Interdisciplinary Teams - Key Concepts

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1 Degrees of interaction between disciplines

There are different approaches to cooperation between different disciplines, depending on their degree of their integration:

Multidisciplinary approaches are where several disciplines are brought together with no systematic attempt to collectively integrate or synthesize the information. Disciplinary specialists work together on distinct aspects of the same issue. Generally, the result is a simple juxtaposition of the disciplinary outputs produced. These outputs may be edited and put together by a team leader whose responsibility is to coordinate the work of the disciplinary specialists.

Interdisciplinary work is a systematic process of developing the ability to analyze and synthesize from the perspective of several disciplines. Its goal is to explain a specific issue in its entirety, recognizing and integrating the relationships between all the individual elements. It attempts to synthesize and link disciplinary knowledge and put it within a larger systemic framework. A pragmatic view of interdisciplinarity sees specialists contributing their experience and disciplinary knowledge of concepts, methods and tools, working interactively with other specialists in a team to study a problem and make recommendations to solve it.

Transdisciplinary approaches are much more ambitious than multidisciplinarity or interdisciplinarity. Its philosophy is the achievement of the unity of all knowledge regardless of disciplines. As the prefix “trans” suggests, it aims at going beyond the narrow disciplinary divisions. Its main assumption is that the real world and its problems are not divided into disciplines. While interdisciplinarity works within the

framework of (several) disciplines, transdisciplinarity purports to start from real world problems and draw from many disciplines in order to build its own content and methodology.

However, the differences between multidisciplinarity, interdisciplinarity and transdisciplinarity are not always obvious. Sometimes the last two labels are used interchangeably. This is mainly because there are no agreed upon criteria to define one or the other; researchers give different meanings to these labels. Actual practice may be the same, even if the research is labelled differently

2 Other views of interdisciplinarity

Interdisciplinarity can be understood in different ways depending on the institutional and professional domains in which we operate: knowledge, research, education, and theory:

Interdisciplinarity and knowledge. Interdisciplinarity can be viewed as the knowledge one person has of more than one discipline. Thus a scientist can study a problem drawing from his / her own knowledge of, say, agronomy, economics, sociology, etc. Such an approach to interdisciplinarity does not involve team work. It may work in situations where the issues being studied are simple enough. For more complex issues, specialized knowledge is required, which is difficult to aquire: it is impossible to be an expert in everything. Given the expanding knowledge generated by each discipline and its fragmentation into sub-disciplines, it becomes increasingly difficult for one person to master anything larger than his / her field of specialty.

Interdisciplinarity and research. Interdisciplinarity can be viewed as the combination of components of several disciplines to search for or create new knowledge. Thus a sociologist can use the tools of, say economics (cost-benefit analysis), to explain the production behaviour of a community. An agronomist can use the tools of statistics or chemistry to study fertility decline. An economist can use concepts of psychology to explain the economic choices of individuals. This view of interdisciplinarity is widely held because a) one single discipline cannot explain everything, especially on complex issues, and b) many methods are not peculiar to a specific discipline. This wedding of disciplinary concepts and methods can ultimately lead to the creation of new sub-disciplines, as it has done in the past: economic anthropology, socio-economics, bio-statistics, political sociology, physical chemistry, etc…

Interdisciplinarity and education. Interdisciplinarity can be viewed as a way to teach a subject holistically. Students are introduced to a specific issue through several disciplines in order to put it in its general context. It aims at making students versatile thinkers with a broad outlook, who can acquire a range of knowledge, skills, intellectual capacities, attitudes and values that make them more adaptable and prepare them better for their professional lives, and the knowledge of other disciplines necessary for good communication with their colleagues. This type of teaching can be done in a disciplinary or an interdisciplinary department.

Interdisciplinarity and theory. Interdisciplinarity can be seen as an object of study in itself. Theorists of interdisciplinarity can study the workings of interdisciplinary collaboration: how do disciplinary specialists communicate? What new insights are gained from the interaction between disciplinary concepts?

3 Complex problems require an interdisciplinary approach.

Most researchers and development workers are trained in one single discipline (agronomy, economics, sociology, geography, etc…). Yet certain problems escape the field of a single discipline. Such problems are often complex and are inherent to the study areas like the environment, agricultural production and health for example. They can only be studied and solved through cooperation between several disciplinary competencies. Through interdisciplinarity, this cooperation leads to a better understanding of the problems and better understanding of others' and one's own discipline.

As the agenda of agricultural development has changed, the political expectations from agricultural research have also changed in nature and widened in scope:

- The role of research is no longer limited to improving yield productivity: it must take into account social, economic and environmental impacts.
- Agriculture is now recognised to be only one element in rural livelihood systems: desirable improvements in agriculture have to be designed within this wider context.
- The goals and objective of rural development are often contested: there is disagreement and even conflict about what is desirable from different disciplinary, institutional and stakeholder viewpoints.

