



BLASTER Teacher Training Kit
Transdisciplinarity

Contents

Applying 'Transdisciplinarity' to Pedagogy in the Context of the Liberal Arts	1
Purpose	2
Activities.....	2
Warm-up activity	2
Introductory activity	3
Long activity	3
Assessed activity	6
Checklists or forms of self-evaluation.....	7
Definitions of transdisciplinarity.....	8
The Origins of Transdisciplinarity: A Timeline	8
Resources.....	11
Select bibliography.....	11
Conferences	12

Applying 'Transdisciplinarity' to Pedagogy in the Context of the Liberal Arts

The Institute for Advanced Teaching and Learning at the University of Warwick developed a shared understanding of the concept of transdisciplinarity as authentic learning beyond the subject areas—learning connected to the world—such that the subject areas are not in opposition to, but complement and support, transdisciplinary learning. It is a core strategy to foster a pedagogy that is committed to innovation, interdisciplinarity, inclusiveness and internationalism in priority areas such as academic literacy and physical and virtual learning spaces.

One of their successful projects has been the development of Open-space Learning¹, or OSL, a pedagogic methodology that was created, developed, and practiced at the University of Warwick beginning in 2007. OSL enables a social constructivist approach to teaching and learning, introducing dialogic and experiential inquiry between tutors and learners as the means of actively discovering, rather than passively receiving, knowledge. The project feeds directly into broader strategies concerning interdisciplinarity and transferable skills, particularly important when graduates need to be flexible in their approach to the world of work. OSL continues to be disseminated at Warwick particularly within the IATL-hosted interdisciplinary undergraduate modules which are designed to help students grasp abstract and complex ideas from a range of subjects, to synthesise these into a

¹ See 'Open-space Learning', http://www2.warwick.ac.uk/fac/cross_fac/iatl/resources/outputs/osl-final/.

rounded intellectual and creative response, to understand the symbiotic potential of traditionally distinct disciplines, and to stimulate collaboration through group work and embodied learning. The parallels and convergences with the broadly defined liberal arts are clear.

IATL echoes Nicolescuian thought to a certain degree, representing the distinctions and connections between multi-, inter-, and transdisciplinarity:

Disciplinarity: how disciplines organise their knowledge and set their parameters.

Multidisciplinarity: how disciplines share perspectives with those outside their individual fields e.g. collaborations between, say, departments in a faculty.

Interdisciplinarity: what happens if these shared perspectives begin to challenge the pre-conceptions of partner disciplines, and question their own e.g. 'Sport, Philosophy, and Practice'.²

Transdisciplinarity: a way to address an issue or problem that does not begin from a disciplinary stance, but looks first at the nature of the material/problem/ issue e.g. 'Climate Change'.³

Purpose

The following is a description of a collection of activities that constitute a single imaginary workshop of approximately 3 hours in duration designed specifically for use by those engaged in learning and teaching as part of a liberal arts programme. Some of the materials have been used in practice, and versions of the activities have been facilitated on many separate occasions. The theme, 'Art and Revolution,' has been selected as it addresses the interdisciplinary and problem-based characteristics of work in the liberal arts.

Activities

The workshop is divided into four categories: warm-up; introductory activity; long activity; assessed activity.

Warm-up activity

The warm-up activity for this activity is generic, lasts up to five minutes and is titled, '1-2-3 Clap.' It is short and is designed to prepare workshop participants for a collaborative, embodied session. It is important to note that this, as is the case with all the activities detailed here, requires an open space free of tables and chairs.

- The facilitator asks the participants to form a standing circle. Participants are required to form pairs. The facilitator asks for a volunteer to demonstrate the activity. The idea is to take it in turns in a count of three, so the Facilitator says '1', the volunteer says '2', the facilitator says '3', the volunteer says '1', the facilitator says '2', and the volunteer says '3.' At this point the demonstration ends. The pairs now take up the activity.
- After a minutes or so the facilitator stops the activity and recalls the volunteer. The demonstration is identical except that '1' is replaced by a clap. The pairs take up the activity.
- After a minute or so the facilitator stops the activity and recalls the volunteer. This demonstration is identical except that '2' is replaced by a stamp of the foot. The pairs take up this activity.

