

WHAT ARE TRANSDISCIPLINARY PRINCIPLES?

ROBERT W. WINQUIST
MAHARISHI INTERNATIONAL UNIVERSITY
FAIRFIELD, IOWA

My thoughts today are going to be focused on that aspect of interdisciplinarity known as transdisciplinarity (TD). TD attempts to explore directly into the nature of those connections which exist when underlying similarities are perceived across diverse subject matter. In a broad sense all of our interdisciplinary efforts and activities seek to further our understanding of the interconnections between the various fields of knowledge. These efforts may be ordered hierarchically according to the extent of interconnection pursued.

At the top of this interdisciplinary hierarchy is the level of transdisciplinarity which is built on the premise that there are discernable principles and purposes which underlie the entire knowledge/knower system. In the opinion of many leading thinkers, including Jean Piaget, who has written on the epistemology of interdisciplinary relationships, our best efforts as interdisciplinarians must be focused on this top structure of the system. In the following excerpt from his essay on the *Objectives and Nature of Interdisciplinary Studies*, K.F. Mather captures the essence of the rationale for a transdisciplinary approach to the integration of the liberal arts curriculum:

...important is the search for basic concepts and underlying principles that may be valid throughout the entire body of knowledge, that serves as the common roots from which the various branches draw their vitality. ... Integrative studies for general education must involve the quest for basic concepts

and underlying principles. Such studies must go down to the very roots of the tree of knowledge; they must deal with the structures of the universe and its fundamental directives.¹

This approach seeks not only a common axiomatics underlying all knowledge, but coordination of the entire educational system towards an overall system purpose inclusive of human meaning and values. In the words of Professor Erich Jantsch:

We arrive here at the same crossroads as in all attempts to view whole systems and aim at their improvement: we lack a deeper understanding of purpose, and thus an unambiguous direction for our organizational efforts. Nevertheless, we cannot hope to act with a true purpose -- in other words, to manage the multi-level multi-goal education/innovation system in a meaningful way -- if we do not search for and bring into play values and norms, a policy for mankind, to guide education and innovation. Our best must therefore focus on the top structure of the system.²

The goal of the transdisciplinary (TD) effort is thus twofold: to unite the disciplines on the level of common underlying principles and on the level of their commonality as expressions of purposeful human behavior.

TD and General Criticism of Integrative Studies

When successful, the TD approach circumvents some of the possible criticisms of interdisciplinarity suggested in the accompanying article by Dr. Thomas Benson on *Five Arguments Against Interdisciplinary Studies*. Three of the often cited shortcomings of interdisciplinary programs discussed by Professor Benson are: "(i) integrative education often rests upon serious conceptual confusion, (ii) it can be inappropriate, given the students' lack of mature disciplinary insight, (iii) a substantial commitment to integrative education can impede the students' development of disciplinary competence."

As an approach to interdisciplinarity, TD is unique in that it maintains the integrity of traditional

disciplinary boundaries, thereby avoiding the latter two of the above dangers. Its emphasis is on the illumination of metaconcepts which transcend the disciplines, thus eliminating the need to reorganize curriculum in ways which weaken or dissolve disciplinary boundaries. TD could therefore provide an administratively practical means to introduce an interdisciplinary perspective into an existing discipline-based general education program without a major effort at curricular reform. The addition of a single TD oriented course could provide ample opportunity for students to search out and apply overarching principles that connect the various fields they are studying. Such a course could be expected to have an impact on the entire intellectual community, as the unifying ideas introduced in it spread by means of student questioning and discussion.

Unfortunately, TD is more subject than any other interdisciplinary effort to the first of the forestated shortcomings: conceptual confusion. Unifying principles are elusive and hard to define. And it is not without some justification that such principles have been criticized as being imprecise and even simplistic. This is the reason that the TD perspective favored by so many scholars has not found practical application on a broad scale.

Epistemological Considerations

At this point we come face to face with the question I have taken as the title for these remarks: What are transdisciplinary principles? One way of responding to this question would be by collecting long lists of fundamental postulates drawn from systems theory, structuralism, mathematics, physics, psychology, and any other body of knowledge with substantive theoretical underpinnings generalizable beyond their own domain.

Personally, I am sympathetic to such an endeavor and would even take the radical step of advocating a search for commonalities across perspectives on a grand scale.*

*The theme of growing parallelism between the postulates of modern science and the classical religio/philosophic world view is already well established in our culture. Philosopher/scientists of the highest calibre have suggested that the insights of the modern sciences are so advanced they could be used to restore our shrunken contemporary knowledge paradigm to a vision more in keeping with its holistic roots (Eddington, 1935; Kunz, 1975; Schrodinger, 1967). An exploratory effort to interrelate advanced themes of the sciences, arts, humanities, and various integrative perspectives could help to define the shape of this impending synthesis.

