Chapter Three

Research Design

Issue- or Problem-Centered Approaches

Transdisciplinarity is not a vehicle that we deploy to stay alive or accomplish our projects. It is a way of being alive. It counsels us to relativize our own understandings, to rearrange our prejudices, to undermine the very knowledge that gives us a presumptive leg-up of expertise on others, to seek to recombine one's "can't helps," and to decenter oneself and seek the marginal.

—Macdonald (2000, 244)

Transdisciplinary approaches to research can be used to study a vast range of research topics, designed in creative ways, and may draw on expertise in any combination of disciplines. Moreover, transdisciplinary research designs may employ any methods in pursuit of the research objectives. Any research method, qualitative, quantitative, hybrid, or a multi-method or mixed method strategy may be used in transdisciplinary research. Some researchers may even create new methods to address their research questions. Methods are simply tools for data collection (Hesse-Biber & Leavy 2011) and do not dictate whether or not the approach to research is transdisciplinary. In short, *there are no standard templates of what transdisciplinary research should look like or what steps it must follow.* Nevertheless, the principles and goals of transdisciplinary research offer suggestions for how to build a research design that meets the goals of any particular project, while maximizing transdisciplinarity. I begin this chapter by reviewing some of the general issues to consider

when developing a transdisciplinary project. Then I provide an in-depth discussion of research design broken down into three stages: 1) planning; 2) data collection; and 3) analysis, interpretation and representation.

Problem-Centered Research and "Responsive Methodologies"

To begin, transdisciplinary research is necessarily issue- or problem-centered. This means that all design issues are determined in relation to the specific issue or problem at hand. *The development of a research strategy is driven by the research topics and purpose(s).* Wickson and colleagues (2006) speak to the design implications of a problem-centered approach to research by asserting that transdisciplinary research "is characterized by an interpenetration of epistemologies in the development of methodology.… The dissolution of disciplinary boundaries is necessary for the construction of novel or unique methodologies tailored to the problem and its context" (p. 1050). This means that there is a limitless pool of possible combinations of disciplinary knowledges, design features and methods choices. Further, design strategies are not built around researchers' preferences, guiding assumptions, and the like, but rather, around how to best address the research problem.

Of course researchers do bring their disciplinary assumptions to bear on the research process, and this can be used to strengthen the research, not weaken it. In order to get the most out of disciplinary expertise while maximizing transdisciplinarity each researcher must engage in a reflexive process where he or she becomes aware of his or her assumptions and is willing to question and challenge them. Moreover, the researcher or research team must pull in needed expertise, including literature from other relevant fields, and collaborators when appropriate.

Although every project will be structured differently, the research strategy developed for a transdisciplinary project should involve a holistic approach to the research purpose and questions. In other words, it should consider "the whole." This means that the research strategy should take into account as much of the issue or problem at hand as is researchable in a given study, and consider the problem or issue from multiple vantage points or perspectives. As you design a study continually reflect on questions like:

- What is being left out of this design?

- What am I missing, failing to get at, failing to see?
- What perspectives are not being considered?
- Are there other ways to look at these issues?
- Have I brought in the relevant bodies of disciplinary/interdisciplinary knowledge?
- Have key concepts been defined using multiple disciplinary and cultural lenses?
- Am I continually approaching this with a transdisciplinary orientation?

When thinking about "the whole" a helpful example comes from the practice of "integrative health care" which is also termed "holistic," "humanistic" and "whole client" health care (Klein 2000). Integrative health care is a transdisciplinary approach to health care that takes biological, social, psychological and ethical factors into account (Klein 2000). Klein explains "integrative health care" as follows: "The human being is perceived as an interacting, integrated whole. Correspondingly, treatment is framed as a dynamic and fluid response and, finally, the health-care team constitutes an interacting partnership of professionals who treat the client as a whole" (2000, 56). In other words, historically healthcare has emerged out of the natural sciences and emphasized biological and physiological wellness. However, researchers are now turning to more holistic approaches to health that integrate the natural sciences and the social/behavioral sciences and thus require transdisciplinarity (Piko & Kopp 2008).

Piko and Kopp (2008) provide an excellent empirical example of a transdisciplinary approach to health research that occurred in Hungary. In the 1980s Hungary had the lowest life expectancy and highest mortality rate in Europe (Piko & Kopp 2008). A transdisciplinary research team assembled in order to study the "health status" of Hungarian populations. Social/behavioral researchers from the following fields were included and categorized under the umbrella term "Behavioral Medicine": medical psychology, medical sociology, medical anthropology, medical communications studies and medical ethics (Piko & Kopp 2008). The multi-method projects involved three stages: "a research phase, measuring the health status of the population; an educational phase, applying research results in the courses for medical and other health science students; and a practice phase, developing skills and prevention programmes

based on the research results" (Piko & Kopp 2008, 306). As this example illustrates, moves towards integrated or holistic approaches to health care promote rich transdisciplinarity.

