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Transdisciplinarity: The dawn of an emerging approach to acquiring knowledge

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Abstract

A number of factors indicate that traditional methods of acquiring knowledge and solving problems are inadequate. This article proposes the use of transdisciplinary training as an additional method in acquiring knowledge. The article further discusses the advantages and barriers to providing transdisciplinary training and suggests ways of incorporating such training.

Keywords: complexity, discipline, education, interdiscipline, research, transdisciplinarity.

Introduction

Problems such as poverty, violence, exploitation and oppression that confront us in this century, force us to deal, firstly, with the realisation that we need to do things differently, and think of creative and innovative ways to solve problems. Secondly, we have to accept and acknowledge that problems, because of their complexity, cannot be resolved merely with the subject knowledge of a single discipline (Klein 2004, 2; Max-Neef 2005). Thirdly, as we learn more about ourselves and are continuously exposed to new modes of knowledge, we must always be mindful of the link between complexity and interdisciplinarity. The nature of complex systems or problems provide a rationale for interdisciplinary study, the latter unifies the apparently divergent approaches, and offers guidance for criteria in each step of the integrative process (Klein 2004, 7).

The relationship between complexity and interdisciplinarity may have far-reaching consequences on the way we view and understand the acquisition and nature of knowledge; the structure of the university, the nature of problem solving and the

dialogue between the different disciplines, especially those seemingly far apart, such as the sciences and humanities (Klein 2004, 7).

This article proposes the use of a transdisciplinary approach as a distinct additional method to problem solving. Transdisciplinarity, unlike other approaches (see below) blurs the boundaries between disciplines. Transdisciplinarity concerns that which is at once between the disciplines, across the different disciplines and beyond all the disciplines. The unity of knowledge and the generation of new knowledge are crucial to transdisciplinarity (Giri 2002, 34,104–106; McGregor 2004; Nicolesc'u 1997). There is indeed a need for all types of disciplinary knowledge and this will briefly be discussed. However, the focus of the article will be on transdisciplinarity.

Definition of concepts

The concepts discussed below have been defined differently, for instance, some writers use the words *interdiscipline* and *transdiscipline* interchangeably. For purposes of this article, these concepts are defined as follows:

Mono-disciplinarity

Disciplinarity is mono-discipline by nature, where specialisation is acquired by using one discipline (Max-Neef 2005). A discipline is a method of training and moulding young minds, and it represents specialisation in isolation (Moore 2003; Heintz and Origgi 2003). It is also defined as a comparatively self-contained and isolated domain of human experience, which possesses its own community of experts (Nissani 1995, 122).

There are currently 5 850-plus disciplines and these, in turn, have sub-disciplines. Specialisation may be acquired in a specific sub-discipline. People who belong to a particular discipline have shared goals and values, concepts, research methodologies and institutions that set them apart from other professionals or people (Nissani 1995, 122; Weinstein 1999, 319–320). Disciplinary research concerns one level of reality, and in most cases, only fragments of one level of reality. It provides a person with knowledge in a particular field or area of study, but it does not necessarily equip a person with understanding (Nicolescu 1997; Odora Hoppers 2005, 36). Knowledge and understanding are on different levels of reality; understanding is more linked to intuition and is capable of solving the contradictions that arise in knowledge (Max-Neef 2005). It should be borne in mind that these characteristics are time-dependent; today's discipline may well be yesterday's sub-discipline (Nissani 1995, 122). It is my view that disciplinary thinking still has its place in education; its Achilles's heel is solving complex societal problems and looking at and analysing problems from multiple perspectives.

Multidisciplinarity

Multidisciplinarity is studying a research topic using more than one discipline at one and the same time (Max-Neef 2005; McGregor 2004; Nicolescu 1997). For example, a person doing research in law may turn to psychology and sociology to help solve a particular problem. Typical multidisciplinary work entails a juxtaposition of

disciplines in terms of which the people involved piece together their individual contributions towards solving a common problem. The members of the group are not required to understand the cultures of other disciplines. They need only have an understanding of their own roles in the task at hand (Weinstein 1999, 332). A multidisciplinary approach to problem solving results in a better understanding of the topic, and the researcher may be able to provide a holistic solution to the particular problem being investigated. However, the research itself remains limited to the framework of disciplinary research as each discipline maintains its distinctive character (McGregor 2004; Nicolescu 1997).