It is a concern, however, that an unintegrated assemblage of candidate TD principles, taken out of context, would not contribute much to the resolution of our question. A better approach will be to identify some of the the fundamental assertions which can be made about the epistemological status of TD principles. This will lay bare the assumptions which underlie my own TD philosophy and, hopefully, raise for discussion several issues which deserve to be more carefully explored. The following then are my own views on three questions which must be addressed in the process of developing a transdisciplinary philosophy.

1. Are transdisciplinary principles descriptive of patterns functioning which really exist in nature?

In the literature one reads about the need to "invent" interdisciplinary principles and "create" connections across the various fields of knowledge. The implications of such terminology are somewhat unclear. It is sometimes used in a context which suggests that transdisciplinary perspectives are only tools whose value is purely pragmatic and should not be taken as descriptions of phenomena which are "out there" in nature. Nothing could be further from the spirit of scientific inquiry. All of science rests on the assumption that there is an inherent orderliness in nature which is knowable by man. The attitude of the scientist has traditionally been more rationalistic and theoretical than empiricist and applied. In other words, their perceived task is simply to describe in ever more comprehensive and precise terms those patterns of behavior and causal relationship in nature which are immutable and eternal.

Bertrand Russell, speaking of mathematics as the language of science, captures the essence of this rationalist spirit:

Too often it is said that there is no absolute truth, but only opinion and private judgement; that each of us is conditioned in his view of the world, by his own peculiarities, his own tastes and bias; that there is no external kingdom of truth to which, by patience and discipline, we may at last obtain admittance but only truth for me, for you, for every separate person. By this habit of mind, one of the chief ends of human effort is denied, and the supreme virtue of candour, of fearless acknowledgement of what is, disappears from our moral vision. Of such scepticism mathematics is a perpetual reproof; for its edifice of

truths stands unshakeable and inexpungeable to all the weapons of doubting cynicism.³

A similar spirit can be readily attributed to the arts and humanities. It is a fundamental premise of the humanities that they deal with a higher form of knowledge than that which is accessible to the sciences. Their methods correspondingly differ from the sciences in that they are more evocative than descriptive, more metaphoric than analytic. But their goal is similarly to communicate the experiences of life. And the more universal and enduring of these experiences have traditionally been the most valued.

What then is the purpose of the formulations of inter- and transdisciplinary? Are they only tools whose value is limited to what is technical and applied? Or are they manifestations of our own best efforts to describe integrative principles as real as any of those described by the sciences? I believe the latter position reflects our true responsibility. For we are free to draw from innumerable perspectives, to explore, describe, evoke, and authenticate -- by whatever means we deem most appropriate, those patterns of wholeness which are so very real in man and nature.

2. Are TD principles less precise than scientific principles? If so, how can this imprecision be justified?

When formulating TD principles we are forced to accept trade-offs between precision and comprehensiveness. If we favor precision, then our descriptive and manipulative power is increased, but at the cost of reducing the range over which the principle is applicable. If we favor comprehensiveness, then insight is gained into a broader range of interaction, but at the expense of precision.

As an example of this dynamic, let's consider the case of four professors having breakfast. The first professor, a linguist, is explaining "The Theory of Last Effort" in linguistics. This theory, or principle, can be stated as follows: language changes tend toward assimilations and other modifications that require least effort for the speaker. This is a formulation which no doubt has considerable explanatory power in the domain of linguistics. Now our second professor, a psychologist, reciprocates by explaining a principle about the

organization of memory, which states that the mind naturally finds the simplest way of coding information in memory.

The two professors are struck by the similarity between these two principles and set out to formulate an overarching principle capable of covering both cases. This is accomplished with a minimum loss of precision because of basic similarities in the subject matter, method and language of the two disciplines. Now a physicist, who can no longer resist joining in on the discussion, bursts forth with the information that a first order principle of physics (a principle which has no exception) states that objects always follow the path of least resistance. When asked to describe in more detail how this principle functions in his discipline, the physicist replies as follows: $P(t) = C_0 + C_1 \times t - 16 \times t^2$. This formula precisely describes the path of a thrown ball arching in accord with the mathematical principle of least action. Our three friends become temporarily confused. On one hand they are excited by the element of commonality they have discovered and wish to develop it further. On the other hand they have come upon fundamental differences in language, method, and subject matter which must be overcome before they can proceed. This is achieved only through a surrendering by all parties, but especially the scientist, of certain elements of their training as professionals in their respective disciplines.

