rooted in the human condition and their resolution will require people of greater philosophical depth and perspective. Sustainability requires a different kind of curriculum that encourages the development of ecological literacy and competence, throughout the population, so that the people can rebuild society from the bottom up. Sustainability also implies an active, engaged, informed and competent citizenry and educational institutions should therefore foster civic competence; education should be both about society and the person. The environmentally literate person has the knowledge necessary to comprehend interrelatedness, an attitude of care or stewardship; and the practical competence required to act on the basis of this knowledge and feeling. Knowing, caring and practical competence constitute the basis of environmental literacy.

Environmental literacy requires: a quality of mind which seeks out connections; a sense of wonder rooted in "biophilia" or an affinity for the living world; a broad understanding of how people and societies relate to each other and to natural systems, and how they might do it sustainably; a knowledge of the planet's vital signs, its ecosystems and the dynamics of the modern world; a thorough understanding of the ways in which people and whole societies have become destructive; how social structures, religion, science, technology, patriarchy, culture and the human consciousness combine as causes of our predicament; the ability to make a reasonable distinction between what is "natural" and what is not; a broad familiarity with the development of an environmental consciousness; an understanding of alternative minority traditions which emphasise democratic participation, the extension of ethical obligations to the land community, careful ecological design, simplicity, widespread competence with natural systems, the sense of place, holism, decentralisation of whatever can be decentralised, and human-scaled technologies and communities; the development of prudence, stewardship and the celebration of the Creation; the development of the practical art of living well in particular places.¹

Environmental literacy rests on six foundations: (a) all education is environmental education; (b) environmental issues are complex and cannot be understood through a single discipline or department - interdisciplinary approach; (c) education occurs in part as a dialogue and has the characteristics of good conversation - sensitivity to language and to the voices of the others and the rest of nature; (d) the way education occurs is as important as its content - participatory and experimental learning; (e) experience in the natural world is both an essential part of understanding the environment, and conducive to good thinking; (f) education relevant to the challenge of building a sustainable society will enhance the learner's competence with natural systems - reflection and action.

Environmental literacy is difficult for western culture because: the ability to think broadly/holistically in an age of specialisation has been lost; education is regarded as solely an indoor activity which is "pure" and not "applied"; we have failed to develop our aesthetic sensitivities and we tolerate ugliness; there is less opportunity for direct experience of nature - sense of habitat/place; formal education is pervaded by technocracy and leads to a policy threatening re-orientation and broadening of the concept of community and citizenship.¹ Therefore, environmental literacy demands:

- an uncompromising commitment to life and its preservation - to health, harmony, balance, wholeness and diversity as these qualities apply to both human and natural systems; to knowledge which promotes life
- the study of nature and other disciplines - history, ethics, sociology, political science, anthropology, economics, architecture, biology, agriculture, world-order studies, natural history and philosophy - with an environmental focus;
- the connection disciplines as well as disparate parts of the personality - intellect, hand, heart - via interdisciplinary and connective education
- an awareness of the tragic in human affairs and a pungent attitude to our own rationality¹

Five measures for rebuilding the modern curriculum are suggested:¹

- developing more comprehensive and ecologically solvent standards for truth; a more inclusive rationality
- challenging the curriculum which assumes that the domination of nature is good, that the growth of the economy is natural, that all knowledge, regardless of its consequences, is equally valuable, and that material progress is our right - a revised notion of progress
- addressing the fact that the modern curriculum teaches a great deal about individualism and rights but teaches little about citizenship and responsibility - a broader idea of citizenship
- questioning the widespread assumption that our future is one of constantly evolving technology and promoting, instead, the notion that this is a good thing to have an ecological imagination with a focus on spiritual needs
- realising that education can take place outside educational institutions

Environmental education aims to bring about the changes in emphasis, loyalties, affections and convictions, necessary to heal the breach between humanity and its habitat. It is less a reform tinkering at the marking of the status quo than a tailback from old assumptions, from the straitjacket of discipline-centric curricula, and even from confinement in classrooms and school buildings. Students ought to be encouraged to find their calling in good and necessary work. The best and most necessary work for our age involves, in a thousand ways, the re-calibration of humanity's values, institutions, behaviours and expectations with those of the Earth. This is the task of education in our time. A courtship between mind and nature, or perhaps an awakening, is in order. Students should be introduced to the mysteries of specific places and things before being given access to the power inherent in abstract knowledge.^{1,2,3}

The above mentioned principles are provoking a great change in the programs for a complex sustainable development education and open up a wide space for experimentation. Education for sustainability is a process which:

- enables people to understand the interdependence of all life on this planet and the repercussions that their actions and decisions may have both now and in the future on resources, on the global community as well as the local one, and on the total environment
- increases people's awareness of the economic, political, social, cultural, technological and environmental forces which foster or impede sustainable development
- develops people's awareness, competence, attitude and values, enabling them to be effectively involved in sustainable development at local, national and international levels, and helping them to work towards a more equitable and sustainable future. In particular, it enables people to integrate environmental and economic decision-making
- affirms the validity of the different approaches contributed by environmental education and development education and the need for the further development and integration of the concepts of sustainability in these and other related cross-disciplinary educational approaches, as well as in established subjects⁴