² See

http://www2.warwick.ac.uk/fac/cross_fac/iatl/activities/modules/ugmodules/sportphilosophyandpractice/.

³ See http://www2.warwick.ac.uk/fac/cross_fac/iatl/activities/modules/ugmodules/climatechange/.

- Again, after a minute or so the facilitator stops the activity and recalls the volunteer. The demonstration is identical except that '3' is replaced by a click of the fingers.
- The pairs now take up the final activity.
- The facilitator finishes the warm-up by asking the participants to drop the gestures and return to counting.

As an icebreaker this activity is always successful: it is simple, but difficult to perfect, so participants find themselves laughing together at their failures. A short reflective session should be conducted after all these activities and the warm-up should be no exception. The exercise is intended to stimulate collaboration and provoke thinking about how collaboration works. Often, participants will note this contrast and, they tend to comment on the focus needed on one's partner in order for the exercise to work correctly. They also often note that the activity combines intellectual and embodied activity. In the terms in which we frame the pedagogy of the liberal arts this activity should suggest to participants that the kinds of global problems that the liberal arts seeks to address require collaboration; they cannot be dealt with by single individuals working alone on highly specific matters. The introduction implies the transdisciplinary, also, in the sense that there is no sense that the activity might have emerged from a particular discipline as they tend to currently constituted in Western universities.

Introductory activity

At this point, the next activity can be introduced. This represents a move from the personal into a more practical experience of transdisciplinary practice in the liberal arts. 'A Long Short Walk' requires the facilitator to select a walk, or a number of walks, of around 15 minutes in any environment they choose, but for the purposes of this workshop it would be an area of the university campus.

A detailed route must be prepared and a precise map given to participants. Participants are split into groups of 3 or 4 and allocated a walk (or the same walk). The key to this activity is that participants are required to undertake a walk that would normally take 15 minutes in 45 minutes, and take notes as they go. It is vital to stress that progress must be slow.

At the end of the walk, participants return to a central point and are encouraged to create a narrative from their experience. Participants then show their work to the other groups and the session finishes with a plenary.

The activity is amenable to the presentation of results in a number of different forms: the activity can be extended by requiring participants to distil their findings into a still-image, or tableau, that represents their experience, or a performance might be created, or participants might want to film and edit their experience, or a written narrative might be chosen. In terms of its relationship to the transdisciplinary status of the liberal arts, the exercise requires participants to slow down in order to read carefully the semiotics of an environment and the behaviour of the individuals and groups therein. Such activities transcend disciplinary categories. It is an activity that promotes 'noticing' as a means of engagement and response. It is very important, too, that the facilitator encourage participants to observe changes in themselves and in their own reactions. There is a significantly transdisciplinary notion, here in the idea that the liberal arts may function in a third space of self and environment, and self and other.

Long activity

The next activity is known as 'theory building.' Theory building requires that the tutor or facilitator prepares in advance a series of laminated images and/or fragments of text. Twelve to twenty is

typical. Each laminate should address some aspect of the session's subject matter either directly or tangentially – please see the detailed descriptions below. It is important that the information does not lead participants in too specific a direction, but also that it is appropriate to their levels of knowledge and ability.

The exercise is for groups of eight to thirty.

The facilitator divides the larger group into several smaller groups. The groups are each provided with a set of identical laminates. Each group is required to create a 'theory' or 'narrative' from the materials and represent this as a pattern on the floor of the space. The facilitator should be ready to step in at various moments to clarify, for example, what the images represent, and from where the quotations are taken. Each group, when they are ready, invite the other groups, in turn, to enter their space and 'read' the theories. This part of the exercise is complete when every group has 'read' every other group's work. This above lasts anywhere from forty minutes to an hour and can be concluded with a plenary of whatever length the facilitator determines is appropriate – this would usually involve the entire group of participants. It is possible to add two stages to the process. Participants can, again, form a tableau or still image of their theory. They can also add movement through an improvised performance. It is also possible to conclude a theory building exercise with a writing session in which participants articulate their theory in five hundred words.

