

# Interdisciplinarity in fact and fiction

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## Abstract

An interminable dispute over the need to distinguish between interdisciplinarity, multidisciplinary, and transdisciplinarity has already filled thousands of printed pages, without an agreement being apparently reached. There is no dispute however over the fact that we need decision-makers and advisors with the ability to tackle complex problems and to face situations where specialized knowledge is not the only requisite but the capacity for holistic thinking is paramount. This article describes a method that has been tested for ten years at the Free University of Brussel's Master Programme on Human Ecology to prepare students to perform beyond the limits of their own professional domain. The students enrolled in this program come from several countries in different continents, and from a variety of professional backgrounds.

**Keywords:** Interdisciplinarity. Human ecology. International post-graduate teaching, Multiprofessional classes.

## Interdisciplinaridade em fato e ficção

## Resumo

Uma discussão interminável sobre a necessidade de se distinguir entre interdisciplinaridade, multidisciplinaridade e transdisciplinaridade já preencheu milhares de páginas sem que se tenha chegado a um consenso. Não se discute, porém, a necessidade de formar tomadores de decisão e de consultores que tenham a capacidade de abordar problemas complexos,

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quando o conhecimento especializado não constitui o único requisito e onde a capacidade de abordagem holística é indispensável. Este artigo descreve a experiência adquirida durante uma década no Programa Internacional de Mestrado em Ecologia Humana da Universidade Livre de Bruxelas (VUB), que se destina a preparar profissionais para atuar além dos limites de sua formação profissional. Os estudantes são oriundos de vários países e diversas formações profissionais.

**Palavras-chave:** Interdisciplinariedade. Ecologia Humana. Ensino internacional de pós-graduação. Classes multiprofissionais.

## 1. Introduction

This paper is based on a ten-year period of observations while teaching a course on *Trends in Human Ecology* at the International Masters Programme on Human Ecology at the Free University of Brussels (VUB).

Many students choose the Human Ecology Programme expecting to become specialists in their own fields of expertise or else, to be taught how to find straight answers and ready-made recipes to solve the world's problems. This is either clearly expressed or implicitly demonstrated in formal interviews, informal discussions, and term papers and, as a consequence, it may bring disillusionment and frustration.

Actually, our aim is to develop the ability to think in a holistic way about complex situations in real life that affects the relationships of human beings and the environment.

My preliminary aim is to show how to approach reasonably complex problems in the general area of human ecology, involving biological, social cultural, ethical, economical, and political dimensions. In order to reach this objective, they must overstep the necessary limitations of a uni-professional approach to problem solving. After a time, they generally succeed in changing their views - but usually only to adopt a simplistic, multidisciplinary, approach. Most of them ignore the difference between complexity and aggregation, and the essential differences between collective and emergent properties of complex systems (BERGANDI, 1995). Emergent properties at a given level of complexity cannot be inferred or

deduced from the combined characteristics of the components at a lower level. This is figuratively described as the total being more than the sum of individual parts. Collective properties, on the contrary, arise from the sum of properties of their component parts. The age-class structure of a population, for instance, results from the combined ages of all the individuals in a population. Emergence, though, is a property of systems and arises from the interactions of the component parts. Emergent properties were figuratively illustrated by Lavoisier who stated that we couldn't predict the properties of the water by knowing the individual properties of hydrogen and oxygen, or by adding them up.

I routinely ask my students to submit a paper describing a problem from their own professional point of view and then, showing how that same question or situation should be approached from the holistic point of view of Human Ecology (see Annex). Many students succeed in presenting a reductionist uni-professional analysis followed by a more complex vision involving several aspects which had been disregarded in the preliminary description, but only to conclude that a multiprofessional committee would come up with a perfect solution.

Moles (1995) warned us against the vain attempts at attaining a holistic overview of a complex situation from the consolidated report of a multi-professional panel. For him, difficulties begin with the lack of a common language. Technical terms with distinct meanings and professional jargon prevent communication and the free flow of ideas. Furthermore, as specialization proceeds, individuals show little inclination to go back to learning new concepts, principles, theories and methods, and begin to display a growing sentiment of superiority towards other professions. The appropriation of knowledge by distinct professions and trades leads easily to inter-professional feuds and jealousies. As to methods, Moles states that:

C'est une formule souvent répétée ... que nous sommes à l'époque du "multidisciplinaire" et que nous devons jouer sur le transfert des méthodes d'une discipline à une autre. Cette affirmation est bien peu contestable sur le plan de la logique scientifique si la science est une dans sa rationalité en dépit de méthodes particulières dans chaque domaine, il n'y a pas de raison pour qu'une

méthode qui a réussi dans un domaine ne soit pas, en principe, applicable, sous bénéfice d'inventaire, à un autre domaine. Mais en pratique cette belle affirmation reste souvent au niveau des voeux pieux, quand elle n'entre pas dans la méthode du "coq-à-l'âne", car selon une formule largement utilisée dans la conversation entre scientifiques, "Tout est dans le tout, et réciproquement."

