Ecological and environmental education in schools and institutes of further and higher education has gained increased importance in recent years, both as an area of study in its own right, and as a component of other disciplines. There is now a requirement in many countries to include the environment in both formal and informal curricula.

This volume presents a long overdue account of the status, progress and underlying concepts of ecological education. It explores areas of recent development and debate in ecological and environmental education, describes the evolution and development of environmental education in different countries, and examines the importance and provision for fieldwork. Case examples illustrate how ecological studies are undertaken in several culturally different settings.

This book will interest teachers and research workers in ecology, environmental science and education.

ECOLOGY IN EDUCATION

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Foreword: General understanding and role of ecology in education

FRANK B. GOLLEY

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Beginning in the 1960s the word 'ecology' began to take on a life of its own. I recall, as a director of an Institute of Ecology, drafting a letter to editors of newspapers and magazines who had misused the word. The letter defined ecology properly and pointed to their mis-usage. It ended with an offer to discuss the appropriate language of the environmental movement over the phone or to send them materials on scientific ecology. There was no response to the offer! We still hear high placed administrators of the environment telling us that he or she has implemented policies to save 'the ecology'.

Confusion about language characterises our time. Presidents call war peace, we are told that tyranny is democracy, capitalism is termed socialism and on and on. We live in a time when confusion over moral purpose, over the role of government and the rights and responsibilities of citizenship seem ubiquitous. We have had more than 30 years of intense discussion and research on the environmental crisis, yet the crisis becomes worse daily. Savants tell us we live in a time of transition, a time when the modern world in which we were born and have lived is being transformed into something different. We all hope, of course, that this new state will incorporate the positive qualities of the familiar modern world and eliminate the negatives. Certainly, for a positive path of transformation in this post-modern period we will depend upon the educational system. Education must provide the young with the tools they need to become effective members of their society and to provide adults with new information so that they can adapt to changing circumstances.

In other words, a key, possibly the most important key, to successful transformation is education. Ecological or environmental education is a fundamental part of the total educational package, especially in the primary and secondary grades. If a student does not understand the

concept of environment and their personal relations to the environment, they are illiterate. Every judgment we make, at every moment of time, has an environmental component. It is essential that we teach the young that they are responsible for their environmental actions and that irresponsibility feeds back to them in terms of ill health, lack of performance, misery and ultimate poverty. Social action is linked tightly to environmental action.

However, ecological education must also be continued at the higher levels of education as well. Here is where the specialists who will manage the environment and study it are trained. Ecological systems are so complex that study of them is continually required. We never stop needing an understanding of how our environment changes and affects us. Further, those students concerned with medicine, engineering, business and other technical and applied subjects need to understand how the environment interacts with their professional interests. Every field has an environmental component. At my university, The University of Georgia, Charles Knapp, our President, declared in his State of the University Address that he wanted us to develop programs to ensure that all graduates of the university were environmentally literate. The faculty has been studying how to implement this goal for more than a year. It is neither simple nor easy to create the interest and will to consider the environmental interactions within the disciplines. Yet, our committees have been enthusiastic that it can be done. They have recommended that faculties study and search for the environmental connections in each department and school. They have avoided the dogmatic environmental position and have chosen diversity and flexibility. I think that this is the best choice. Who knows what we will be required to teach about the environment in the next decade and the one after that? Who would have predicted the rapid deterioration of the ozone layer or the synergistic response of pollutants? Our environment and our society is continually dynamic.

But the ecological and environmental education specialists have an even broader agenda. They include within their interests adult education too. We have long passed the point where a few years of schooling and then many years of job experience is sufficient to equip a person to cope with a world of industrial, social and technical change. People need continual education. This need is especially true in the environmental area because the environment is so rapidly changing and dynamic and our understanding of the environment advances rapidly. We can think of our relationship to the environment through an analogy with the oriental martial arts. For successful adaptation, we act with disturbance or change and seek to

direct and guide it into the paths we choose. We do not attack or seek to directly stop change. This kind of environmental management requires well educated practitioners.