A complex situation requires that researchers are able to see "the big picture", that is to see all the factors contributing to the problem they are studying as well as putting it in a larger context. Each discipline can contribute to understanding this complexity. Interdisciplinarity offers two advantages:

- Complementarity: since no single discipline can explain everything, several disciplinary perspectives bring in more insights
- Creativity: the interaction between disciplinary perspectives challenges team members' views and forces them to come up with more original explanations and methodological innovations.

Being able to see the "big picture" helps researchers develop a broader understanding of how their individual research methods, concepts and skills fit into larger research issues. They are then able to gain new insights into their own disciplinary biases and limitations, and develop a broader knowledge. Stepping out of their own disciplinary methods and comparing it to others will give them a better understanding of their own discipline.

4 Teams require shared objectives

In all teams, it is important to have commonly agreed objectives. These should be formulated in a way that appeals to and includes all the disciplines present in the team and at which the "bigger picture" is manifest. These objectives then serve as the starting point for team planning of collective and individual tasks and for the definition of disciplinary inputs.

Usually, the interdisciplinary team works for a client, defined here as the institution (or institutions; more likely than a particular person) that requested the study, who is

financing it and - in some cases – has given the team specific objectives or terms of reference. Apart from this primary client, several other institutions or interest groups may have a stake in the problem under study, and the team will need to consult with these to further clarify and refine their overall objectives. An advantage of consulting clients and stakeholders is that they usually do not see the problem under study in disciplinary terms. They can therefore greatly contribute to the interdisciplinary thrust by helping the team to avoid excessive use of theory and putting the subject back into a broader context.

Although the team may be given specific guidelines, objectives or terms of reference, it is important to discuss these from the different disciplinary viewpoints of the team, and to come to a common definition of the *purpose* of the team's activity, and the specific *outputs* expected from the team. The team can then go on to find common ground through a common definition of the central problem or problem that is to be addressed by their efforts, and translate this into specific research questions to which each of the disciplines can contribute.

Working from a common understanding of the overall team purpose and outputs and a common understanding of the problem area under study reduces the risk that, due to disciplinary biases in thinking, team members start with a "method of investigation" rather than an "object" or "problem" of investigation. Discussing a shared objective or problem from different disciplinary viewpoints helps open minds to:

- Different views about the problem
- Different approaches to the investigation
- Different methods of investigation

5 Teamwork involves both individual and collective activities

Interdisciplinary teamwork does not mean that all team members have to participate in all activities. This is a common error of inexperienced teams, much as young children learning to play football all tend to run after the ball in a pack instead of running into spaces and creating opportunities. Identifying disciplinary contributions, individual capabilities and consequent task distribution and programming is vital in effective teams.

Getting the balance right between individual and collective activities is one of the hardest aspects to get right in interdisciplinary teams. As a general guide, the areas of competence for individuals and teams are given in the following table:

Best done in team	Best done by individuals/ sub-teams
➢ Produce ideas ➢ Exchange experiences ➢ Communicate information ➢ Make decisions	➢ Gather information ➢ Elaborate on ideas ➢ Produce proposals ➢ Prepare team work sessions ➢ Formulate / write texts

No interdisciplinary team can be competent if the members do not have expertise in their own disciplines. While interdisciplinary teams are more efficient in analysing complex issues, this efficiency rests entirely on the ability of team members to feed the collective reflection with detailed and relevant analysis of information. A failure in one or several aspects of the complex issue will impair the team's judgements. Similarly, the lack of disciplinary competencies within a team will reduce its ability to collect relevant and valid information.

Disciplinary incompetence from one or several members can have one of the following effects:

- Predominance of one disciplinary perspective: those members who are more competent, or articulate, will impose the orientation of their discipline, even if it is not necessarily the most relevant
- Retreat from the project: those members who are most competent may be discouraged and adopt a passive attitude
- Reduction to lowest common denominator: failures from a majority of members may lead to a superficial analysis, based on the simplest and most easily understandable information.

6 Understanding the value systems of other disciplines

Different disciplines are based on different sets of concepts. Team members from different disciplines have different knowledge constructs and different values. In agricultural research, these values will be reflected in the importance given to different types of data (often contrasting numerical/quantitative/"scientific" with descriptive/qualitative/"non-formal"), and what constitutes valid or reliable evidence in general. An understanding of these different concept "maps" - and a good appreciation of one's own – is necessary for team members to work together. They can then better:

- Understand and appreciate what other disciplines can offer and how they can contribute to the study
- Understand the specific language ("jargon") of their colleagues and better communicate with them
- See the similarities and differences with their own specific discipline.