Interdisciplinarity

Interdisciplinarity is a process of answering a question, solving a problem, or addressing a topic that is too complex or broad to be dealt with adequately by a single discipline (Klein 2004, 2). It involves bringing together distinctive components of two or more disciplines in a single mind, research endeavour, or instructional programme (Nissani 1995, 124). Interdisciplinary education brings together distinctive components of two or more disciplines in a single programme of instruction. Interdisciplinary knowledge requires researchers to be familiar with distinctive components of two or more disciplines. Interdisciplinary theory takes interdisciplinary knowledge, research, or education as its main objects of study.

Inter means between the disciplines and, *interdisciplinarity* means interaction between two or more disciplines. In this instance the interdisciplinary approach refers to the appropriate combination of knowledge from different specialities, especially as a means of shedding new light on an actual problem (Brewer 1999, 328–329; McGregor 2004). Interdisciplinarity also concerns a transfer of methods from one discipline to another, either for a new analysis, new application or creation of a new discipline (Hoppers 2005, 35; McGregor 2004; Nicolescu 1997). The main objective of interdisciplinarity is to solve a particular problem or understand a portion of the world modelled by a particular complex system (Klein 2004, 7–8).

Transdisciplinarity

Transdisciplinarity refers to that which is across the disciplines, between the disciplines, and beyond and outside the disciplines (McGregor 2004; Nicolescu 1997). Transdisciplinary research is about transition and movement, and sharing knowledge among disciplines. Joint problem solving is one of its aims. It is different from other forms of inquiry because it requires researchers, educators and/or students to approach their areas of research in a ‘trans’-sitory fashion (Burnett 2003). It traverses all disciplines, that is, it criss-crosses, zigzags and moves laterally from side to side (Nicolescu 1997; McGregor 2004). Its goal is understanding the present world with all its complexities. The knowledge engendered from transdisciplinarity is globally open and entails both a new vision and lived experiences. It is a way of self-transformation orientated towards the knowledge of the self, the unity of knowledge and the creation of a new art of living (Nicolescu 1997; McGregor 2004). It is a new form of learning and problem solving, involving collaboration among people from

different disciplines and societies. Where research is of a transdisciplinary nature, no discipline can make strong claims about its value and output, and all disciplines have to be informed by transdisciplinarity and vice versa (Burnett 2003; Nicolescu 1997; Nowotny 2003).

Disciplinarity, multidisciplinary, interdisciplinarity and transdisciplinarity are like four arrows shot from one single bow: knowledge (Nicolescu 1997).

It is often necessary to rank the interdisciplinary or transdisciplinary richness of any given research. This can be done by using Nissani's (1995, 124–125) metaphor of mixing fruits. The first determinant criterion is the number of different fruits involved in the mix. In preparing a fruit salad, one can use apples and pears, which is less amalgamated than using pears, apples, oranges and plums. The second criteria may be one of distance. Mixing oranges and berries will result in less amalgamation than mixing oranges and grapefruit. The third criterion is the novelty of the mixture itself. Mixing bananas, apples and grapes is common. However, mixing guavas, kiwis and blueberries is more creative. The fourth determinant criterion is blending or integration. The fruit may be cut into big pieces or served side by side. In this instance, each fruit will keep its distinctive taste. The best results are achieved if the fruits are blended so that the distinctive flavour of each is no longer recognisable, yielding instead a smoothie (Nissani 1995, 124–125).

In a similar manner, the extent of interdisciplinary richness of any two exemplars of knowledge, educational programmes, or research can be compared by weighing the following variables: the number of disciplines involved, the distance between them, the creativity involved in combining the disciplinary elements and their degree of integration (Nissani 1995, 125; McGregor 2004). Integration is vital to interdisciplinary research. But it must be coherent and not random. It should help enrich our knowledge, instruction or research, and result in interconnections, and cross-fertilisation of the different methods and perspectives.