For the purposes of this exercise the following materials are used:

Quotations:

- 'Like art, revolutions come from combining what exists into what has never existed before.' Adorno.
- 'A writer or painter cannot change the world. But they can keep an essential margin of nonconformity alive.' Luis Buñuel.
- 'One big difference between now and then is that in 1979 and 1980, artists actually believed there was going to be great change in society. Nowadays, artists believe there won't be any change in the next 20 or 30 years. The artists don't believe they have the strength to change. Their lives are comfortable, but they feel they don't have any freedom of expression.' Wang Keping.
- 'Take pictures of what you fear.' Diane Arbus.
- 'You never change things by fighting the existing reality. To change something, build a new model that makes the existing model obsolete.' R. Buckminster Fuller
- 'Sometimes people hold a core belief that is very strong. When they are presented with evidence that works against that belief, the new evidence cannot be accepted. It would create a feeling that is extremely uncomfortable, called cognitive dissonance. And because it is so important to protect the core belief, they will rationalize, ignore and even deny anything that doesn't fit in with the core belief.' Frantz Fanon.
- 'The role of the artist is to make the revolution irresistible.' Toni Cade Bambara.
- 'If the Revolution has the right to destroy bridges and art monuments whenever necessary, it will stop still less from laying its hand on any tendency in art which, no matter how great its achievement in form, threatens to disintegrate the revolutionary environment or to arouse the internal forces of the Revolution, that is, the proletariat, the peasantry and the intelligentsia, to a hostile opposition to one another. Our standard is, clearly, political, imperative and intolerant.' Leon Trotsky.
- Imitationalism.
- Emotionalism.

- Formalism.
- Institutionalism.
- Instrumentalism.
- 'The truth of art lies in its power to break the monopoly of established reality to define what is real.' Herbert Marcuse.
- 'Behind the aesthetic form lies the repressed harmony of sensuousness and reason.' Marcuse.

Images:

- A cartoon consisting of a tree with nooses hanging from it with the names of Arab leaders beneath a number of the nooses. The caption is: 'The Arab Spring bears strange fruit.'
- A photograph of Cairo street art featuring Snow White carrying a gun looking back at 9 oversized ants.
- A highly stylized painting of Mao holidaying happily with his 'Chinese family,' who consist of stereotypes of revolutionary heroes.
- An illustration of a 19th century factory.
- A photograph of large piles of skulls from the genocide in Cambodia featuring an individual in a seated position dusting one of the skulls.
- A photograph of an early printing press.
- A graphic representation of 'the internet.'
- A photograph by the artist, Shirin Neshat, showing a naked boy covered in henna tattoos. His mother is fully veiled standing next to him, holding his hand.
- A photograph of the celebrations in Tahrir Square during the revolution.
- An image of an auction taking place at Sothebys.
- *Wanderer Above the Sea of Fog* by Caspar David Friedrich.

The materials in this exercise are designed to guide participants towards a discussion of the idea that revolution and art are related in complex ways. The exercise does not offer right or wrong answers, but guides participants in their construction of a potentially sophisticated and contradictory representation of the nexus of art and revolution. The exercise should help participants to understand that 'art and revolution' is an inherently interdisciplinary juxtaposition that requires a wide variety of disciplinary analysis in order to understand its inherent richness. Again, the mechanics of the activity – its form – demand that participants perform a negotiation at the level of discipline, temperament and opinion as the only means by which the collaborative activity can be successful.

Whilst it is true that it is the facilitator choosing the images, and she/he must be in some way leading the participants, the process can be made more impartial by asking that participants supply an image or phrase themselves before the session. It is also true that what might appear to be a simple exercise can create profound experiences for participants if the facilitator creates materials that allow participants to own the narratives they create. Furthermore, the final element of the exercise brings the two artificially divided notions of embodiment and intellectual activity back into closer proximity.

What is most powerful in this exercise is the move students make from individual reflection to collaborative reflection, to changes in those reflections, to the shared embodiment of an idea. The phase in which participants are asked to make a tableau, or still-image, of the idea they have represented in images and text on the floor is always the most challenging. The requirement is that

they should all be in physical contact with one another, and that they should be silent in the final moment of presentation. All other possibilities are open to them.