We need an integrated ecological education starting with the primary grades and extending continuously into adult life. The child learns why we are concerned about the environment and the basic principles of ecology. The college student learns how to study the environment and how to apply advanced knowledge to other disciplines. The employed adult learns the latest environmental knowledge in order to apply it in practice. I wonder if any society has such a broad program in place?

Finally, let me return to the theme of the Congress of Ecology, which was the stimulus for writing the papers that make up the chapters of this book.

Ecology is a science that developed in Europe and North America. It has become an important part of science in universities that teach a western orientated, modern education curriculum. However, the human–environment relationship is universal. It develops through the interaction of humans and their environments and human adaptation to the environmental circumstances of each place and time. While in one sense ecological science is universal, in another sense it is culturally relative to the place of its origin. Its principles are universal. The applications of those principles are local and specific. Therefore, there is a rich field of ecological application that underlies ecological education. The two must fit together otherwise the lessons may be inappropriate and possibly destructive. It was exciting for me to see this theme of cultural relativity worked out in the papers of the ecological education sessions at the Congress of Ecology.

Ecological education is a key part of the discipline. We hope that this present volume will continue the advance to create an environmentally literate society.

Preface

The global environment has deteriorated to such an extent that the great life-supporting systems of the planet's biosphere are being threatened. Changes in the earth's climate, the accumulation of waste products, soil exhaustion, deforestation and the destruction of ecosystems, are already apparent.

The radical change in human attitudes forseen by the acceptance of the concept of sustainable development depends on a vast campaign of public education and re-education, a world-wide debate around these vital life and death issues to start now if sustainable human progress is to be achieved.

(*Gro Harlem Brundtland, former Prime Minister of Norway, Chairman of the World Commission on Environment and Development (1987)*)

The Fifth INTECOL Congress held in Yokohama, Japan, in August 1990 focussed on the 'Development of ecological perspectives for the 21st century'. This was the first international congress on ecology to be held in Asia. Almost 3000 ecologists and environmental professionals from in excess of 80 countries participated in over 100 symposia and plenary sessions.

The chapters in this book are based on the congress symposium 'The general understanding and role of ecology in education', which brought together ideas, achievements and current developments in ecological and environmental education from many parts of the world. The symposium's aim was to stimulate interest and commitment from academic ecologists to broaden the base of the dissemination and application of ecological science on a wider educational basis.

There has not been a significant review of international ecology education since the symposium, 'The teaching of ecology' in 1966 organised by the British Ecological Society (BES). In Lambert's introduction to the symposium volume she stated that 'Ecology is rapidly gaining ground as an integral part of modern education', while noting that ecology is 'a subject which seems to have given rise to more controversy as to its place

in our education system than any other branch of biology' (Lambert, 1967). A quarter of a century later, this is not now the case as ecology is taking on a more integrated role and is included in a broad range of subjects: not just confined to biology but also finding a place in geography, environmental science, the broad-based disciplines and subjects and in environmental education generally.

Ecology is now viewed as a basic component of education to be included in the curriculum for all, not just those studying biology or going on to higher and further education. There has been a rapid rise in the public's general interest in the 'natural world' demonstrated by increasing media attention, numerous television programmes and books on ecological topics and issues. A greater appreciation of the world around us has taken root and is a trend that is growing internationally.

Professor Frank Golley (President of INTECOL 1986–90) in his opening address to the 1990 Congress emphasised that ecological education, as one of the most pressing needs for further development in the 1990s, will be vital if the twenty-first century is not to suffer ecological and social disaster on a global scale. That *all* people of the world should be ecologically literate is an aim that must be strived for.

It is therefore timely to compare and consider developments in other parts of the world and to review the different approaches adopted.

The papers reproduced in this volume provide an account of how ecology in education has developed since the BES Symposium on ecology education in 1966. They describe recent advances and approaches adopted in different educational settings in a range of environments, for various age groups, education systems, curricula and syllabuses in different parts of the world. The contributions include considerations of the basic problems of providing opportunities for ecological education for all young people and adults through the various levels and stages of education.