Rethinking knowledge

Knowledge results from the pursuits of human curiosities, and it is traditionally enshrined in universities, museums, libraries and so on all over the world (Brewer 1999, 327). Knowledge is acquired and dispensed with in most cases by institutions that are often disciplinarily organised. Academic disciplines have played a major role in the way people think, define themselves, perceive and understand the world (Giri 2002, 104; Weinstein 1999, 313–314). In practice, boundaries are drawn between the different disciplines and respect, recognition and promotions are acquired by publishing in areas that are related to one's discipline. The climate and culture that emanate from specific individual disciplines is one of competition and not collaboration.

It has become apparent over the years that knowledge is complex, hence it is now viewed differently. It used to be regarded as a linear structure, a metaphor of unity, and was underpinned by values of universality and certainty (Klein 2004, 3). Today older values of control, mastery and expertise are replaced with values relating to collaboration, dialogue and interaction. Boundaries between the disciplines, which

were drawn over time, are now supplanted by cross-fertilisation, alliances, dialogue and cross-pollination of ideas and skills (p. 3).

The trend to 'forge bridges across disciplines' was propelled by the realisation that problems cannot effectively be solved solely within specific disciplines (Klein 2004, 2). Indeed, problems are complex and interdependent, and they cannot all be tamed or managed by traditional problem-solving approaches (pp. 3–4). Problem solving or a research endeavour is a process that involves people from different disciplines, it unfolds over time, it needs patience and commitment, problem solvers or researchers have on their part to adapt to new challenges and phenomena, and be prepared to question their paradigms, perceptions, realities, assumptions or frames of reference (Nowotny 2003). Those working together will know the differences between complex problems and complicated problems; complicated problems are hard to solve because they are intricate and detailed. Complex problems, however, have order inside, an element of emergence, which is a process of deriving some new and coherent structures or knowledge (McGregor 2004).

This nature of mutual learning is unique: it requires those involved to ask themselves why they are where they are and how they got there; they are compelled to think of the routes they chose or navigated and the routes not taken. As they continually work on how to be with others, they will simultaneously be rediscovering themselves, the exchange of ideas and discovery of new knowledge will help them realise their paradigms and limitations, and help them see the world differently, through new lenses. They will discover that the world is made of different layers of realities, and that individual realities are not necessarily a mirror of the real world. The different realities will ultimately persuade them to question their paradigms, their frames of reference and obligate them to make a paradigm shift. Transdisciplinarity is about changing people's perceptions; it is about rebirth and the exploration of the self and the discovery or creation of new knowledge.

The nature and character of knowledge has changed and our connection with a complex world and nature requires complex thought on our part. We need to deconstruct and reformulate traditional knowledge. I agree with the view that we have reached a point as human beings where we know very much, but understand little. Understanding is holistic, whereas knowledge is fragmented. It must be understood that knowledge is only one side of the coin; it is the road most travelled. Understanding is the other side of the coin; the road less travelled. Descriptions and explanations help to generate knowledge, nevertheless, knowing is not the same as understanding. One can only understand that of which one becomes a part. Understanding bridges the gap between the subject and the object; the subject that searches and observes becomes inseparably integrated with the object searched and observed. Max-Neef (2005, 15), in explaining the relationship between knowledge and understanding, states aptly in explaining the human phenomenon called *love*: 'so, you [might] know everything that can be known about Love; but you will only understand Love, once you fall in love'.

Most countries in Africa were colonised for decades, and the education system and knowledge that were generated were not appropriate to the local, cultural, economic and social realities of these countries. African indigenous knowledge systems were

ignored and undermined. This contributed to an imbalance in the way information was acquired and used. Africans need to go through a renaissance, a rebirth a heightened consciousness as they learn about themselves and are exposed to new knowledge. They have to examine their upbringing and interrogate the education they received. They have to re-organise phenomena as they are exposed to it; re-organise objects and tools; and interpret and mould them into a shape that is their own creation. By so doing, they will finally be able to discover who they really are and the routes they have not navigated.

