

The Transdisciplinary Evolution of Learning*

Basarab NICOLESCU

President of the International Center for Transdisciplinary Research (CIRET)

Abstract

A number of symptoms function to conceal the general cause of the disorientation of the education in today's world: the loss of meaning and the universal hunger for meaning. A viable education can only be an integral education of the human being. Transdisciplinary education is founded on the inexhaustible richness of the scientific spirit which is based on questioning, and of the refusal of all a priori answers and all certitude contradictory to the facts. At the same time, it revalues the role of the deeply rooted intuition, of the imaginary, of sensitivity, and of the body in the transmission of knowledge. It is only in this way that the society of the twenty-first century can reconcile effectivity and affectivity. Universal sharing of knowledge - a necessity of our world - cannot take place without the emergence of a new tolerance founded on the transdisciplinary attitude, one which implies putting into practice the transcultural and transreligious vision.

Concrete proposals will be also discussed: time for transdisciplinarity (devoting approximately 10% of the teaching time to transdisciplinarity), creation of ateliers of

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transdisciplinary research in each educational institution (composed of researchers from all disciplines), transdisciplinary forums (directed towards epistemology, Philosophy of Nature and Philosophy of History), pilot transdisciplinary experiences in cyberspace.

1. INTRODUCTION : DISCIPLINARITY, MULTIDISCIPLINARITY, INTERDISCIPLINARITY AND TRANSDISCIPLINARITY

The indispensable need for *bridges* between the different disciplines is attested to by the emergence of pluridisciplinarity and interdisciplinarity around the middle of the 20th century.

Pluridisciplinarity concerns studying a research topic not in only one discipline but in several at the same time. Multidisciplinarity brings a *plus* to the discipline in question (the history of art or philosophy in our examples), but this "plus" is always in the exclusive service of the home discipline. In other words, the multidisciplinary approach overflows disciplinary boundaries while *its goal remains limited to the framework of disciplinary research.*

Interdisciplinarity has a different goal from multidisciplinarity. *It concerns the transfer of methods from one discipline to another.* For example, when methods from mathematics were transferred to physics mathematical physics was generated, and when they were transferred to meteorological phenomena or stock market processes they generated chaos theory; transferring methods from particle physics to astrophysics produced quantum cosmology; and from the transfer of computer methods to art computer art was derived. Like pluridisciplinarity, interdisciplinarity overflows the disciplines but *its goal still remains within the framework of disciplinary research.*

As the prefix "trans" indicates, *transdisciplinarity* concerns that which *is* at once *between* the disciplines, *across* the different disciplines, and *beyond* all discipline. Its goal is *the understanding of the present world*, of which one of the imperatives is the unity of knowledge.

Is there something between and across the disciplines and beyond all disciplines?

In the presence of several levels of Reality the space between disciplines and beyond disciplines is full just as the quantum vacuum is full of all potentialities: from the quantum particle to the galaxies, from the quark to the heavy elements which condition the appearance of life in the universe. The discontinuous structure of the levels of Reality determines *the discontinuous*

structure of transdisciplinary space, which in turn explains why transdisciplinary research is radically distinct from disciplinary research, even while being entirely complementary. *Disciplinary research concerns, at most, one and the same level of Reality*; moreover, in most cases, it only concerns fragments of one level of Reality. On the contrary, *transdisciplinarity concerns the dynamics engendered by the action of several levels of Reality at once*. The discovery of these dynamics necessarily passes through disciplinary knowledge. While not a new discipline or a new super-discipline, transdisciplinarity is nourished by disciplinary research; in turn, disciplinary research is clarified by transdisciplinary knowledge in a new, fertile way. In this sense, disciplinary and transdisciplinary research are not antagonistic but complementary.

Disciplinarity, multidisciplinary, interdisciplinarity and transdisciplinarity are like four arrows shot from but a single bow: knowledge.

The three pillars of transdisciplinarity -- levels of Reality, the logic of the included middle, and complexity -- determine *the methodology of transdisciplinary research*. They emerge from the most advanced contemporary sciences, especially from quantum physics, quantum cosmology and molecular biology.

Transdisciplinarity is globally open. Transdisciplinarity entails both a new vision and a lived experience. It is a way of self-transformation oriented towards the knowledge of the self, the unity of knowledge, and the creation of a new art of living in the society.