The chapters reflect the wide range of work currently being undertaken in ecological education and changes in environmental philosophy. This is borne out in particular by Robottom, who argues that the scientific, technocratic emphasis of ecology and the solving of environmental problems has diminished our capacity to deal effectively with them. He hypothesises that failing to understand environmental problems as essentially political issues has resulted in a failure to provide an appropriate form of environmental education in schools.

Ecology education in both formal and informal education at different levels (school to adult education) is explored in terms of its place in the

curriculum, its content and the ways in which it may be developed. Examples from developed and developing countries are reviewed in the chapters by Acar, Thomas, and Hale and Hardie.

Berkowitz examines the status of ecology education in the curriculum in the United States and describes some of the inherent difficulties in organising ecological study programmes at school level. He then goes on to show how these difficulties are being overcome with the support of outside expertise, such as involving ecologists and specialist organisations in specific programmes of ecology education.

Field-work has traditionally been an integral part of ecological and environmental studies. This can act to discourage some from undertaking practical work as the outside environment often presents a bewildering array of phenomena and modes of study to both teachers and students alike. Tilling reviews the problems and constraints encountered in teaching field ecology at school level and examines the relevance of practical experience to higher education and research in ecology and other areas of study. The differences in field-work provision between developing and developed nations are considered by Leal Filho. From a survey of schools in Britain and Brazil, Leal Filho shows that the disparities that exist appear not only as a result of differences in funding support but traditional methodology and historic factors also play a major role in the level of provision of field experience.

The benefits of practical experience in the environment are demonstrated in a comparative study carried out by Harvey, who assesses the effects of contact with vegetation on how children view their immediate surroundings. The benefits arising from this experience underline the need to ensure children are given every opportunity to study and play in the outdoor environment. This theme is taken up by Adams in reviewing the provision of school sites for experiential learning. As well as the school site itself, the local environment can provide a wealth of opportunities to undertake ecological and environmental study. As Hale shows, the importance of the urban environment has only comparatively recently been recognised as providing a stimulus for ecological studies. As much of the world's population is concentrated in urban areas and, by implication, is potentially out-of-touch with the 'natural world', the development of field-work in the built environment is of particular importance.

Ecological education has taken a number of forms and has developed at varying rates in different countries. Cultural factors have been shown to influence the pace of development and the nature of ecological education. Soerjani and Yoshida review the development of ecological educa-

tion in two Asian countries, Indonesia and Japan respectively.

The promotion of projects devised and coordinated by organisations and individuals outside the formal education sector has been a common feature of ecological education. These projects are often centred around a theme or issue and impart expertise and techniques to pupils or communities. Two examples of this strategy are described in relation to a comparative study of acid rain in Norway and Britain (by Shirley) and conservation education in West Africa (by Smith).

This book is not a manual on how to teach ecology, nor does it present unified solutions to the many ecological and environmental problems of the day. Indeed, the opinions of the various contributors frequently differ: the mode of thought or action adopted by one is sometimes a direct antithesis to that considered or found to be successful by another. Essentially, the chapters review and debate aspects of ecological education and discuss issues where no clear agreement has been reached by practitioners.

The fact that there are many views and approaches to ecology education is itself an indication of the vitality of ecology today. As has been observed, 'Ecology is still essentially a "young" subject in terms of established disciplines'. Indeed, the world's oldest ecological society (the British Ecological Society) celebrated its 75 years Jubilee only in 1988.

All that this volume can do is to offer suggestions for consideration in the light of individual circumstances and experience; it will have served its purpose if it leads to a recognition of the increasing part that ecology must play in the general field of education.

The symposium papers are an important bridge between the first 'Teaching of Ecology' conference organised by the BES in 1966 and future work that will be vital to the well-being of every nation and to the world as a whole. Only through ecological knowledge and understanding and the engendering of skills of interpretation and good environmental housekeeping, can people develop a sense of concern for what is happening on a local and global scale and be encouraged to take appropriate action.

Monica Hale

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