They finally agree on the following wording for a TD principle which covers all three examples: natural efficiency involves following the most direct path. The physicist, however, is concerned that something worthwhile may be left out in such a vague and imprecise statement. He turns to the biologist in search of a fourth opinion. Her reply is that the principle they have come up with beautifully expresses one of the most fundamental concepts in her field, i.e., that natural selection automatically favors organisms that are most efficient. Stimulated by the thread of commonality they have discerned, they collectively wonder what more their colleagues in other disciplines could add to this discussion. They agree that there are times when it is worthwhile to surrender specificity in favor of comprehensiveness.

Other transdisciplinary principles and samples of disciplinary concepts which they might encompass include:

1. The interdependence of part and whole

Physiology: As the science of human physiology advanced, the attempt to study the function of each organ in isolation gave way to the study of integrated biological systems.

Math: To know the value of a digit such as 10,373 we must know not only the value of each individual symbol but also their relationships to one another.

2. Adaptability on the basis of underlying stability

Genetics: The genetic code of the African tree lizard has remained stable for thousands of years except for modest changes brought about by adaptation to changing environmental conditions.

Law: Twenty-six amendments have been added to the original U.S. Constitution without altering a single basic precept.

3. Inner as the basis of the outer

Chemistry: The chemical burning of deuterium yields 82 ergs of energy per gram. The atomic fission of deuterium yields several million ergs of energy per gram.

Psychology: Freud held that a single insight into the workings of subconscious processes could free one from a lifetime of compulsive behavior.

4. The principle of homeostasis

Psychology: People presented with facts which threaten deeply held values tend to reject such information for psychological reasons.

Physics: The spring in a weighing scale returns to its original position when the two pounds of apples placed on it are removed.

5. Maintenance of inner stability amid outer change

Zoology: Warm blooded animals have physiological mechanisms for maintaining stable body temperature under varying climatic conditions.

Linguistics: Through the use of repetitious phrasing, cultures which transmit knowledge through oral traditions compensate for errors in transmission.

6. The facilitation of change by a non-involved agent

Chemistry: Invertase, an enzyme which catalyzes the breakdown of sucrose to glucose and fructose, accelerates metabolic activity while remaining virtually unchanged in the process.

Psychology: In Rogerian counseling the counselor maintains a non-directive attitude yet assists the client in making choices supportive of personal growth.

7. Structure and function as complementary

Biology: The left side of the heart which pumps blood throughout the entire body has a thicker musculature than the right side which only pumps blood to the lungs.

Poetry: In Haiku poetry, the unique structure of the poetic form is an integral part of the mood and message it conveys.

It will be argued that under certain circumstances both precision of language and a broad interdisciplinary vision can be sustained. Systems theory with its incredibly broad encompassment and somewhat precise terminology could be cited as an illustration of this. But the point is that it is a discipline. It comes complete with experts, its own sophisticated language and structure of thinking -- and also has been found more or less incomprehensible to many an intelligent layman.

For TD principles to be truly comprehensive, they should also be generally comprehensible. This is in keeping with Earl J. McGrath's provocative definition of inter (between) disciplinarity (the disciplines) as that which is literally between the disciplines; namely, the common language and experience of daily life. There is something ironic and not at all far-fetched about the image of the advocates of two great integrative approaches, say a systems theorist and a Gestaltist struggling to communicate with each other. My own bias is that it should be possible to develop transdisciplinary principles which are formulated in plain English, are meaningful for virtually

every discipline, and are completely open-ended in their application. Such principles will, however, of necessity lie closer to the artistic end of the continuum which runs between statements which are precise and descriptive and those which are general and evocative.

If people can't verbalize their integrative insights in precise terms, that doesn't necessarily imply that the insights themselves are vague. Indeed, such experiences are often described as having a revelatory or "AHA" quality, which is hardly the characteristic of vague understanding.

According to Michael Polanyi, the inability of otherwise articulate people to describe the content of integrative experience is an example of what he calls "the tacit dimension" of human experience. This is the dimension in which Polanyi says we literally "know more than we can tell." For example, we know a person's face, and we can recognize it among a thousand, indeed a million, others, but we usually cannot tell how we recognize a face we know. In Polanyi's analysis the transformation of particulars into coherent wholes is dependent on this tacit dimension of knowing. This integration is achievable only through a process of "interiorization" or "indwelling" in which the mind recedes from the level of explicit particulars and attends to the tacit dimension. Therefore, for Polanyi, "The belief that, since particulars are more tangible, their knowledge offers a true conception of things is fundamentally mistaken."⁴

Analytic thought, of course, is to be valued, for as Polanyi points out, a knowledge of the laws of metrical structure may deepen our understanding of so delicate a thing as a poem. His main theme, however, most fully expounded in his book, *Personal Knowledge*, is that tacit thought forms an indispensable part of all knowledge. It is a well documented vision of personal non-cognitive, integrative elements of knowledge at the basis of all our explicit expressions and formulations of knowledge. Such a perspective will perhaps enable us to better understand the significance for inter and transdisciplinarity of that category of human experience described as transcendental or illuminative.