Transdisciplinarity in practice

The following are some of the factors that must be taken into account when professionals are involved in transdisciplinary training:

Communication skills

Different actors should set in motion a process of communication and identify people with the same questions who will discuss real transdisciplinary problems, collectively identify areas of mutual concern, agree on what the problem is and work towards a joint solution (Nowotny 2003). Dialogue enables us to embrace other peoples' points of view and gradually let go of our conditioning, prejudices and ultimately be able to learn and listen to each other in a new way. It is through communication that people become aware of the fertile space between and beyond the disciplines that need to be navigated.

Communication skills are crucial to transdisciplinary research. In this context they can be understood as, firstly, the ability to speak and understand a shared language. This includes creating a space for persons to reach their potential and discover their hidden possibilities. Secondly, communication entails an ability to engage in a dialogue with another so that those involved actually exchange ideas with the hope of understanding the world as a complex whole (Giri 2002, 108; McGregor 2004; Weinstein 1999, 333). The willingness to listen to the other is facilitated by the discovery of the true self within (Giri 2002, 108). As participants engage in dialogue, two things begin to emerge. Firstly, the nature and scope of the problem identified change. The structure in which problems are addressed differs, and the discussion helps bring the problem into greater focus (Klein 2003; Sperber 2003). Secondly, participants usually start the dialogue with trepidation and uncertainty. However this changes as the dialogue gathers momentum and the participants dispel negative factors they perceive as responsible for the problem or situation. A sense of calm then settles over them and they begin to identify similarities in the problems discussed, share their experiences and views, and collectively come up with solutions.

Openness

Transdisciplinary dialogue requires from us that we be firmly embedded in our own discipline. However, transcendence does not necessarily mean abandoning our turf or cutting off from the ground where we stand. What it does entail is an

ability to venture into uncharted waters and being open to new ideas (Giri 2002, 108). Transdisciplinary dialogue and practice enables us to be open to new ideas and acknowledges the limitations of our individual disciplines. There is a shift of power that helps to liberate our thoughts, which are influenced by education, culture and conditioning. This open dialogue helps us to find our own place and home, and to move away from a place of conditioning. Transdisciplinarity requires us to question values and cultures that were transmitted unconsciously during our professional training; to question assumptions and dig deeper through dialogue and perspective sharing – even in the face of results, search for fruitful alternatives rather than an obvious response (McGregor 2004) and always ask ‘who are we?’; ‘where are we?’; how and why we chose certain routes, and not others, to get where we are.

Commitment and courage to abandon

Transdisciplinary training takes time and energy, and if participants are not mentally prepared for the challenge they may give up half-way through the process. Those who persevere may, in the long run, be able to develop a clear and detailed understanding of the work done in other disciplines, and in their own work, and be adept at addressing transdisciplinary issues. Ultimately, something novel and relevant will emerge that could not have been fostered in a disciplinary context (Sperber 2003). Commitment goes hand in hand with a preparedness to abandon our discipline as we seek to acquire new knowledge or engage in research. Transdisciplinarity suggests a way out, for example, for a lawyer who wants to delve into the field of psychology to better understand an issue from the vantage point of a psychologist and not a lawyer. This is not unlike the foreigner landing on alien shores, forced to learn the local culture – not with the aim of denying his or her origins – but so that he or she can gain the full respect of the indigenous people (Giri 2002, 109; Sperber 2003). The courage to abandon our disciplines, by extension, requires us to question values and cultures that were transmitted, unconsciously at times, during our professional training. We need to discover how we were conditioned. We need to confront our confusion and inner turmoil and continuously test the foundations of our convictions and to question – always question even in the face of results. And as we change, ask ourselves ‘who am I?’ ‘where am I’. The knowledge so acquired is different from other types of knowledge engendered through other approaches to research and practice (McGregor 2004).

Challenges to transdisciplinary work

People who engage in transdisciplinary research confront numerous challenges and the section below looks briefly at some of the obstacles.

Language

Each discipline develops its own language and vocabulary. It is crucial to transdisciplinary research that there be an appropriation, accommodation and integration of the different languages. Finding a mechanism to bridge the language

gap in transdisciplinary practice represents a major challenge. McGregor (2004) is of the view that metaphors, narratives, stories and dance may be used as tools to create a temporary language as people make analogical leaps from the familiar to the unfamiliar. Metaphors simplify and augment the joint learning process giving those involved a common language while navigating the space between the disciplines. The different concepts used by the professionals need to be concretised and developed so that those working in the fertile space between the disciplines are able to develop common patterns and form a common language that will help them to express themselves.