Another interesting example of moving from disciplinarity to transdisciplinarity comes from the field of architecture. John Last (2000) has written about his engagement with transdisciplinarity throughout his career, although he hadn't always named it as such. He writes about a public health course for architects as a necessary and necessarily transdisciplinary part of training.

> Ventilation, lighting, heating and cooling, water purification, sanitary services, sewerage… describe the relationship between housing conditions and mental health… "ekistics"—science and art of making cities and towns aesthetically, socially, psychologically, and spiritually pleasing to live in as well as healthy and functionally efficient. (Last 2000, 194)

This is another example of thinking about "the whole" through transdisciplinarity.

Moreover, the research design strategy itself should be holistic. A *holistic approach to research design* means that each phase of the research should be integrated with the other phases (Hesse-Biber & Leavy 2011). Wickson and colleagues suggest three dimensions of integration: 1) integrating epistemologies, 2) theory and practice, and 3) researcher and the context of research. This is a *synergistic approach* to research methodology. As opposed to a set of linear steps researchers may follow, a holistic or synergistic research design might look very different, with periods of cycling back, re-testing or re-questioning, making modifications to the design based on new insights, and so forth. Transdisciplinarity therefore requires *an evolving methodology* that follows an *iterative or responsive process* where the methodology evolves over the course of the research process as a result of new learning (Wickson et al. 2006). Interestingly, this positions researchers, and rightfully so, as learners in the research process and not all-knowing experts who can design "perfect" research studies without actually collecting and looking at context specific data—which is often the case in traditional disciplinary research. Transdisciplinary research presupposes that researchers don't necessarily know everything they should be asking or doing until they are in the process, learning. If we had all of the answers we wouldn't need to do research.

Again, the key principle of *flexibility* comes to bear. Research strategies must be flexible enough to allow for adaptation to new insights[1] (Russell et

al. 2008). Therefore, transdisciplinary research follows "responsive methodologies" (Wickson et al. 2006). Wickson and colleagues define a responsive methodology as "iterative and an ongoing part of the research process… evolving methodology" (p. 1051). In this regard Flinterman and associates (2001) suggest a *spiral model of research design*[2] as follows: "1) define research field, 2) identify relevant actors, 3) literature search, 4) preliminary data (in-depth interviews, focus groups, discussion groups/workshops), 5) feedback by all (and repetition), 6) develop shared vision/plan of action" (Flinterman et al. 2001, 259–260).

This procedure can be used to "identify, assess, and prioritize research topics; to formulate research questions and objectives; to design research projects; and to analyze and interpret research results in a transdisciplinary manner (Flinterman et al. 2001, 259). This model can be adapted to suit particular projects. It is very important to emphasize that the model suggested by Flinterman and colleagues is just one example of what a responsive methodology may look like. This model should not be taken as "the" way to conduct transdisciplinary research—there is no one-size-fits-all strategy.

A responsive approach (or spiral approach) to research design follows *the principle of recursiveness*. Recursiveness is a key feature that strengthens the quality of transdisciplinary research (and as noted in chapter 6, is central to issues of evaluation) (Pohl et al. 2007). Recursiveness is another way of describing an iterative research process, where the researcher(s) cycle back to check data as they go and adapt to new insights. Pohl and colleagues write:

> Recursiveness (or iteration) implies foreseeing that project steps may be repeated several times in case of need. The possible limitation or uncertainty of a preliminary result thus becomes a means of targeted learning. Recursiveness is important in all phases of the research process. (2007, 22–23)

By applying the principle of recursiveness researchers avoid rigid research strategies in favor of a living research design that is influenced and strengthened by additional learning. Krimsky (2000) offers another way to think about this by suggesting that a transdisciplinary approach to methodology requires *recurring* communication, critique, disclosure, evaluation and reporting. Pohl and colleagues expand on their discussion of recursiveness as follows: "A recursive design is a meaningful pragmatic way of working with intermediary results and further developing them

with the help of critical assessment" (Pohl et al. 2007, 43). This suggests that recursiveness is a way of enacting reflexivity (Pohl et al. 2007).

While reflexivity has been a major buzz word in the qualitative research community for the past few decades, there is far more attention paid to its philosophical importance than to how one actually "does" reflexivity. By adopting an iterative research process researchers are able to put the principles of reflexivity into practice along with flexibility and innovation. McMichael posits that transdisciplinarity requires an "open, flexible, and self-reflective framework" (2000, 218). So while transdisciplinary research projects may look very different from each other—appearing in different "shapes"—they share holistic and synergistic approaches, they require flexibility and innovation and typically follow a responsive methodology of some sort that fosters reflexivity.