... En bref, la multidisciplinarité n'existe réellement qu'à l'intérieur du cerveau d'un même individu qui n'a plus à se heurter à l'univers du faux sens.

A course such as the one offered at the VUB is intended to teach individuals to develop their ability and the capability to work as advisors to governments and as policy consultants, to evaluate risks, to co-ordinate environmental impact assessments, to understand global problems and to help solve complex environmental issues (FUNTOWICZ; RAVETZ, 1994). They must be able to identify all the relevant components of a problem, weigh the contributions and implications of each component and find the point of least resistance for intervention. They must be able to suggest what actions are immediately required and where an intervention may obtain success, by being economically viable, socially and culturally acceptable and ecologically sound. Then, and only then, the search for a professional specialist for the designed job must begin.

As Fraser and Greenhalgh (2001) aptly pointed out,

Learning how things are interconnected is often more useful than learning about the pieces. Traditional curriculums, based on a discrete and simplistic taxonomy of disciplines that focus on the acquisition of facts, usually highlight content without helping learners to understand the interrelationships of the parts.

To attain such an objective requires leaving a well-trodden path towards specialization in order to acquire novel ways of seeing the world, coupled with the ability to master the concepts and methods from all fields of knowledge.

## 2. The need for a holistic view of complex issues

As early as 1939, Clements and Shelford remarked that the very essence of ecology lies in its synthetic nature, and noted that the trend towards specialization in training and in methods of research was having an adverse effect reflected in a hostile or indifferent attitude to an approach which is vital to the ecological study of humankind. They pointed out that

...students of ecology will continue to be trained primarily as botanists, zoologists, sociologists, or economists for some time to come - probably as long as university departments are organized on the present basis.

Clements and Shelford's comment applies to all fields of transdisciplinary knowledge. In most cases, though, professionals in one area claim the field for themselves, usually adopting a reductionist approach, as Bertalanffy (1968) recognized.

Specialized knowledge has its own importance. Since the scientific revolution, the trend towards specialization has been a clear - and a necessary one. Definition of disciplines and demarcation of territorial professional domains began during the XVIIth Century, following the professionalization of scientists and the advent of the learned academies and their journals in Italy, France, England, and Germany. It found its way into the universities, through the establishment of chairs, departments and specialized curricula. Specialization was pushed to the extreme. Eventually, after the rise of new intermediate areas, as with physical chemistry, in the XIXth Century, the somewhat artificial borders of distinct fields of knowledge were to be challenged, but only to form a new specialized field.

Recently, epistemologists and philosophers of science began to realize the rich epistemological potential offered by the extension of theories and methods from one specific field to another. Pasteur's application of his knowledge of crystallography to solve the mystery of fermentations, and from hence to unravel the origin of infectious diseases, constitutes a good example. A growing literature on creativity in science has accumulated since, as shown by Moles (1956). Creativity is more than invention and it usually results from analogical thinking.

In the years after the Second World War we have witnessed a considerable change in the relationships of science with society, as remarked by Price (1954) and Snow (1960). Science acquired a political dimension. Haskins (1965) called our attention to the fact that when the early scientific associations were formed in Europe, their relationships were with a pre-industrial society. In modern times, rapid industrialization and urbanization transformed the very nature of scientific pursuits, and in turn changed social values, social structure and philosophy. From the quest for truth, science acquired the public image of truth itself. Technological and industrial research opened new avenues for progress and comfort, and the common people both expect and trust scientists to have the right answers for everything.

Applying scientific laws and principles to solve pragmatic problems and to develop new technologies used to take a long time, sufficient in itself to permit the evaluation of its effects, and to make preparations for the changes it would bring to society in general. This timing has changed, and the resulting impacts are now felt immediately. New ideas now are spread rapidly thanks to the revolution in the communications media. Technological and industrial research occupy nowadays an important role in society and are responsible for novel aspects of social development and political directives. As a result, human being's impact upon the social and natural environments demands a new ethics.

Traditional university undergraduate curricula are insufficient to provide the necessary abilities demanded from a human ecologist. The fallacy of the two cultures - scientific and humanistic - so aptly criticized by Snow (1959), is at the root of our present problems. Aldous Huxley (1962) dismissed our clumsy attempts at solving them when he aptly said: *Your cure for too much scientific specialization is a few more courses in the humanities....But don't let us be fooled by the name. ...They're simply another form of specialization on the symbolic level.*

Problems in real life are seldom simple, and problems resulting from the interaction of humans with environmental factors, never are. In 1977, Maldague addressed these questions in detail, to reach the conclusion that what we need is to prepare experts with an open mind. Actually what we need is less people saying what we need, and more experts explaining how to accomplish our quest for transdisciplinarity - not just trying to define it.

### 3. The special case of human ecology

No single, magic, all-purpose method or research instrument will permit the manifold analysis needed for solving the problems that confront and befuddle human ecologists. These problems result from a combination of factors, some of them quantifiable, others depending on the whims of individuals and the ways of societies. As a result, the training of a human ecologist must start with professionals from different backgrounds, going on to supplement their specialized knowledge with a selection of basic principles, methods and techniques of analysis used by the so-called exact, natural, and social sciences.