Environmental education for equitable sustainability is a continuous learning process based on respect for life. Such education affirms values and actions which contribute to human and social transformation and ecological preservation. It fosters ecological and equitable societies that live together in interdependence and diversity.⁵

The long term aims of environmental education are to improve management for the environment and promote satisfactory solutions to environmental issues. Environmental education aims to: provide opportunities to acquire the knowledge, values, attitudes, commitment and skills needed to protect and improve the environment; encourage pupils to examine and interpret the environment from a variety of perspectives - physical, geographical, biological, sociological, political, historical, aesthetic, ethical and spiritual; arouses awareness of and curiosity about the environment and encourages active participation in resolving environmental problems.⁶

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Educational institutions need to be reoriented towards helping students to learn systematic thinking, future thinking, creative thinking, values and analysis, and moral reasoning.⁷

Schools also need to reverse their priorities. Instead of giving priority to training "human computers" whose memory capacity, abilities, analysis, calculation potential and so on, are surpassed and made redundant by electronic computers, they need to give priority to developing irreplaceable human capabilities, such as manual, artistic, emotional, relational, and moral capabilities, and the ability to ask unforeseen questions, to search the meaning and to reject nonsense, even when it is logically coherent.⁸

As schools move into the post-modern age, something is going to have to give off. It might be the quality of classroom learning, as teachers and their curriculum are spread increasingly thinly to accumulate more and more demands. It might be the health, lives and stamina of teachers themselves, as they crumble under the pressures of multiple managed changes. Or it can be the basic structures and cultures of schooling,

reinvented or realigned with the post-modern purposes and pressures they must now address. These are the stark choices we now face. The rules of the world are changing. It is time for the rules of teaching and teacher's work to change them.⁹

In the move towards a more sustainable local authority, education should achieve changes in the community which:

- lead to changes in work and lifestyles and consumption patterns which are more sustainable
- build on people's existing knowledge, understanding and concerns
- encourage people to consider alternatives, help them make appropriate choices and empower them to bring about change
- encourage and enable people to take part in the decision-making process, offering them the tools, skills, values, knowledge and confidence to be effective
- enable people to find and use information effectively
- give opportunities to participate, leading people to take responsibility and gain a sense of ownership
- help people to understand the links between issues and see connections with their own lives
- encourage principles leading to a fairer society and the more equitable distribution resources, both within and outside the authority
- enable people to identify practices that are relevant to sustainability and to monitor their own actions in relation to them¹⁰

The topic of integration of science curricula in compulsory education is the complex thinking formation system, through which will be shown - not only to students - how to deal with totality and its constructive parts. Its main and important role lays in the teacher's talent for playing the role of the "moderator" and "player" in the game of life, where students and teachers acts as inventors.

Complex system thinking is obviously not focused on the relationship between integrated teaching and integrated learning, because conceptual integration is not in the teachers' prerogatives. Similarly, the dictation of laws, principles, and data, depends on the way in which each student reflects on the given reality in a given moment, and how he/she categorises it as spatial or temporal, as causal or effective, etc. This demand is individual/personal and, at the same time, it possesses some integral in essence features, which are the preliminary condition for each living being's existence - the aim to be and live in equilibrium, within him/herself and with others, in his/her vicinity and the environment. These are long-lasting specialising and decentralising phenomena.

The integrated science curriculum shows how to deal with totality and its constituent parts by giving examples of how nature "works" and the possible ways man can choose to participate in this "work." The consequences of both approaches are shown, so that the student can either define his/her own responsible and reasonable answers now, or make moral decisions for the future.

Chemistry, physics, biology and geography are natural sciences, but their reflection on the human social consciousness and on society are of great power. Concerning what is happening with information in our societies, sustainable development provides another way of integration, by giving wide possibilities for interpretation and creation of different tools and methods for its application.

The possible point of analysis and discussion focuses also on the problems of working teams, their inner potential, teaching and learning capacities and the ways they might improve on the principles of formation of student groups or teams. The acquaintance with the students' individual features, potential and hidden talents to collaborate, as well as to create and discover, will make the material which seemed boring and unpleasant to learn attractive. Use of the wide possibilities of modern computer technologies could spark up the student's consciousness and decrease the need for long verbal explanations.

Sustainable development can be designed and practically applied in the formation of the man-earth-nature-cosmos circular view of life. Even the simplest explanation of oxidation-reduction reactions, could give countless examples of this view, by focusing on the transformations occurring in biological systems in the processes of energy exchange in nature and in the universe.

The examples for formation of a scientific model of thinking are countless, something which perhaps will help to use this information not as a tool but as a consistency. The marriage between science and the humanities is just happening in practice, and is filling up the space which, for many years, scientists and the general public were frightened to think of.

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