Table 3.1 Summary of Holistic and Responsive Approach

Holistic Approach to Research Design
1. Considers problem holistically (comprehensively, as a whole)
2. Holistic or synergistic research process (all phases integrated with each other)
Evolving or Responsive Methodology
1. Iterative process with periods of cycling back
2. Follows principle of recursiveness
3. Continual process of adapting to new learning requires flexibility and innovation
4. Process requires recurring communication/reflection and thus fosters reflexivity

Research Design: Planning

As reviewed, research design decisions should be made in relation to the research topic, purpose and questions. A problem-centered approach to research design implies that "the order of the phases and the amount of resources dedicated to each phase depend on the kind of problem under investigation and on the state of knowledge" (Hadorn et al. 2008,

19). Wickson and colleagues (2006) suggest considering the following design features as you develop a project (although this is not meant to be prescriptive):

1. responsive goals (refining and shifting goals)
2. broad preparation (theory and literature from multiple disciplines)
3. evolving methodology
4. significant outcome (contribute to the solution of a problem, "satisfying multiple agendas" [p.1057])
5. effective communication
6. communal reflection (in addition to personal reflection) (pp. 1056–1057)

Additionally, differing from traditional sequential research strategies, the design phases may occur in recurrent order (Hadorn et al. 2008).

In the beginning, no matter what kind of project you are developing, I think the most important issue to pay attention to is time. Because of the complexity of designing a transdisciplinary research project, it is important to devote plenty of time to the percolation of ideas, preliminary research/immersion into the literature, collaborative planning (when appropriate), and the development of a research strategy. Nurturing the development of ideas (and tenets of collaboration when appropriate) is vital and should not be overlooked or rushed through.

Researchable Topics

A colleague once told me that she didn't see the point in doing research unless you could study the most important thing there is to study. While I do not agree with that, as I think there are innumerable opportunities to engage in worthwhile research projects and we do not need to make a hierarchy of importance, I do understand her point. By applying a transdisciplinary approach to research we are able to research a host of topics that would otherwise be out of reach, and we are able to address topics more holistically or comprehensively then would otherwise be possible. This opens up a vast range of possible research topics that may otherwise be beyond our disciplinary visions and capabilities.

Transdisciplinary approaches are generally used for issue- or problem-centered research topics. Moreover, ideally, there is a moral, ethical or social imperative driving the research. Topics are selected to fulfill a

need in the real world—to build knowledge that is needed, is useful, and has the potential to propel social change. Transdisciplinarity allows us to research large, complex, and "significant" problems. Transdisciplinarity provides an approach for conducting *research that matters.* Some questions to consider as you select a research topic include:

- Is this a significant issue or problem in the real world?
- Is knowledge about this topic needed?
- Is there a moral or ethical imperative for researching this topic?
- Will knowledge about this topic be useful?
- Is there potential for social change?

Researchers may select topics in a variety of ways including their awareness of a pressing need/problem/issue in the community or society at large, a funding opportunity or invitation to collaborate on a project, or a long-term interest in a topic of some social significance. Transdisciplinary research topics may also be organized around a "site." This is a conceptual space where disciplines assemble (Krimsky 2000) and is likely transdisciplinary by nature. Krimsky defines this concept as follows:

> 1. a space such as an inner-city community or factory; 2. a community, such as gypsies, with shared experience; 3. a conceptual site such as drug abuse, which is specific but extends over the physical environment and many other forms of human experience; and 4. a discursive site such as debates over race or native title/land rights, in which different groups are in conflict over the interpretation of certain issues…. The site is a space in which or about which disciplines gather and proceed to engage in analysis from a variety of perspectives. From the locus of the site, we get the definition of the issues raised and the creation of team goals and objectives. (2000, 232)

Multiple "sites" may also overlap, creating the ultimate locus of the research topic.

Research Purpose and Questions

Once a general topic has been selected it is important to determine a specific research purpose or set of purposes and then to develop research questions aimed at addressing the purpose. While this is always the case in social research the process may be more complicated and time-consuming in transdisciplinary research given the complexity of the topic

that may be under investigation and the need for immersion in other literatures and/or collaboration with other researchers, practitioners or community members. Fairly extensive learning or training may be needed just to form appropriate guiding questions.

The use of a transdisciplinary approach allows the asking of many new research questions that would not otherwise be possible. Identifying and structuring research questions may be particularly challenging in transdisciplinary research because of the scope and complexity of the research topic studied (Pohl et al. 2007). Transdisciplinarity does not reduce this complexity, as disciplinary applied research may, but rather embraces and goes after the real-world complexity of the issue or problem as much as possible (Pohl et al. 2007). Klein notes that a "multi-dimensional framework of questions is a key methodological tool" (2000, 8) in transdisciplinary research.

Pohl and Hadorn (2007) suggest that transdisciplinarity can address three kinds of questions, each linked with three different kinds of knowledge. The question types are:

> 1. Questions about the genesis and possible further development of a problem, and about interpretations of the problem in the life-world (this set of questions creates "systems knowledge")
>
> 2. Questions related to determining and explaining the need for change, desired goals and better practices (this set of questions produces "target knowledge")
>
> 3. Questions about technical, social, legal, cultural and other possible means of acting that aim to transform existing practices and introduce desired ones (this set of questions produces "transformation knowledge") (2007, 36)

Further, they acknowledge "interdependencies between the three forms of knowledge" (p. 38), and thus projects may combine these kinds of questions and knowledge outcomes.

