



Integration

Terminology Briefs Series

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Formal Definition - Integration is the act of combining two things together or one thing with another in order to make a whole (Oxford Dictionaries). Within an institution or project, integration refers to bringing groups of people with particular needs or characteristics into equal participation or membership. Depending on the level of integration and when the combined effect is greater than the sum of the individual effects, this is called a **synergistic integration**.

The URPP could be an example of a group with potential for integration as it is formed by groups of people characterized by a different academic backgrounds in a specific discipline (geography, biology, environment, statistics, ethics), that work towards a common aim, under a common framework.

There are several terms that refer to the interaction between disciplines in the

context of **integrative research**: cross, multi, inter and trans - disciplinarity. Although sometimes used interchangeably, they are not.

Crossdisciplinarity may be the weakest form of integration between disciplines as it suggests boundaries are simply crossed rather than an integration of the parts (Stock and Burton 2011). The other three terms represent progressive levels of integration.

A *multidisciplinary* approach characterizes by having an interaction between disciplines, without resulting in new integrative knowledge. This is, the actors do not participate in the question driving the research but have an opinion from their point of view on the subject.

An *interdisciplinary* approach requires collaboration both in the formulation of the question and the methodology that will be used to address it. There may be

further divisions within interdisciplinarity, according to the distance between the disciplines involved (e.g.: small/weak interdisciplinary project: between natural sciences; big/strong interdisciplinary project: between natural and social sciences).

The step between interdisciplinarity and transdisciplinary is somewhat small in theory but huge in terms of feasibility. A key component present in a *transdisciplinary* approach, is the possibility of transferring the knowledge achieved through collaborative research, to society, policy and decision makers. In this sense, transdisciplinary projects involve not only different disciplines but also non-academic actors (**stakeholders**) and are involved with local and regional issues (Stock and Burton 2011). Further discriminations in terminology refer to the level of participation of stakeholders (consulted but not involved in research: consulting transdisciplinarity; active participants of the research: participative transdisciplinarity).

For example, a project with the aim of increasing food diversity in a diet, that includes academic research in genetics, agronomy, meteorological sciences but also involves local farmers in the test of stress resistant seed varieties, with the consequent issues dealing with patents, could be said to be a “participative transdisciplinary” project (Dempewolf et al. 2015). Transdisciplinarity can also be

the way to synthesize new bodies of knowledge to address complex problems. Political Ecology and Ecological Economics are examples of emerging transdisciplinary disciplines (Kronenberg 2013).

A key first step towards transdisciplinary integration of knowledge is the identification of its barriers and facilitators (Jakobsen et al. 2004). Barriers consist mainly in lack of understanding of terminology and lack of knowledge on methodology between disciplines.

People with different backgrounds may appropriate differently the concepts behind shared terms and words. For example: the term “Biodiversity” could refer to genetics, species and ecosystem diversity but also cultural, behavioral, taxic, functional and may include or exclude artificial diversity and domesticated species. Similar terms like variability and variation present an extra source of confusion. Furthermore, the term by itself lacks a spatial or temporal framework so is dependent on the situation in which is used (Kaennel 1998).

The methodological barriers between disciplines may have a deeper root in each discipline’s intrinsic paradigms. The traditional approach is the division of labor between people with different skills. This may be effective to achieve specific goals but at the same time hinders the possibility of one individual to work

across disciplines, reducing his synthesizing capacity to a mere opinion on the other's work (Borrego and Newswander 2010).

On the other hand, there are also bridges that stimulate integration. Fields of study like sustainability and remote sensing may be inherently transdisciplinary (Jerneck et al. 2011, de Araujo Barbosa et al. 2015). Furthermore, concepts like scalability, interactions, feedbacks, functional diversity and ecosystems services are based on a dynamic flow of data across different actors and these may be as well used in integrative research (e.g. in Homolova et al. 2014, Bonan 2008).

Our integration

There is not a single way to construct integrative research. In the particular case of our program, there are numerous projects with a common global aim that could be briefly stated as "assessment of biodiversity change". Integration within the URPP GCB refers mainly to the communication between disciplines and projects involved in the study of the effects of global change over biodiversity and its feedbacks. Level of integration will likely vary among members, since inter- and transdisciplinary may not be fully possible or advisable within all of the members of the program. However, all members should be aware of the current integration efforts and strive to

create, recognize and communicate opportunities for more integrative science.

The program uses a feasible challenge in a way that the greatest possible level of integration between parts is achieved. This means choose in each particular situation, to make progressive efforts in one of three directions:

1. **Multidisciplinary efforts:** Understanding research of other members, co-exist within a common framework, make comments and give an opinion to improve other's work.
2. **Interdisciplinary efforts:** Generating new integrative knowledge. Establishing common questions, hypothesis and variables to be measured in parallel. Analyzing altogether the results from different projects to find patterns and relations.
3. **Transdisciplinary efforts:** Involve local and regional stakeholders in research, connect and transfer new knowledge with policy makers, economic and social actors, interact with society members outside academic world.

The key on what approach is better in each case, is problem-based. That is, some problems require or benefit from different levels of integration in order to

be solved. A useful guide for the evaluation of transdisciplinary projects is provided in Bergman et al. 2005.

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