In his or her capacity as an analyst and advisor, a human ecologist must be able to evaluate in depth all aspects of a problem. Human ecologists are expected to know how to draw a composite picture of the natural environment, climatic patterns, structure of the biota, the variety of the human communities and sub-communities involved, their social structure and institutions, cultural patterns, historical antecedents, economic imperatives, and political constraints. Human ecologists must rely on other specialists to further their preliminary analysis and to supplement their own data, but must be able to communicate with experts in several fields, to ask pertinent questions, and understand their answers. They should be careful to steer away from speculative ideas such as those of ecological determinism and ecological catastrophism. In short, to build a holistic picture of the situation.

When addressing a particular problem, human ecologists may depart from the standpoint of their special professional knowledge, but should be able to overstep the limitations of their own previous field of expertise and to delineate the picture of a situation in all its complexity. They must learn the special methods and paradigms of the distinct fields of human knowledge. They are not expected to become a sociologist, an economist, a biologist and a mathematician altogether, but they must learn just enough from different fields to be able to take into account all the complex aspects of a problem. They should be trained to identify the relative role and weight of each contributing factor; and to recognize the weakest link in the chain of events, where intervention will bring the desired results. The final picture they draw must show the dynamics of synergic relationships, not a mosaic of isolated elements and factors. As human ecologists, their main concern should be with the interrelationships of the distinct factors, more than with the listing and description of each of them. And then, search for a specialist to offer a solution.

My own and final conclusion is that we are a long way from recognizing problems in human ecology as emergent properties of complex systems, not merely collective, i.e., a sum of partial views from distinct professional areas. But we must develop teaching strategies to attain our goal.

Teaching a multiprofessional, multicultural, group of students has some advantages. Students can profit from a rich exchange of knowledge, varied experiences, diverse cultural and social backgrounds, and the opportunity for an exchange of world views – from distinct points of view. I have used this special opportunity to organize one-morning seminars where each student presents a problem – his own thesis subject, for instance – and all the others are called upon to give comments *from their own professional field and cultural background*. Solutions which are viable in one country may be illegal in another; culturally acceptable by some, rejected by others. As a result, final solutions must be *legal, economically viable, socially and culturally acceptable and ecologically sound*.

I have avoided being lost in the interminable disputes that surround the attempts at defining and distinguishing multidisciplinary from interdisciplinarity and transdisciplinarity in theoretical terms, and I am confident to have found a way of implementing whatever you may want to call it.

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## Annex

*Papers: what is expected and how they are graded*

*Write a short statement comparing how to approach a problem from the traditional uni-professional point of view and how it should be approached from the point of view of the human ecologist. Problems in real life are complex and they must be understood in all its complexity.*

*It is your own analysis and arguments that will be evaluated.*

*It is expected that you have learned during the course of lectures to approach a problem in a holistic way, by taking into consideration all relevant aspects, including those which are not pertinent to your own professional field of expertise. Remember that you are not describing the problem as a professional expert in a given field or profession, but as a policy maker, a general consultant or an analyst.*

*Choosing a topic:*

1. *Select a problem you are familiar with.*
2. *Avoid wide-angle analysis of “great questions” like: the destruction of tropical forests, the ozone layer, the melting of polar caps or the greenhouse effect.*
3. *Begin as journalists usually do, by answering the questions “what, when, where” in relation to the problem you have chosen. Describe how a person with your own professional background would suggest a way of solving it. Then, how it will appear in all its complexity and what you would suggest, as a human ecologist, in your role of decision-maker.*
4. *Evaluate carefully your sources of information (primary, secondary, tertiary). Give full bibliographic references.*
5. *Avoid common sense and try to find new angles or original points of view which are characteristic of the un-common sense of the scientific interpretations.*
6. *If you present a solution it must be legal, economically viable, socially and culturally acceptable and ecologically sound. You are not required to offer solutions, but to highlight all important issues that must be considered to approach the problem its full complexity.*
7. *Never “cut and paste” loose paragraphs from published materials (books, articles, reports), trying to link disjointed opinions gleaned from secondary or tertiary sources. Forget the Xerox machine.*

*A manual for Panamerican Health Organization consultants advised against recommendations that required social or cultural changes, drastic bureaucratic reorganizations, or profound political reforms at a national or regional level. You must search for viable solutions under current local conditions.*

*Grade ratings*

- 18-20 - *Your paper is outstanding, original, well written, the arguments are sound, and you succeeded in presenting an overall picture of the problem you chose.*
- 15-17 - *You did a good job, but could have presented better arguments or a finer analysis.*
- 12-14 - *You have possibly chosen a problem you don't know well, or failed to see it in a holistic way.*
- 9 - 11 - *You did not chose a suitable subject, or did not meet the requirements.*
- Fail - Try again.*