An example of how these tableaux have worked for is a session in which the facilitator wished us to understand the concept of hegemony. Two of one particular of the groups of three involved blindfolded the third before leading them around the room then stopping at the moment the facilitator counted them down to stillness to form a natural pose on the floor. The 'third' reached out towards the dominant two, meeting fingertip-to-fingertip, with an extraordinary expression on her face, which is almost impossible to describe – something like a combination of gratitude and puzzlement, but more subtle and varied than this. The readers from the other groups were obviously struck by some kind of 'authenticity' that clung to the image, and participants reported that they knew this concept, through feeling it, better and in a radically more meaningful way than they might have done before.

If I was asked for a 'learning outcome' it might be possible to say that, 'participants are forced by the nature of the activity to engage. It both promotes collective action and encourages a sense of individual responsibility. It deepens understanding of the subject matter and provides a platform for later, more detailed discussion.' Other learning outcomes would be broader and, in this case, related to the specifics of the exercise in cultural geography that is at the heart of the session. Learning outcomes such as these might be monitored by asking participants to keep 'reflective notes' during the course of the workshop. The facilitator should pause at 6 or 7 points during the workshop in order to provide time for participants to record their reflections in the notebooks provided for the purpose. It should be made clear to the participants what the learning outcomes are, and how they relate to the subject matter. Above all it should be made clear that the journals should be immediate, unrevised, and reflective of a process of change in ideas and experience.

Assessed activity

Alternately participants may be invited at the end of the session to write 500 words, as a group, or as individuals. These pieces of work may be summative or formative. If they are to be assessed the facilitator has the choice of gathering the work and providing feedback later. Or the situation at the end of a session such as this is optimum for a for a peer assessment exercise. Participants will have already exchanged and embodied ideas, and otherwise collaborated, in a mutually-supportive atmosphere in which a significant degree of trust will have already been built. Participants should be provided with very specific lists of grading criteria, and work should be anonymized before each student provides feedback on a reflective notebook not their own. The final stage is for the facilitator to collect the notebooks and moderate the peer assessment.

In certain important respects liberal education is designed to create a community of lifelong learners. In many cases we guide these learners along paths towards jobs and careers that we cannot define, or which do not yet exist. There is an increasing recognition in higher education that isolated academic disciplines neglect to accommodate the rich diversity of the global environment in which we live. In reality the world consists of problems, ideas and challenges that require multiple and various perspectives to understand and address. How then do we establish pedagogies that might be effective in the face of such a collection of unknowns? What becomes important is a balance between breadth and depth, and between learning methodologies and the acquisition of knowledge.

The activities described above are designed to respond to this need to balance what can appear to be competing imperatives. In a unit titled 'Art and Revolution,' for example, it is plainly necessary to provide students with readings that engage across a variety of disciplines, whilst ensuring these

readings are pitched at a level that is sufficiently challenging. Such a foundation must be accompanied, however, with a pedagogy that equips students to communicate effectively, to develop insight, to work collaboratively, and to behave ethically and responsibly. In the collection of activities described above, such a pedagogy is designed into the process: it is impossible to complete the theory-building task, for example, without co-operation. Effective communication is necessary throughout the session from the first moment of the first activity, to the point at which students explain their theories or narratives to one another at the end of the theory-building session.

Equally important is an ability to transfer disciplinary skills from one situation to another, hence the application of the idea of 'close reading' from literary studies to observation of the environment. Collaboration, too, features heavily: the warm-up cannot work without it, nor the theory-building exercise. The latter, in particular, is designed to go to the heart of a liberal arts curriculum in that it requires students to address an issue in terms of its breadth and its depth. It demands that they decide what is actually important in the juxtaposition of 'art' and 'revolution' and form their responses accordingly. Built into the session, also, is that there are responsibilities and ethical considerations in both how we address problems, but also in the language in which we frame those problems, and how we work together to solve them.