When working collaboratively, as is often the case in transdisciplinary projects, the research questions must be agreed on. Moreover, when the research is community-based (that is, serving the needs of the community you are working with) then "the legitimacy of the research questions is also dependent on the agreement or consensus of the community" (Greckhamer et al. 2008, 318). Research questions in these projects should be developed in a highly collaborative context. In any

kind of research partnership, whether researcher(s) and community partners, or a team of researchers, addressing the questions should ultimately be mutually beneficial. Pohl (2005) suggests that the process should be one of "mutual learning" (p. 1161). Since transdisciplinarity promotes forward-thinking, research should advance prior research or fill a gap in our knowledge. Greckhamer and colleagues write: "For a community of inquiry, acceptable research questions are those that continue the work of previous scholars, contributing to the existing literature, and/or have significance within the terrain of knowledge over which the community has, or claims, jurisdiction" (2008, 318).

Here are some questions to consider as you develop your research purpose and questions:

- What kind of knowledge is being sought?
- How can questions be formulated in order to get at the desired knowledge?
- How can this research extend current knowledge on the topic?
- Will this research fill a gap in our knowledge about the topic?
- Have relevant stakeholders/partners (e.g., researchers, community members) agreed on the research questions?
- Will answering the research questions be mutually beneficial to relevant stakeholders/partners?

Transdisciplinary Literature Review

In any research project the purpose of a literature review is to figure out what research has already been conducted on your topic which can assist you in a range of ways including determining the scope of your project, defining key terms, and eventually interpreting data. A literature review consists of locating, summarizing and synthesizing the current (and landmark) research on your topic. This process is much more complicated in a transdisciplinary research project because you are seeking literature in multiple relevant fields. Researchers must immerse themselves in those literatures, learning their language, and seeking the expertise of others as needed. As literature may be pulled from numerous disciplines the process of taking an "inventory" of the relevant literature alone can be a long process, and ample time must be given to building this framework (Darbellay 2008). Darbellay suggests taking inventories of what is just beyond the scope of each relevant discipline and determining where synergies

can be found or forged. Synthesizing the literature is also more complex than in a disciplinary literature review. As Miller suggested back in 1982, transdisciplinarity requires the creation of holistic conceptual frameworks that transcend disciplinarity, which I suggest literature can help us build. The process of conducting a transdisciplinary literature review may require the following steps:

1. determining relevant disciplinary bodies of knowledge,
2. locating and summarizing relevant literature (current and landmark studies) from each discipline,
3. determining what is just beyond the scope of each discipline ,
4. locating existing synergies between different disciplinary resources,
5. locating and creating possible/new synergies between different disciplinary resources, and
6. synthesizing the literature in order to build a framework.

It is important to note that the preceding process may involve extensive negotiations between differently positioned research partners.

Researchers may be working with studies conducted from different paradigmatic viewpoints and may be using very different conceptual frameworks. Using the literature to define key terms is one of the most important design processes in a transdisciplinary project. This can be a challenging process because many different disciplinary perspectives may come into the mix. Additionally, culturally sensitive definitions must be sought (as relevant to the project). So, for example, in a community-based research project, definitions of key terms and concepts must be determined in a collaborative context in which community partners and very likely research participants (or community members) are involved. Terms must be relevant to the communities the research serves—to community understandings of relevant concepts. This is even more challenging in trans-cultural or transnational research where various cultural perspectives are also brought to bear on the process.

Here an excellent example comes from a transdisciplinary endeavor called "The Household, Gender, and Age Project." This ten-year cross-cultural project was highly complex, focusing on the effects of macro events on the family unit and women in eight developing countries. The genesis of the project occurred when three scholars from different parts of the world (Africa, Europe and North America) participated in a program advisory committee, organized by the United Nations University,

aimed at dealing with major contemporary challenges such as development. Through their participation the researchers came to the realization that the committee was "gender-blind" and working from the assumption that the labor force was male (Boulding 1991, xi). Put simply, women weren't being properly included. Elise Boulding writes:

> Wenche Barth Eide of Norway, Frede Chale of Kenya, and I wondered how a more differentiated perception of women and men as agents of change with different but overlapping roles, responsibilities, and contributions could be inserted into development models. We thought in terms of relating macro-phenomenon to the micro-realities of daily life. We sought a perspective that could make women visible…. The answer was the household. Here, in all its cultural diversity, is the primary living unit of human beings, where the species is reproduced and nurtured, the base from which individuals participate in the whole range of tasks that shape and change a community and a society. Looking at people in households means seeing each member as an individual, a source of reproduction and production, a resistance to change and of change. It means seeing men and women, children and old people in relation to their community as well as in relation to each other. (Boulding 1991, xi)

Clearly, from the outset this project was problem-driven. With the problem of including women in long-term development research in the developing world at the center of all research efforts, from initial planning to representing the findings, the researchers were guided by the principles of transdisciplinarity. The research team aimed to impact policy so that women's situations would be properly included in policy planning (Boulding 1991) by targeting national and international decision-makers who may not know women's needs in different regions (Masini 1991).