2. THE TRANSDISCIPLINARY EVOLUTION OF EDUCATION

The emergence of a new culture capable of contributing to the elimination of the tensions menacing life on our planet, will be impossible without a new type of education which takes into account *all* the dimensions of the human being.

All the various tensions — economic, cultural, spiritual — are inevitably perpetuated and deepened by a system of education founded on the values of another century, and by a rapidly

accelerating unbalance between contemporary social structures and the changes which are currently taking place in the contemporary world.

In spite of the enormous diversity of the systems of education from one country to another, the globalization of the challenges of our era involves the globalization of the problems of education. The different upheavals continually traversing the area of education in one or another country are only symptoms of one and the same flaw: the disharmony which exists between the values and the realities of a planetary life in the process of change. Most certainly, while there is not some miraculous recipe, there is nevertheless a *common center of questioning* which it would behoove us not to hide if we truly want to live in a more harmonious world.

The UNESCO report of the International Commission for the Education 21st Century, chaired by Jacques Delors, strongly emphasized four pillars of a new kind of education: learning to know, learning to do, learning to live together with, and learning to be.

In this context, the transdisciplinary approach can make an important contribution to the advent of this new type of education.

Learning to know means first of all training in the methods which help us distinguish what is real from what is illusory and to have intelligent access to the fabulous knowledge of our age. In this context *the scientific spirit*, one of the highest ever attained in the human adventure, is indispensable. It is not the assimilation of an enormous mass of scientific knowledge which gives access to the scientific spirit, but the quality of that which is taught. And here *quality* means to lead the student into the very heart of the scientific approach which is the permanent questioning in relation with the resistance to facts, images, representations, and formalizations.

Learning to know also means being capable of establishing *bridges* — between the different disciplines, and between these disciplines and meanings and our interior capacities. This transdisciplinary approach will be an indispensable complement to the disciplinary approach, because it will mean the emergence of *continually connected beings*, who are able to adapt themselves to the changing exigencies of professional life, and who are endowed with a permanent flexibility which is always oriented towards the actualization of their interior potentialities.

Learning to do certainly means acquiring a profession. The acquisition of a profession necessarily passes through a phase of specialization.

However, in our tumultuous world, in which the tremendous changes induced by the computer revolution are but the portent of other still more tremendous changes to come, any life which is frozen into one and the same occupation can be dangerous, because it risks leading to unemployment, to exclusion, to a debilitating alienation. Excessive specialization should be outlawed in a world which is in rapid change. If one truly wants to reconcile the exigency of competition and the concern for the equal opportunity for all human beings, in the future, every profession should be an authentically woven occupation, an occupation which would bind together in the interior of human beings threads linking them to other occupations. Of course, it is not simply a question of acquiring several competencies at the same time but of creating a flexible, interior core which could quickly provide access to another occupation should it become necessary or desirable.

In this context, the transdisciplinary approach can be invaluable. In the last analysis, "learning to do" is an apprenticeship in *creativity*. "To make" also signifies discovering novelty, creating, bringing to light our creative potentialities.

Creating the conditions for the emergence of authentic *persons* involves insuring the conditions for the maximal realization of their creative potentialities. The social hierarchy, so frequently arbitrary and artificial, could thus be replaced by the cooperation of *structural levels in the service of personal creativity*. Rather than being levels imposed by a competition which does not take the interior being into account at all, these levels would in fact be *levels of being*. The transdisciplinary approach is based on the equilibrium between the exterior person and the interior person. Without this equilibrium, "to make" means nothing other than "to submit."

"*To live together with*" does not mean simply tolerating the other's differences of opinion, skin color, and beliefs; submission to the exigencies of power; negotiating between the in's and out's of innumerable conflicts; definitively separating interior from exterior life. The transcultural and transreligious attitude can be learned. To the extent that in each being there is a sacred, intangible core it is innate. Yet, if this innate attitude is only potential, it can forever remain non-

actualized, absent in life and in act. In order that the norms of a collectivity be respected they must be *validated* by the interior experience of each being. The transcultural and transreligious attitude permits us to better understand our own culture, to better defend our national interests, to better respect our own religious or political convictions. Just as in all other areas of Nature and knowledge, open unity and complex plurality are not antagonists.

Learning to be appears at first like an insoluble enigma. We know to exist but how can we learn *to be*? We can begin by learning that the word "exist" means, for us: discovering our conditioning, discovering the harmony or disharmony between our individual and social life, testing the foundations of our convictions in order to discover that which is found underneath. To question, to question always ; here also, the scientific spirit is a precious guide for us.