3. What are the implications for inter and transdisciplinarity of the human capacity to experience

transcendence?

The human capacity for transcendence has been a theme of philosophy and literature for thousands of years. Aldous Huxley identified the experience of transcendence as the central characteristic of what he called The Perennial Philosophy. Although such experiences have usually been couched in the language of religion and metaphysics, psychologists and occasionally educators, have more recently attempted to study this phenomenon in an empirical and naturalistic way. Such studies are empirical in that they consistently appeal to human experience, and naturalistic in that no recourse is made to supernatural causes or interventions. The descriptions of the experience of transcendence which emerge from objective study of this phenomenon are, as Huxley noted, surprisingly consistent. The following is a composite definition drawn from the writing of Aldous Huxley, Abraham Maslow and Philip Phenix: The term "transcendence" refers to the experience of limitless going beyond any given state or realization. (Phenix) It is an experience that is attested to, often in paradoxical form, because the experience is said to be one of oneness, such that it resolves the polarities of time and space, yet the reporter must characterize the experience in terms of time and space. (Huxley) It is not simply openness-in-general, but a cognition of being and the characteristics of being: truth, goodness, beauty, wholeness, aliveness, perfection, justice, etc. (Maslow) It is not an experience at all in the sense of involving subject/object dichotomy. It is a state of self immanent awareness, unbounded by any object of experience.

The most notable of those to explore the topic of transcendence empirically was Abraham Maslow who spent much of his career studying the lives and experiences of what he called self-actualized people. He found that what was most strongly characteristic of highly developed people was their tendency toward transcendence. He referred to such people as "transcenders" and to their experiences as "Being-state cognitions" or "peak experiences." The tendency toward a unity or wholeness of understanding and experience of their surroundings was found by Maslow to be so characteristic of these people that he used the term "unitive consciousness" to describe their state of awareness. He also observed in self-actualized people a style of perceiving which he

referred to as Taoistic perception. This concept is described in the following passage taken from Maslow's preface to the second edition of *Religion, Values and Peak Experiences*.

The perceiver can more readily look upon nature as if it were there in itself and for itself, not simply as if it were a human playground put there for human purposes upon it. In a word, he can see it in its own Being (as an end in itself) rather than as something to be afraid of or something to wish for or to be reacted to in some other personal, human, self-centered way.⁵

Notice that the ability Maslow describes here seems to be an expanded form of Polanyi's concept of indwelling. Whereas indwelling is conceived by Polanyi as an entering into an individual object of knowledge or art, so as to more fully understand the mind of its creator, Maslow expands the concept into a seeing into the Being of nature. This is parallel to the idea that transcendence is a deep and more generalized form of indwelling.

Our brief references thus far to the process of indwelling and its logical extension, transcendence, deepen our perspective into the mechanics of creative insight. Whereas it is generally understood only that creativity requires a period of passive incubation, our analysis suggests that the quiescent mind possesses a dynamical integrative power. It is this power which acts upon our learned structure of ideas and experiences to produce creative insight. In this view one can culture or stimulate but not "teach" an integrative perspective. In the following excerpt from a book summarizing the conclusions reached at the conference on interdisciplinary college teaching, Guy Michard captures this perspective:

I hope that the reader of this book understands that interdisciplinarity cannot be learned or taught, for it is a way of life. It is basically a

mental outlook which combines curiosity with open mindedness and a spirit of adventure and discovery; and it also includes the intuition that relationships exist between all things that escape current observation.⁶

At this point, we can focus down more sharply on the relationship between transcendence and transdisciplinarity and address the following question:

3A. How can the study of transcendence improve our ability to formulate and apply transdisciplinary principles?

One answer to this question is suggested by Abraham Maslow's attempt towards the development of a psychology of being. On the basis of extensive observation and interaction with self-actualized people, Maslow compiled a list of what he called "fourteen values or characteristics of being," also referred to as "descriptions of the world as perceived in peak experiences."⁷ These fourteen values are listed below, followed by one example of the fuller description he also provided for each value.