This ten-year project that involved studies conducted across the developing world cannot be replicated here. However, the story of how the team developed the project and each sub-study illustrates how a large and diverse research team can work together in order to build an appropriate conceptual structure. Perhaps more than anything, this multi-faceted project illustrates the challenges of transnational research, particularly incorporating different cultural and disciplinary perspectives into the project, but simultaneously how a transdisciplinary approach can make this possible. It took the team one year just to develop an appropriate transdisciplinary approach (showing the significance of the planning stage). The approach involved historical, sociological, demographic, ethnological, statistical and

mathematical analysis and used multi-method and mixed method designs that included a life-course approach (Masini 2000).

One of the main challenges during the first year was developing a transdisciplinary definition of "the household" that works in the eight different cultural contexts. Here both disciplinary and cultural issues emerge. With respect to the former, the researchers worked together and came to view the term

> from an economic point of view in terms of income; from a sociological point of view in terms of numbers of members of the household; from a psychological perspective in terms of interrelations within the family; from a historical point of view in terms of changes in the household; and from an anthropological point of view in terms of co-residence. (Masini 2000, 122)

It was equally important to consider how cultural understandings of "the household" differ across contexts. Therefore, in addition to considering the conventional Western notion of the household (co-residence) the team also included other cultural understandings of the household such as kinship and obligations of non-resident "household" members to resident members (such as financial or childcare obligations) (Masini 1991).

Balancing different bodies of literature as well as the perspectives of the different players involved can be taxing but when done with care can result in the creation of appropriate and highly effective concepts that allow researchers to access the dimensions of social life they are after.

Although the team worked together in order to build the conceptual structure of the project they also deemed it important to acknowledge and include the insider cultural knowledge of the individual researchers as well as their disciplinary and practical skill sets. Therefore, the larger research team ultimately created eight different projects each conducted in a different country and led by a different principle investigator or investigators from that country. These studies all stand on their own but are also a part of this larger cross-cultural, longitudinal project.

For each study the research team investigated how macro events impact the household, particularly women. Changes and issues considered included: migration to those countries, economic changes, technological changes, ecological changes, rates of labor force participation, family planning (including fertility and sexuality), education, socioeconomic conditions, "domestic power structures" and how psychosociological levels of experience are impacted by macro changes. Each

of the eight research projects focused on a macro event or macro events relevant to the particular community under investigation. For example, the Kenya research project focused on changes in labor at tea and coffee plantations that produce the main crops and exports of the agricultural country (Masini 1991). The focal point of that sub-study was "on the role of the household as a unit integrated into the contemporary plantation economy" (Masini 1991, 14).

For each study the research team in that location also determined the appropriate methodological strategy. So the larger overarching project included many different research design strategies. In the case of the Kenya study a mixed method strategy was employed. The team used multiple quantitative questionnaires as well as fieldwork that included systematic observations and qualitative interviews. Following the methodological principles of good quantitative questionnaire construction, the team pretested and revised the questionnaires in order to ensure that they would access the data they were after in a way that was understandable to their research participants. The data collection occurred at three tea and coffee plantations, each of which was over 60 years old (enabling a historical perspective, or social change perspective, to emerge). The researchers engaged in many negotiations with the management of the plantations who acted as "gatekeepers" in order to carry out this research. In total 600 participants were interviewed, 400 women and 200 men, in sessions lasting two to three hours. While some were given permission to be interviewed during work time due to the perceived importance of the research, other participants lost up to a day's wages. (For a discussion of the research findings see Agadala 1991.)

"The Household, Gender, and Age Project" developed in order to address a pressing transnational social problem. With that in mind, a truly diverse group of researchers were able to organize around the problem at hand and bring in their diverse disciplinary, practical and cultural knowledge in order to serve the research project. The success of this project is largely a result of the willingness of the team to spend ample time developing a conceptual structure for the research that worked across contexts while also allowing specific cultural concerns to take center stage, and methodologies to be developed accordingly.

The Division of Labor

In collaborative or team research it is important to clearly define tasks, roles, expectations and responsibilities as a part of the planning process (if you are conducting research alone and the transdisciplinarity of the project is based on the resources you are using and framework you are building, you may skip this section). This process is twofold: one dimension includes determining the division of labor, and the other dimension includes creating the context of transdisciplinary collaboration.

In terms of determining the division of labor, the process of defining roles and expectations should not be rushed through as it is vital that team members build a solid foundation from which to work. During this process team members should clearly define the steps that will be taken (and build time for review, repetition and revision as necessary) in relation to their goals (which should also be determined collaboratively). It is important to decide individuals' roles and responsibilities. In short, the team must answer the questions:

- What will be done?
- Who will do what and by when?
- How will team members assist each other?