The differences between the disciplinary concepts and type of methods are due to the object of their study. This leads to different disciplines working at:

- Different geographical scales. Typically, plant and animal scientists work at the plot or farm level. Sociologists often work at the community level. Agro-pastoralists and planners at a more regional level. Agricultural economists and geographers work at various levels.
- Different time scales. Generally, economists, plant and animal scientists have a narrower time scale (a few years) than anthropologists and sociologists (several generations). Consequently, their respective methods are more or less adaptable to the time context of an interdisciplinary study. An agronomist will find it more difficult to carry out an agronomic diagnosis in a three-month field study, especially if it is during the dry season.

Sociologists are better able to meet their information needs through the use of secondary information (historical records, old resource persons, etc…) than plant and animal scientists whose information needs are usually more precise and need to be collected directly.

For interdisciplinary teamwork, the results of the various disciplines must be comparable and complementary. For example, the scales at which the disciplinary specialists work must allow the team to synthesize all disciplinary contributions. Also, the outputs of each disciplinary specialist must be presented in a language that is understandable by others and that can be easily integrated into the collective output.

Nevertheless, conflict is inevitable between disciplinary visions. Indeed, it can be regarded as the essence, or source of creativity of interdisciplinary research. The rationale of interdisciplinary research is precisely that teams must find the way to integrate concepts and methods in a way that uses their best comparative advantages. For this, team members must be willing to collaborate and to give up some control.

One way for the team to prevent and / or solve conflict is to avoid getting bogged down in disputes over theoretical issues and constantly go back to the object of the study, their terms of reference and their clients and other stakeholders for clarification and / or arbitration. Effective communication is also important, and is best helped by procedures that allow the expression of disciplinary differences while at the same time anchoring individual contributions to the team's effort. Another practical way of reducing the scope for conflict and enhancing participation of all team members is to use visualisation whenever possible. Visualisation helps eliminate jargon and gives a "shape" to ideas. It helps team members to expose their analyses to others without resorting to disciplinary jargon.

7 A coherent interdisciplinary model

For interdisciplinary teams to work efficiently, it is important to agree on a common model or approach. Such an interdisciplinary model should not be seen as a rigid set of steps applicable to all situations, but rather a model that is designed by the team for the specific needs of their study.

The ARD procedure as presented in these learning materials is a general research procedure from which interdisciplinary teams can adapt the model best suited to their needs. It is a logical procedure to plan joint actions needed to address complex problems through a series of iterative steps. It is the choice of steps within the ARD procedure that represents the team's model.

The exact model or process followed by the team should not just represent the use of all the tools available, but result from a confrontation of disciplinary insights and stakeholder interests around the problem area in question. From the formulation of the problem and the subsequent research questions, the team identifies:

- Their information needs
- The concepts best suited to the analysis of the problem
- The tools best suited to the collection of specific information
- The contribution of each disciplinary specialist in the collection and interpretation of information

- The specific procedure needed to involve stakeholders in the process (direct participation in information gathering, analysis and proposal formulation or simple validation of the team's proposals).

The steps of the ARD procedure, broadly, cover the study of natural and institutional systems, as well as the process of proposal identification and development. Specific terms of reference may preclude one or the other topic. Therefore, they need not all be followed in the interdisciplinary model.

As well as a common procedural approach, interdisciplinary teams need a common conceptual framework that can integrate their different perspectives. One such useful framework is provided by systems concepts; tools that develop and promote systems concepts are therefore well adapted to interdisciplinary work.

8 Learning together as an interdisciplinary team

Interdisciplinary teams are problem-solving teams. Their problem solving capacity depends to a large extent on learning to work together. Team learning is to a large extent based on the team's ability to use the diversity of its members to experiment, evaluate and capitalize on its experience to produce better outputs. Some conditions for this are:

Team members' openness to diversity. The diversity of points of view is what is peculiar to interdisciplinary teams. This diversity comes from their disciplinary training as well as from their social and cultural backgrounds. An interdisciplinary team need to look at problems from different angles in order to generate the best solutions. If not they will revert to "group think" (the same, unchallenging, way of looking at things, the same opinions, and unanimous decisions) with the risk of making conventional decisions. For the team to keep innovative, each member must accept to be challenged in his / her way of thinking. This requires an open mind and a positive way of looking at conflict.

Learning/ procedural reviews. Learning is by nature an iterative process. It requires regular feedback. In an interdisciplinary team, members should give this feedback to each other. To enable this feedback, the team needs a procedure that enables them to regularly review the *process* (e.g. at the end of each meeting). How did we go about the meeting? What were the differences? How did we individually deal with them? How did we communicate? What individual behaviour was helpful, harmful or ineffective? In case of conflict, what caused it and how did we manage it? How can we improve in the future? This learning process review is different from the evaluation of the technical *content* or work progress: it is important that time should be allocated for both activities.