Methods

The different methods and operational objectives within and between the disciplines pose a challenge to those taking part in transdisciplinary work. Methods are the procedures used for integrating information and exercising professional skills. Information gathering is an important tool in assessing and determining the nature of a problem (Weinstein 1999, 330). Each discipline has its own methodology for approaching problems, and methods reflect the collective knowledge, language and skills of a professional culture (p. 331). The use of different methods by the respective disciplines may lead to misunderstanding and opposition by other disciplines. To counter this problem, a person may have to use and integrate methods from all the disciplines involved in solving the problem and phrase the research problem in a language that can be understood by everyone involved.

Quality

Serious concerns have been raised about assessing the quality of transdisciplinary research (Nowotny 2003). The daunting task therefore is identifying a standard that can be used to measure quality. Gardener and Mansilla (2003) have suggested the following guidelines, namely

- Whether the transdisciplinary research succeeded in providing insights to the question/problem investigated otherwise not attainable through traditional disciplinary means.
- Assessment is sometimes done by looking at the aim of the work and the way in which integration advances the goals that researchers set for their pursuits and the methods they used and the effectiveness with which a particular piece of work advances understanding and inquiry.
- Whether the researchers were successful in integrating different perspectives.

Institutional impediment

The way in which academic institutions are currently organised hamper transdisciplinary research and teaching. Academic institutions are disciplinarily organised and there are usually institutional barriers relating to incentives, funding and priorities given to disciplinary as opposed to transdisciplinary work (Brewer 1999, 335).

Transdisciplinary education

Transdisciplinary approaches can provide society in general and students in particular with tools to understand and interpret social reality on an ongoing basis. Transdisciplinarity fosters a new vision and a new experience of learning (Marinova and McGrath 2004; Nowotny 2003). Our educational system is built upon the approaches of a previous century confined solely to the boundaries of a disciplinary perspective. As a result, our universities are inward looking rather than universal. They are filled with scholars who are no longer required to study reality (Voss 1998). As a result, some have not even woken up to the realisation that the universe is a coherent whole comprising several layers of reality and that we can no longer effectively study only one aspect of a problem.

We also have to look at how scholarship is acquired at universities. It is a venture in which the students, teachers and the facts are conceived of as separate entities operating within an impersonal or 'machine-like' structure; the educational institution (Voss 1998). A student is taught by experts who have specialised in specific areas or sub-disciplines and, the student's role in the process of learning is in most cases to internalise what he or she has been taught without questioning. The culture generated by this kind of learning is that of win/lose. The winners are students who are adroit at memorising and regurgitating everything they were fed while acquiring knowledge. At the end of their training, which is normally four years in South Africa's tertiary institutions, they are then expected to apply the skills obtained. Others may decide to continue the process by focusing on one topic to the exclusion of all others: specialisation. Once that process is finished, the person then may attempt to find an academic position at a good university. This having been accomplished he or she has to publish extensively in his or her area of specialisation in peer-reviewed/accredited journals. The merit of the scholar is sometimes determined by the journal in which the scholar chooses to publish his or her articles (Voss 1998).

The scenario described above is by no means the only way of doing scholarship. Voss (1998) rightly suggests that academics should change their perceptions about how knowledge can be acquired and generated, and think of scholarship as being a multi-levelled and never-ending process characterised by curiosity and creativity. It should therefore entail openings and not closings. Education then becomes an adventure and a learning process of discovery, including discovery of the self and an exploration of previously unknown territory (Voss 1998). The university should be a place where this new knowledge is engendered. The report to Unesco of the International Commission on Education for the Twenty-first Century recommends four pillars of an educational system, namely: learning to know, to do, to be with and to be. The transdisciplinary approach can make an important contribution to the advent of this new type of education (Nicolescu 1997).