Learning to be is also a permanent apprenticeship in which teachers inform the students as much as students inform the teachers. *The shaping of a person inevitably passes through a trans-personal dimension.* Disrespect for this necessary process goes a long ways towards explaining the reason for one of the fundamental tensions of our era, that between the material and the spiritual.

There is one very obvious inter-relation between the four pillars of the new system of education: how to learn to make while learning to know, and how to learn to be while learning to live together with?

In the transdisciplinary vision, there is a *trans-relation* which connects the four pillars of the new system of education and which has its source in our own constitution as human beings. A viable education can only be an *integral education of the human being*. An education which is addressed to open totality of the human being and not to just one of its components.

At present, education privileges the intellect, relative to sensibility and the body. This was certainly necessary in the previous era, in order to permit the explosion of knowledge. But this privileging, if it continues, sweeps us away in the mad logic of efficiency for efficiency's sake which can only end in our self-destruction.

The experiments made by the Nobel Prize winning physicist Leon Lederman with children from the most disadvantaged neighborhoods of Chicago, demonstrates what we have been saying. The Chicago experiment shows well that the intelligence assimilates knowledge much better and much more rapidly when this knowledge is also *understood* with the body and feeling.

This is a prototype of the emergence of a new type of intelligence, founded on equilibrium between analytic intelligence, feeling, and the body. It is only in this way that the society of the 21st century can reconcile effectivity and affectivity.

It is quite obvious that the various areas and ages of life call for extremely diverse transdisciplinary methods. Even if transdisciplinary education is a long-term, global process, it is still important to discover and to create places which help to initiate this process and insure its development.

The University is one of the privileged places for an education geared towards the exigencies of our time which would also be a pivotal place for an education directed not only towards children and adolescents but also towards adults.

Instilling complex and transdisciplinary thought into the structures and programs of the University will permit its evolution towards its somewhat forgotten mission today — *the study of the universal*. In addition, the University could become the privileged place of apprenticeship in the transcultural and transreligious attitude, of the dialogue between art and science, which is the axis of a reunification between scientific culture and artistic culture. A renewed University would become the place for welcoming a new kind of humanism.

In spite of extremely varied conditions between universities from one country to another, the disorientation of the University has become worldwide. A number of symptoms function to conceal the general cause of this disorientation : the loss of meaning and the universal hunger for meaning. Transdisciplinary education can open the way towards the integral education of the human being which necessarily transmits the quest for meaning.

The break between science and culture, which manifested itself over three centuries ago, is one of the most dangerous. On the one hand, there are the holders of pure, hard knowledge ; on

the other, the practitioners of ambiguous, soft knowledge. This break is inevitably reflected in the functioning of universities which favor the accelerated development of scientific culture at the cost of the negation of the subject and the decline of meaning. Everything must be done in order to reunite these two artificially antagonistic cultures - scientific culture and literary or artistic culture - so that they will move beyond to a new transdisciplinary culture, the preliminary condition for a transformation of mentalities.

The University is not only threatened by the absence of meaning, but also by the refusal to share knowledge. The information circulating in cyberspace generates an historically unprecedented richness. Taking into account present developments, it is nevertheless possible that the "information poor" will become increasingly poor, and the "information rich" will become increasingly rich. One of the goals of transdisciplinarity is research into the steps which are necessary for adapting the University to the cyber-era. *The University must become a free zone of cyber-space-time.*

Universal sharing of knowledge cannot take place without the emergence of a new tolerance founded on the transdisciplinary attitude, one which implies putting into practice the transcultural and transreligious vision ; whence the direct and indisputable relation between peace and transdisciplinarity.

3. PROPOSALS

The Centre International de Recherches et d'Etudes Transdisciplinaires (CIRET), located in Paris, elaborated, in collaboration with UNESCO, the project *The Transdisciplinary Evolution of the University*. The CIRET-UNESCO project was discussed at the International Congress *Which University for Tomorrow?* (Monte Verità, Locarno, Switzerland, April 30 - May 2, 1997), sponsored by UNESCO and the Department of Education and Culture of the Republic and Canton of Ticino.