Important too in this pedagogic environment are the ideas of experiment and failure, both of which are prevalent in the sciences, but tend to be viewed differently elsewhere. Students should have a safe space to try out ideas: a formative environment in which they are made to feel unafraid if their responses to a problem do not solve it, or their solutions fail to work the first time.

Checklists or forms of self-evaluation

1. Does the activity you have designed address the key elements of a liberal education as detailed in your institution's aims and objectives?
2. How might these aims and objectives be translated into learning outcomes for your session?
3. Does the activity demand that students work together for all or most of its duration?
4. Do you have a plan that scaffolds the session in 5-minute increments?
5. Is the pedagogic space a 'safe' one in which students can experiment and be free to fail?
6. Imagine yourself giving instructions to students. Imagine their likely responses. Does the activity work when you do this?
7. Limit the amount you talk to less than 10% of the session. The tutor's prime responsibility is effective preparation.
8. Practice with your own materials.
9. Are there cultural, gender, and other differences that you have to account for?
10. What is your contingency plan if things seem not to be working? Do you have additional activities? Are there elements of the session you dispense with if certain sections require more time?
11. Are you ready to contextualise the activities before you begin, and link to other sessions and the liberal arts more broadly?

Definitions of transdisciplinarity

The Origins of Transdisciplinarity: A Timeline⁴

Towards the end of the sixties and the beginning of the seventies, as Bernstein notes, global events such as the Apollo moon landings led to an upsurge in optimism, in 'thinking big and imagining what the university could be in a perfect world', with a particular focus on the 'interconnectedness of many seemingly disparate things'.⁵ Combined with the creatively disruptive activities of dissatisfied students and academics, and the counterculture in general, scholars articulate transdisciplinarity in terms of 'utopian speculations about the future possibilities for universities'.⁶ The seventies also see the continuing growth of collaborative and interdisciplinary areas of study, as well as the creation of 'new specialities including disability studies and peace and conflict studies'.⁷ Transdisciplinarity doesn't become a consistent and wide-spread focus of scholarly attention until the nineties, but several key thinkers helped to establish the foundations of transdisciplinarity against this backdrop of global events.

1970: The next stage of interdisciplinary thinking

JEAN PIAGET (Swiss psychologist, 1896 – 1980) uses the term "transdisciplinary" at a seminar on interdisciplinarity in universities in Nice, defining it as

A higher stage succeeding interdisciplinary relationships... which would not only cover interactions or reciprocities between specialised research projects, but would place these relationships within a total system without any firm boundaries between disciplines.⁸

As Nicolescu notes, Piaget articulates the ability of transdisciplinary thinking to move across and between disciplines, but not the facility to move beyond: 'In such a way, transdisciplinarity is just a new, but "superior" stage, of interdisciplinarity'.⁹

1970: Ethical considerations

JACK LEE MAHAN, a doctoral student at the United States International University, writes that transdisciplinary thinking arises in response to the need for ' "reverence of life, man, and the human condition"' in social sciences research.

1972: Transdisciplinary curricula

Also present at the seminar with Piaget, ERIC JANTSCH (Austrian astrophysicist, 1929 – 1980) follows his presentation with an article which situates transdisciplinarity within the context of the 'planning of future curricula in the context of emerging ideas about science as a source of innovation'.¹⁰

⁴ The information for this timeline is drawn from Jay Hillel Bernstein, 'Transdisciplinarity: A Review of its Origins, Development, and Current Issues', *Journal of Research Practice* 11.1 (2015), 1 – 20.

⁵ Jay Hillel Bernstein, 'Transdisciplinarity: A Review of its Origins, Development, and Current Issues', *Journal of Research Practice* 11.1 (2015), p. 3.

⁶ *Ibid.*, p. 3.

⁷ *Ibid.*, p. 3.

⁸ *Ibid.*, p. 2.

⁹ Basarab Nicolescu, 'Transdisciplinarity: Past, present, and Future', published in *Moving Worldviews: Reshaping sciences, policies and practices for endogenous sustainable development*, ed. by Bertus Haverkort and Coen Reijntjes (Holland: COMPAS Editions), pp. 142 – 166. < http://www.basarab-nicolescu.fr/Docs_articles/Worldviews2006.htm > [accessed 4 August 2016].