Teaching and learning to know

Teaching and learning to know refers to training in the perpetual questioning of traditional assumptions and building bridges leading to continually connected beings

(McGregor 2004). Knowledge is best understood when it is not only processed by the brain but also by emotions and intuition – by the head and the heart. Knowledge so acquired brings us closer to the possibility of understanding. Understanding helps us contextualise problems or situations and appreciate the different realities. For example, experts dealing with the issue of poverty eradication should be aware that there are different ways in which people from different backgrounds view the world. That there is wealth, although not material wealth, in the heart of poverty; that although people may be poor, they may still be innovative and find ways to survive. An expert will also have to be aware that poverty is multifaceted. It may not only relate to subsistence, but may be poverty of identity generated by discrimination, or violence, or repression, and so on.

Teaching and learning to do

Learning to do, firstly, refers to the acquisition of a profession, but doing so in a way that will enable a person to successfully weave together several competencies at the same time. It requires the ability to let go of power and to embrace something new, including a desire to realise the empowerment of others. It allows us to dream and unleash our full potential not only on a personal level, but also as a group (Marinova and McGrath 2004). Secondly, teaching and learning to do require an ability to do research and understand in a transdisciplinary manner. This includes skills to facilitate collective participation, collaboration and coordination between all stakeholders whereby dialogue is not tainted by biases of position and power (Marinova and McGrath 2004).

Teaching and learning to be with others/live with others

Learning to be means being able to tolerate and respect other people's cultures, colour, religion and opinions, and to learn a new attitude that allows us to defend our own convictions. By extension, it requires us to have an ability first to understand before we can seek to be understood. Seeking first to understand is an entirely different paradigm. It requires a person to listen with empathy. Empathic listening enables us to get inside another person's frame of reference. It enables a person to see life through the eyes of another, to understand a person's paradigm and how they feel (Covey 2004). This new attitude creates a space for both open unity and complex plurality, and results in a synergy of different ideas and cultures (McGregor 2004; Nicolescu 1997).

Teaching and learning to be

The university is the privileged place for an education geared towards confronting the challenges of our time and instilling transdisciplinary thought into its structures and programmes, thereby permitting the study of the universe.

Conclusion and recommendations

It is clear from the above discussion that universities need to be innovative, evolve

and adapt in order to be able to deal effectively with problems of global and long-term impact. Academic institutions must move toward forming partnerships with other academic institutions, form partnerships with government, non-governmental organisations, and industry. Another alternative is to establish professional schools specialising in transdisciplinary programmes that meet market needs by anticipating and engaging realistic problems without threatening the dominant, disciplinary and departmental paradigm (Brewer 1999, 332). The university has to create new ways or systems for recognising and rewarding individuals engaged in transdisciplinary research, this will by implication necessitate training of future scholars and professionals to think beyond the confines of their basic disciplines (Brewer 1999, 331–332).

If academic institutions want their graduates to be innovative problem solvers they must ensure that the theoretical benefits of a transdisciplinary approach to the curriculum are in harmony with their institutional mission goals, which in turn have to respect and embrace transdisciplinarity as an additional method to acquiring knowledge. The colleges/schools within the universities should articulate their statements of intent and state clearly who they are as evidenced by their curriculum. They should also indicate how they are going to implement programmes with a transdisciplinary paradigm. Institutions should state how they intend to achieve the values espoused in their statements of intent. The latter may include issues on who the participants are (students and academia). Attention should also be paid to triggers of transformation, for example, the use of language and the affirmation of diversity. There should be a sharing of different perspectives on transformation. This will by necessity include debates by academics, students and members of the community on different issues. Discussions should be on how transdisciplinarity can be operationalised, how to best use reflective practice and how to acquire skills to be knowledge generators. Learning in universities should be an ontological process, that is, it should be accompanied by a change of being. Scholarship should become an existential process, a way of growth through which a person can be able to acquire wisdom (Voss 1998). Nicolescu (1997) recommends the following:

- Universities should have one transdisciplinary department, every other department should devote ten per cent of its time to transdisciplinary work;
- Institutions should establish studios or workshops of transdisciplinary research comprising researchers from all disciplines and people from the arts, music, theatre, poets, writers and dancers;
- Universities should encourage and stimulate publications which record and analyse the major examples of innovative experience;
- The National Research Fund should make funds and incentives available to those who want to engage in transdisciplinary research.

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