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|--------------|---------------|----------------------|
| 1. Truth | 6. Uniqueness | 10. Simplicity |
| 2. Goodness | 7. Perfection | 11. Richness |
| 3. Beauty | 7a. Necessity | 12. Effortlessness |
| 4. Wholeness | 8. Completion | 13. Playfulness |
| 5. Aliveness | 9. Justice | 14. Self-sufficiency |

4. Wholeness: (Unity; integration; tendency to oneness; interconnectedness; simplicity; organization, structure; order; not dissociated; synergy; homonomous and integrative tendencies).

Maslow held that those Being-values are the characteristics and preferences of fully human people, and therefore the characteristics of ideal art, or ideal science and of the ideally good society. He even suggested

operations which could define the meanings of each of these Being-values in testable form.

This is a remarkably comprehensive undertaking. What Maslow has endeavored to do is categorize those elements which go to make up transcendental perception and thereby discriminate the context of holistic vision. In other words, he has tried to discriminate the contents of the tacit dimension from which TD principles spring. It may therefore be valuable to use these characteristics, which define the perception of self-actualized people, as working hypotheses for transdisciplinarity, i.e., as candidates for TD principles.

A set of TD principles generated from this level of insight could satisfy both elements of the definition of transdisciplinarity. First, they could be applied to, and hence interconnect, all fields of knowledge. Second, they could serve to link the disciplines in a common purpose. What is this element of common purpose, or what Maslow called the "hint of value," associated with TD principles derived from transcendental perceptions: It is their embodiment of qualities of wholeness which guide the disciplines they illuminate toward growth of wholeness.* The sciences seek comprehensiveness of understanding and humans seek wholeness of life. Thus TD principles reflecting holistic values could subtly suggest the direction toward that far goal. When I use the expression "a comprehensive set of TD principles," it reflects my belief that there are a limited number of basic types or categories of TD principles. The word 'comprehensive' is meant to imply a set of TD principles in which all of these basic categories are well represented. Nothing could be further from my mind than the idea that some set of TD concepts could give us a firm and complete program for grasping the inexhaustibly complex realities of interconnectedness in nature. This would be opposed to the entire spirit of transcendence through

*If we conceive of the various disciplines as Phenix does: "as channels of insight into the structure of being,"⁸ then it would be expected that many TD principles reflecting Being-values would find their counterparts, expressed in principles of the disciplines, especially the more advanced disciplines. This suggests that such a synthesis may not have been possible a hundred years ago simply because the disciplines were not adequately advanced.

which one becomes more fully aware of the many-sidedness of reality and the inability of any symbol system to adequately reflect what it seeks to describe. The number of permutations and combination of TD principles operating in nature must come close to the proverbial number of atoms in the universe. But just as atoms can be placed into the 109 categories of chemical elements, so too do I believe that a similar structure exists for transdisciplinary principles.

Two final points should be made. Maslow was by no means the first to attempt to study the cognitions of transcendental experience. This has been the major focus of inquiry in the East for thousands of years. The ancient Vedic texts of India present a comprehensive system of knowledge based entirely on the transcendental cognitions of Vedic seers. Just because these formulations predate the advent of Hinduism by thousands of years, there is no reason to assume that they cannot be used to inform a transdisciplinary perspective in a modern secular university.*

Secondly, from the perspective of the Vedic East, it is not the study of, but the experience of transcendence which is most important. No intellectual system is, in itself, seen to provide an adequate basis for the unification of knowledge and life. "Darkness is not dispelled by mention of the word lamp." (Katha Upanishad)

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*See the February, 1980 issue of the AIS Newsletter for a description of the Maharishi International University curriculum in which the ancient Vedic texts and modern scientific traditions have been fused to create a transdisciplinary perspective.

FOOTNOTES

¹Erich Jantsch; *Interdisciplinarity: Problems of Teaching and Research in Universities*; Center for Research and Innovation; 1972; pg. 106.

²Bertrand Russell; Quoted in *The Learning Society*; 1968; pg. 120.

³Michael Polanyi; *The Tacit Dimension*; 1967; pg. 19.

⁴Abraham Maslow; *Religion, Values and Peak Experiences*; 1967; pg. 61.

⁵Guy Michaud; *Interdisciplinarity: Problems of Teaching and Research in Universities*; Center for Research and Innovation; 1972; pg. 286.

⁶Abraham Maslow; *The Farther Reaches of Human Nature*; 1971; pg. 133.

⁷Op. cit. #6, pg. 133.

⁸Philip Phenix; "Transcendence and the Curriculum," *Teacher's College Record*; Dec. 1971; pg. 281.

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