¹⁰ Bernstein, p. 2.

1972: Systems of science

Another alumnus of the Nice seminar, ANDRE LICHNEROWICZ (French mathematician, 1915 – 1998) writes that, in mathematics, transdisciplinarity describes “the homogeneity of the theoretical activity in different sciences and techniques, independent of the field where this activity is effectuated”¹¹.

1979: ‘... So as to make education (and research) more socially relevant’

JOSEPH J. KOCKLEMANNNS (Dutch philosopher, 1923 – 2012) contributes a chapter (‘Why interdisciplinarity’) to *Interdisciplinarity and Higher Education* in which he states that the purpose of transdisciplinary work ‘is not so much to find a reasonable solution to a given problem under study as to develop a larger, unifying all-encompassing theoretical framework for scholarly and scientific work’.¹²

In the late seventies and eighties the debate about transdisciplinary lies mostly dormant. However, faced by global crises that do not recognise geographical, social, political, or disciplinary boundaries (the end of the Cold War and an increasingly globalized workforce, the AIDS epidemic, new forms of labour exploitation, and a growing awareness of climate change as a global threat) scholars use the concept of transdisciplinarity as a mode for tackling sustainability and environmental issues.¹³

1992, 1994: ‘A need for action in the scientific and academic communities

The United Nations Earth Summit (Rio, 1992) takes place, and is pinpointed by JULIE THOMPSON KLEIN (American scholar of the humanities, 1944 -) as a point at which the academics and industry and government come together to take action, using the framework of transdisciplinarity. The First World Congress on Transdisciplinarity follows two years later (Portugal, 1994), and produces a Charter of Transdisciplinarity.

1994: The Charter of Transdisciplinarity

BASARAB NICOLESCU (Romanian theoretical physicist, 1942 -), LIMA DE FREITAS (Portuguese artist, 1927 – 1998), and EDGAR MORIN (French philosopher, 1921 -) publish the Charter of Transdisciplinarity, which is taken forward and developed by Nicolescu.

1990s: A philosophical approach vs taking action

Two separate approaches to transdisciplinarity emerge, opposing a ‘philosophy of transdisciplinarity’ against a ‘descriptive and analytic’ approach.¹⁴ Building on his statements in the Charter, Nicolescu goes on to articulate transdisciplinarity as

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.¹⁵

¹¹ Nicolescu.

¹² Bernstein, p. 3.

¹³ Bernstein, p. 4.

¹⁴ Bernstein, p. 5.

¹⁵ Nicolescu. In this section of his article Nicolescu provides a very helpful description of the ‘fertile complementarity’ that he perceives between multi-, inter-, and transdisciplinarity:

Multidisciplinarity concerns itself with studying a research topic in not just one discipline only, but in several at the same time. Any topic in question will ultimately be enriched by incorporating the perspectives of several disciplines. Multidisciplinarity brings a plus to the discipline in question, 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.

In contrast, *The Production of Knowledge* (Michael Gibbons, Camille Limoges, Helga Nowotny, Simon Schwartzman, Peter Scott, and Martin Trow) takes a more practical approach, developing the concept of Mode 2 knowledge production, 'involving knowledge developed for a particular application and involving the work of experts drawn from academia, government, and industry'.¹⁶ This second school of thought is known as the 'ZURICH SCHOOL', named for the International Congress that took place in the city in 2000.

Whereas Nicolescuian thinking centres on 'a new way of thinking about knowledge and enquiry... and emphasizes a concept of the human life world and lived meanings', the Zurich approach focuses on 'tangible solutions to real world problems... and the interface between science, society, and technology in the contemporary world'.¹⁷

Current issues

Bernstein provides a concise definition of current approaches to transdisciplinarity:

Transdisciplinarity involves work that creatively reimagines the disciplines and the possibilities for combining them... Transdisciplinary work challenges the entire framework of disciplinary thinking and seeks to assemble new approaches from scratch, using materials from existing scholarly disciplines for new purposes.