Although the effort will be collaborative, it is also important to determine the leadership structure for the project. Oftentimes it is helpful to have someone or some group who is responsible for keeping things on course. Further, even in collaborative research some team members may be more invested in the project for any number of reasons. This must be factored into the division of labor and leadership structure as appropriate. When planning the leadership structure individual or disciplinary "power" can come into play, even if unintentionally. Open communication and reflexivity can help alleviate the unintended replication of dominant relations of power (between researchers and their community partners; between the natural and social sciences; between the natural sciences and humanities or arts; and so forth).

Finally, when determining each member's role in the process it is important to come to an understanding about the research outcomes.

- What are the expected outcomes?
- How will the research findings be reported and disseminated?
- Will there be multiple outcomes?

- What will be co-authored, and how will that transpire?
- What will be single authored, and how will that occur?
- How will the team work be identified in any single or co-authored work?
- What data will be "communal" and what "belongs" to certain team members, and why?

This planning process is not only a means of determining the division of labor but also creating a productive space in which team members can become acclimated to each other and each other's disciplinary perspective (or other experiential expertise) and can develop some common understandings of how the process will unfold. In this regard, this process can help sensitize research partners to their own perspectives so that they are more able to challenge their own assumptions and thus fully engage with the possibilities of transdisciplinary vision. Depending on the particular project individuals involved in this process may include any combination of researchers, practitioners, members of community-based organizations, and research participants. It is critical that during this planning phase team members, who will be coming to the project with different perspectives and experiences, find ways to bridge differences in "methods, work styles, and epistemologies" (Klein 2004, 520). This period, therefore, provides an opportunity for team-building, rapport-building, and cross-disciplinary learning in a variety of ways. Language and communication are vital in team work and, therefore, since research partners come to the process speaking different disciplinary languages, it is important to spend time developing common understandings, defining key concepts, and building effective approaches to communication. In funded research ample time for planning and team-building should be built into the grant structure. Moreover, if some participants work at community-based organizations or are lay members of the community involved in the research, their ability (time/financial) to participate in this stage of the process should be considered in advance.

Any necessary recruiting (for research partners or participants) and training should also be planned during this stage. For example, researchers may have to be taught the tenets of quantitative or qualitative approaches to research which may differ from their past experience. For instance, they may need to learn how to conduct unstructured interviews or how to moderate focus group interviews. Researchers may have to learn how to use computer-driven data analysis packages that they are

unfamiliar with, or they may have to learn the workings of a particular community-based organization, or perhaps the process of art-making in some particular genre or style, or any other number of skills/practices with which they are unfamiliar. Issues of recruiting and training are discussed further in the next chapter on community-based research.

Research Design: Data Collection

Transdisciplinary research is characterized as a problem-centered approach to research. Therefore, the methods (tools used to gather data) are always selected in relation to the specific problem or issue at hand. Methods are selected for their utility in eliciting or generating appropriate data (Hesse-Biber & Leavy 2011). There are no methods that are inherently transdisciplinary—transdisciplinarity is an *approach* to research. Any methods or methods combinations may be employed, including traditional disciplinary methods such as case studies, interviews, surveys, experiments, ethnography, document analysis, historical comparative research, focus groups, oral histories and life stories; hybrid methods (which may mix the tenets of the qualitative and quantitative paradigms); and, other cross-disciplinary methods innovations (such as arts-based research practices). Transdisciplinary approaches to research may result in methodological innovations (and often do) that go beyond traditional mixed-methods designs and result in the creation of new research strategies. To summarize, transdisciplinary projects may use any number of research methods and methods designs in service of addressing the issue or problem at hand, including:

- traditional qualitative or quantitative methods
- hybrid methods
- cross-disciplinary methods
- multi-methods
- mixed methods

It is important to note that while I suggest traditional disciplinary methods may be employed in transdisciplinary research, they cease to be "disciplinary" when applied through a transdisciplinary approach. In other words, while surveys or interviews, for example, are used in disciplinary research projects, when the perspective and approach is transdisciplinary, the same method (surveys or interviews) is being employed

in a very different way. Nicolescu writes: "The transdisciplinary method does not replace the methodology of each discipline, which remains as it is. Instead the transdisciplinary method enriches each of these disciplines by bringing them new and indispensable insights, which cannot be produced by disciplinary methods" (2002, 122).

There is wide acknowledgement within the research community that methodological innovation abounds (for example see Hesse-Biber & Leavy 2006, 2008; Leavy 2009; Van Manen 2001). For instance, Van Manen writes: "Researchers now employ methods and approaches that have moved far beyond traditional discipline-based methodologies and methods" (2001, 851). Transdisciplinary concerns have provided the push for many methodological innovations, and transdisciplinarity has simultaneously created the context in which such innovations can emerge.

I now move into a brief review of mixed method and multi-method designs as well as hybrid research designs, including examples of some commonly used methods innovations.