Social skills. Apart from disciplinary expertise and an appreciation of others' knowledge and skills, team members must be able to work with other persons. This requires basic skills in dealing with one's own and others' way of expressing themselves and their emotions. These basic skills are the basis of all teamwork and require self-awareness and self-discipline. If team members cannot adapt their behaviour to the needs of others, they will prevent participation and reduce team efficiency.

Recognition of team interdependence. A basic condition for team success is the recognition by all team members that their own personal success depends on that of their teammates. This interdependence relates to:

- Roles: team members depend on each other for the performance of tasks
- Resources: logistics, time, information sources, etc., are shared by all
- Objectives: the objectives of the study need to be shared by all team members – who will be assessed according to the achievement of these objectives.

This recognition will help each to better coordinate their activities, appreciate the contribution of others and assist them.

Mutual support. The team's common objectives will be better achieved through mutual support. By encouraging their teammates, they will help them improve their performance, and thereby the performance of the team. This mutual support can be manifested through:

- The provision of assistance
- The sharing of resources
- The constructive challenge to ideas
- The advocacy of team objectives

9 Organizing the effective interdisciplinary team

In synthesis, the effective interdisciplinary team should:

Reach agreement on the general research problems. This is a standard task for team work, in consultation with clients and stakeholders. A general agreement on what is to be researched is a basic condition for subsequent interdisciplinary team work. The team must arrive at some form of consensus at this general level before trying to operationalize their research. General *development* problems must be explored further by the team and translated into *research* problems to which each discipline can contribute.

Explore what each discipline can contribute. Once there is agreement on the general research problems, disciplinary contributions must be made explicit. At this stage, disciplinary specialists should present:

- Their concepts and their relevance to the investigation of the problems being researched,
- The time and geographical scales at which these concepts are operational.
- The indicators used by their discipline to evaluate the success or worth of new policies or technologies.

The team can then appreciate the differences and complementarities between disciplines and make decisions on the comparative advantages of each discipline, the steps that will make up their interdisciplinary model, select tools and allocate tasks.

Synthesize knowledge and identify gaps. With their disciplinary knowledge reviewed, teams should come to an agreement on a common framework. In the process, they should decide whether their added disciplinary knowledge is sufficient to carry out their research or whether they need added concepts from other disciplines.

In this process, two points are important:

- Acknowledge diversity and resist the temptation to reach consensus: two coherent but different concepts are better than one hybrid but incoherent concept
- Avoid sterile theoretical discussion and do not hesitate to go to the field and check validity / feasibility of concepts

Allocate tasks. Allocating tasks between disciplines is the biggest challenge for an interdisciplinary team. They must at the same time:

- Reach formal agreement on individual tasks and set the deadlines that are necessary for efficient team management
- Retain for all members the flexibility in interpreting this agreement so as to keep the flexibility to respond creatively to changing conditions and opportunities.

Success in combining these two conditions will greatly depend on how well the research problems have been formulated and how well the various disciplinary contributions have been identified by the team.

Formulate ground rules. While a relaxed atmosphere helps team dynamics, a permissive attitude may pervade teamwork. Interdisciplinary teams must therefore reach a formal (written) agreement on some basic collective rules which will ensure that team members will participate and deliver as agreed at the beginning of the research. These include:

- A clarification of individual responsibilities in data collection, analysis and processing
- Leadership and a clear decision making procedures
- A timetable for exchange of information and review of contributions
- A procedure for assessing individual contributions and deciding on follow-up.

Decide on leadership. The allocation of tasks to disciplinary specialists for parts of the team's research presents the risk of letting team members drift apart. The team needs strong intellectual and management leadership to keep their work on track. This leadership requires specific skills:

- The ability to understand people, respect their different perspectives, and be prepared to learn from them. For this, an interdisciplinary team leader must be able to think outside the boundaries of his/her own discipline;
- The ability to synthesize the different team members' contributions and produce proposals that are easily understandable by all;
- The ability to facilitate team members' work on a day to day basis while at the same time keeping the "broader picture" in mind and thinking ahead.

Evaluate the teamwork. Criteria of evaluation vary substantially among disciplines; definitions of common terms ("data", "hypothesis", "survey", etc…) may be understood differently. It is therefore very important for the team to address issues of evaluation, quality control and relevance of methods.

Some components of the team research can be entrusted to the rigour of the disciplinary specialist. These relate to specific or technical outputs (ie, agronomic assessment of soil fertility, identification of animal diseases, calculation of farm budgets, etc…) that require disciplinary knowledge. But the integration of these outputs into the overall research must be discussed as a team so as to ensure that the work of each individual is closely linked to the research objectives.

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