Here I will sketch some of the proposals contained in the *Declaration of Locarno*, adopted by the participants at this congress and which have a larger validity than for universities:

1. CREATION OF INSTITUTES OF THE RESEARCH FOR MEANING

The most complex key problem of the transdisciplinary evolution of learning is that of the teaching of teachers. Universities could fully contribute to the creation and operation of *bona fide* « *Institutes of the Research for Meaning* » which, in their turn, would inevitably have beneficial effects on the survival, the life and the positive influence of universities.

2. TIME FOR TRANSDISCIPLINARITY

It is recommended to devote 10% of the teaching time in each discipline to transdisciplinarity.

3. CREATION OF ATELIERS OF TRANSDISCIPLINARY RESEARCH

The different teaching places should create ateliers of transdisciplinary research (free from any ideological, political, or religious control) comprised of researchers from all disciplines. It is a matter of gradually introducing researchers and creators exterior to the traditional teaching places, including musicians, poets, and artists of high caliber, in specific projects, with a view towards establishing a viable dialogue between different cultural approaches. Co-direction of each atelier will be insured by a teacher in the exact sciences and a teacher in the human sciences or art, each of these being elected by an open process of co-optation.

4. CREATION OF CENTERS OF TRANSDISCIPLINARITY ORIENTATION

Centers of transdisciplinary orientation will be destined to foster vocations and to enable the discovery of hidden possibilities in each person ; at present, the equality of the chances of the students strongly clashes with the inequality of their possibilities.

5. TRANSDISCIPLINARITY AND CYBERSPACE : PILOT ATELIERS

It is recommended to encourage and develop all available technical means with an eye towards giving emergent transdisciplinary education the requisite universal dimension

and, more generally, to promote the public domain of information (the virtual memory of the world, the information produced by governmental organizations, as well as the information linked to the regulations of *copyleft*).

In this respect it is highly recommended to develop pilot experiences, which are founded on the extension of networks, such as Internet, and "invent" the education of the future by insuring planetary activity in continuous feed-back, thereby establishing interactions on the universal level for the first time.

6. CREATION OF TRANSDISCIPLINARY DOCTORAL THESIS

The aim is to put everything in place so that the seed of complex thought and transdisciplinarity can penetrate the structures and programs of learning of tomorrow. Doctoral thesis in subjects with a clear transdisciplinary orientation has to be allowed. This transdisciplinary PhD could have the labels of several universities in a given country.

7. DEVELOPMENT OF RESPONSIBILITY

It is recommended to universities to make an appeal in the framework of a transdisciplinary approach, notably to philosophy of Nature, philosophy of History, and epistemology, with the goal of developing creativity and the meaning of responsibility in leaders of the future. It must introduce courses on all levels in order to sensitize students and awaken them to the harmony between beings and things. These courses should be founded on the history of science and technology as well as on the great multidisciplinary themes of today (especially cosmology and general biology) in order to accustom students to thinking about things with clarity and in their context, with an eye to industrial development and technological innovation, and in order to insure that applications will not contradict an ethics of responsibility vis a vis other human beings and the environment.

8. TRANSDISCIPLINARY FORUMS

In order to reconcile two artificially antagonistic cultures - scientific culture and literary or artistic culture - and to make mentalities evolve, it is recommended to the learning places to organize transdisciplinary forums including history, philosophy, and sociology of science and history of contemporary art.

9. PEDAGOGICAL INNOVATION AND TRANSDISCIPLINARITY

It is essential to perform the follow-up of the results of experiences bearing witness to the strictly pedagogical innovation linked to the transdisciplinary approach in teaching. The learning places should encourage and stimulate publications which record and analyze the major examples of innovative experience.

10. REGIONAL ATELIERS AND TRANSCULTURAL INTERNET FORUMS

It would be necessary to organize regional ateliers for transdisciplinary research which include the application of the transcultural and transreligious, transpolitical and transnational vision. Special effort must be made so that some of these ateliers take place in, or in close collaboration with, developing countries.

Of particular interest would be the organization of Internet moderated forum with teachers and students from countries involved in religious, cultural, political or national conflicts. The transdisciplinary approach is also a science and an art of dialogue.

4. CONCLUSIONS

If the learning places intend to be valid actors in sustainable development they have first to recognize the emergence of a new type of knowledge : transdisciplinary knowledge.

The new production of knowledge implies a necessary multidimensional opening :

- towards the civil society ;

- towards the other places of production of the new knowledge (private institutions and laboratories, industrial companies, non-profit organizations etc.) ;
- towards the cyber-space-time ;
- towards the aim of universality ;
- towards a redefinition of values governing the own existence of learning.

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