Mixed Methods or Multi-Methods

Transdisciplinary projects typically require the use of more than one method (although this is a norm, it is by no means a requirement). Therefore, many transdisciplinary projects follow mixed methods or multi-method designs which involve the use of more than one data collection method. Transdisciplinary projects often require the use of multiple methods because the problem or issue addressed is complex and multi-faceted. Transdisciplinarity does not reduce this complexity but enables us to better see and investigate it. Additionally, triangulation is often practiced in order to build validity and trustworthiness into the findings (Connor, Treloar & Higginbotham 2001).

Mixed methods designs are those which use methods from at least two different paradigms (typically, a qualitative and quantitative method). So, for example, mixed methods designs may include the use of surveys and in-depth interviews, or statistical analysis and qualitative document analysis, or many other combinations. These approaches involve the mixing of methodological tools that are based on different epistemological and ontological assumptions. These design formats are particularly common in transdisciplinary projects when researchers from different disciplines collaborate (such as the natural and social sciences). Sometimes three or more methods are used in a triangulated model.

For example, "The Household, Gender, and Age Project" reviewed earlier in this chapter is an example of mixed methods research. Not only did the overarching project include a variety of methodological strategies from across research paradigms, smaller studies within the project relied on mixed methods designs. For instance, the Kenyan tea and coffee plantation study noted employed both quantitative questionnaires and qualitative interviews.

Multi-method designs also involve the use of at least two methods but do not involve the mixing of paradigmatic viewpoints. So, a multi-method project may involve the use of two or more qualitative methods (such as ethnography and in-depth interviews) or two or more quantitative methods (such as surveys and statistical analysis of census data). These projects are typically carried out by individual researchers or researchers who share similar disciplinary backgrounds (or come from similar paradigmatic backgrounds within different disciplines), although this is not always the case and may simply result from the topic and questions driving the research.

For example, the large-scale study conducted on the health status of Hungarian populations reviewed earlier involved researchers from many different disciplines and relied on a six part methodology that included multiple survey protocols and the analysis of statistical data (Piko & Kopp 2008). One could envision adding qualitative methods to that study (such as interviews, focus groups or daily diary research) and transforming the multi-method study into a mixed methods study.

Of course, in transdisciplinary research projects researchers are often required to work outside of their typical methods "comfort zone" (see Hesse-Biber & Leavy 2006, 2008 for a discussion of methods "comfort zones") so these generalizations refer to norms and not dictates. Often researchers will be willing and able to learn new viewpoints, methods and approaches, and some research grants and design strategies account for this needed training. However, equally true, disciplinarity (and all the training and expertise that comes with it) can be a big asset in many transdisciplinary projects and therefore may require researchers to practice what they already know, but in new ways or new contexts.

In their best form, mixed method and multi-method designs offer holistic approaches to research where each component of the research speaks to the other components (Hesse-Biber & Leavy 2011; Hesse-Biber 2011). In other words, in their best execution, the use of multiple methods is not simply additive (more methods, more data), but rather, the use of

each method informs the use of the other methods (Hesse-Biber & Leavy 2011; Hesse-Biber 2011). Although this is the ideal form of mixed methods research, I suggest that the potential of mixed methods research is rarely reached. Most often the methods are used in a series of linear steps where one method is privileged over the other (one paradigm is privileged over the other). Generally speaking, quantitative data is privileged with qualitative data serving in a secondary capacity, often as an add-on and source for quotes in published research reports, but with little bearing on how the research was conducted and what was found. I suggest that transdisciplinarity, which requires integrated, holistic and synergistic approaches to research can go well beyond the promises of mixed method designs, and can help promote the kinds of holistic approaches to mixed methods research that are held as the ideal. In other words, *a transdisciplinary perspective can strengthen mixed methods research practice*.

There are also specific methodological strategies that can be used as vehicles for mixing methods in transdisciplinary research. I offer a couple of examples: "social network analysis" and "extended case method."

Social Network Analysis and Extended Case Method

"Social network analysis" and "extended case method" are two methodological innovations for studying transdisciplinary topics such as public policy. *Social network analysis* is useful for examining how public policy shapes society (or aspects of society) because, differing from traditional approaches which may only gather data on either the micro or macro level, social network analysis can be used to examine policy from multiple levels (Wedel, Shore, Feldman & Lathrop 2005). Wedel and colleagues elaborate on this as follows: "By linking actors, network analysis can show how the local or regional level is connected with the national level or the local, regional, or national level with the international" (2005, 40). Social network analysis is a multi-method research strategy (that may involve ethnography, interviews, document analysis and other methods) employed in transdisciplinary studies in order to study, for example, transnational policy processes (Wedel et al. 2005). Social network analysis is not only a method but also "an orienting idea" (Scott 1991, 37) that can be particularly useful for studying transnational policy processes (Wedel et al. 2005) which is a transdisciplinary domain of inquiry. Wedel and colleagues point to the need for a transdisciplinary approach to public policy research: "The value of a theoretical and methodological

framework that can both dissect and connect levels (such as local and global) and spheres (such as state and private) is difficult to overstate in a multi-layered and rapidly changing world" (2005, 41). Similarly, the "extended case method" is also used to make micro-macro and local-global links (Wedel et al. 2005). Wedel writes: "Although actors included in a particular 'case' sometimes are located in different sites, they always are connected by the policy process and/or by actual social networks" (2005, 41). This approach is increasingly valuable in a globalized world in which people impacted by particular policies may be geographically, culturally, technologically and/or economically scattered.