He also notes that other characteristics of contemporary transdisciplinarity include an awareness and balancing of power between the subject and researcher in social sciences research, and an intention to create 'engaged, socially responsible science' that invites participation from government, industry, and citizens as well as academics.

Key terms related to transdisciplinarity include:

WICKED PROBLEMS, which 'defy complete definition and cannot be solved using existing modes of enquiry and decision making... No final solutions for such problems are possible since any resolution generates further issues'.¹⁸ Transdisciplinarians are therefore the ideal people to tackle these problems, as they exist in the real world and can only be approached by moving fluidly between and beyond disciplinary approaches.

COMPLEXITY, which 'is not exactly synonymous with complicatedness, since a complicated system may be understandable in terms of its components, while in a complex system the individual components interact with each other and with their environment in such a way that the system as a whole cannot be explained in terms of its parts'.¹⁹

Interdisciplinarity has a different goal than multidisciplinary. It concerns the transfer of methods from one discipline to another. Like multidisciplinary, interdisciplinarity overflows the disciplines, but its goal still remains within the framework of disciplinary research. Interdisciplinarity has even the capacity of generating new disciplines, like quantum cosmology and chaos theory.

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

¹⁶ Bernstein, p. 5.

¹⁷ Bernstein, p. 5.

¹⁸ Bernstein, p. 7.

¹⁹ Bernstein, p. 8.

Being a transdisciplinary, Bernstein tells us, requires the ability to 'think in a complex, interlinked manner', an attribute which can make one inclined to tackle problems creatively and imaginatively. A result of this approach, Bernstein warns us, can lead to experiencing the 'pain inherent in abandoning one's intellectual comfort zone by working outside one's home discipline and engaging in new modes of thinking and taking action'.²⁰ Transdisciplinary work often works together in collaborative teams but transdisciplinary work can be done by an individual: in addition to being able to think, act, and accept the sometimes unexpected and unwelcome consequences of transdisciplinary thinking, the solo transdisciplinary must be able to 'fuse knowledge from a number of different disciplines and engage with stakeholders in the process of generating knowledge'.²¹

Resources

Select bibliography²²

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²⁰ Bernstein, p. 8.

²¹ Bernstein, p. 8.

²² Drawn from Bernstein.

Conferences

There are many transdisciplinary conferences to choose from, some of which explicitly state the interface between disciplines (such as The Transdisciplinary Imaging Conference at the Intersection between Art, Science and Culture²³), whereas some are more firmly located in their home discipline (for example, the International Conference on Transdisciplinary Engineering²⁴).

Some examples of conferences concerned with transdisciplinary teaching include:

- Inner and Outer Dimensions of Thinking: a Transdisciplinary Conference (Alanus University of Arts and Social Sciences, Germany, 2016);²⁵
- The European Conference of Educational Research: ECER 2013, Creativity and Innovation in Educational Research, which featured papers on transdisciplinary teaching in sustainability education (Austria, 2013);²⁶
- Disciplinarity and Transdisciplinarity: Challenges and Chances of Transdisciplinary Teaching in Subjects oriented towards Natural, Social and Human Sciences in Compulsory Education (University of Applied Sciences and Arts Northwestern Switzerland, Switzerland, 2016).²⁷

²³ See <http://transimage.i-dat.org/> for the conference webpage [accessed 5 August 2016].

²⁴ See <http://www.tidep.ct.utfpr.edu.br/te2016/> for the conference webpage [accessed 5 August 2016].

²⁵ See <http://www.crossfieldsinstitute.com/event/inner-and-outer-dimensions-of-thinking-a-transdisciplinary-conference/> for a description of the conference's aims and objectives [accessed 5 August 2016].

²⁶ See <http://www.eera-ecer.de/ecer-programmes/conference/8/contribution/21960/> and <http://www.eera-ecer.de/ecer-programmes/conference/21/contribution/39230/> for paper summaries [accessed 5 August 2016].

²⁷ See http://ishd.co/wp-content/uploads/2016/01/Call-for-papers_Disciplinarity-and-Transdisciplinarity.pdf for a description of the conference's aims and objectives [accessed 5 August 2016].