Hybrid Research Designs

Sometimes transdisciplinary efforts result in the development of hybrid methodological strategies (see Leavy 2008; Porteous et al. 2001). In this regard Klein and colleagues write: "Existing and new approaches are combined in a collaborative effort to create new spaces and cultures of mutuality" (2004, 44).

Qualitative Case-Control and Contrasting Groups Framework

Porteous, Higginbotham, Freeman and Connor (2001) suggest two "hybrid study designs" that are frequently used in transdisciplinary research: "qualitative case-control design" and the "contrasting groups framework." These two designs may be particularly useful for "exploring non-linear relationships" (Porteous et al. 2001, 337). These approaches combine the strengths of both quantitative and qualitative approaches (Porteous et al. 2001), creating hybrid techniques that go beyond traditional mixed methods. Qualitative case-control expands on the possibilities of case studies. Poretous and colleagues note the primary principle of case-control (in health studies) as follows:

> Subjects may be categorized as cases or controls using a range of criteria such as disease status (presence or absence of heart disease), health behavior (smoking or non-smoking, Pap smear or no Pap smear), or psychological profile (depressed, not depressed). The important thing is that the cases, those having the outcome of interest, can be clearly distinguished from those that do not (controls). A range of qualitative techniques… are then employed to fully explore the sociocultural, environmental, and other factors relevant to both groups. (Porteous et al. 2001, 311)

The research team explains "contrasting groups framework" as follows:

> In the contrasting groups design, subjects in a survey are first assigned a score according to some agreed performance criteria and then rank ordered according to that score, from greatest to least. The researcher then selects subjects from the top and bottom of the rankings. In doing so, two contrasting groups are created that will become the focus for intensive qualitative follow up. The criteria on which subjects are ranked can be derived from previous work in the area or *de novo* by the researcher. There are no strict rules for how to define the contrasting groups. (Porteous et al. 2001, 321)

Again, these are just examples of hybrid research designs with many other possibilities. Like with other forms of mixing methods, in transdisciplinary projects these designs require holistic and integrated approaches.

Photovoice

There are also hybrid research methods that emerge out of the tenets and practices of other methods combinations (technological progress may fuel the development of these techniques as well). One such innovation frequently used in transdisciplinary research is "photovoice." *Photovoice* is a commonly used method in a variety of transdisciplinary efforts that maintain a social action orientation. This participatory method involves having participants take photographs to document their experiences, situations or environments and can be used in many different research genres. Examples of the kinds of projects in which photovoice is used range from arts-based approaches to social topics, such as poverty or development, to community-based research in health and other topics. Holm (2008) notes that photovoice has become particularly popular in public health research. In community-based research, a genre in which the use of photovoice is expanding greatly, participants take photographs which they can use to advocate for community improvement (Berg 2007; Holm 2008). In these contexts photovoice may be used as a part of public policy work. One can envision photovoice being used with a social network analysis framework, for example. I suggest that photovoice combines the tenets of social action research, participatory research, and arts-based research and is

useful in a variety of transdisciplinary research contexts. Wang (2005, www.photovoice.com/method/index.html) suggests the following model when designing a study that employs photovoice:

> Conceptualizing the problem; defining broader goals and objectives; recruiting policymakers as the audience for photovoice findings; training the trainers; conducting photovoice training; devising the initial theme/s for taking pictures; taking pictures; facilitating group discussion; critical reflection and dialogue; selecting photographs for discussion; contextualizing and storytelling; codifying issues, themes, and theories; documenting the stories; conducting the formative evaluation; reaching policymakers, donors, media, researchers, and others who may be mobilized to create change. (as quoted in Holm 2008, 330)

Researchers from any discipline can be trained to use this method, and one can imagine it being employed in a great range of transdisciplinary contexts in service of many different kinds of research objectives.

Research Design: Analysis, Interpretation and Representation

Issues of analysis, interpretation and representation are reflected on further in chapter 6 during the discussion of evaluation strategies; however, at this point I review some of the general issues and practices that emerge frequently in the literature.

Analysis and Interpretation

Data analysis strategies will vary depending on the methods employed in the study, and techniques should be selected accordingly. Whether the study uses quantitative, qualitative or mixed methods, computer-assisted analysis programs are available and may be useful. When a transdisciplinary project is collaborative, involving multiple stakeholders, a collaborative analysis strategy should be employed. Transdisciplinary research is often a group undertaking involving research teams or individual researchers working with other research partners (such as practitioners, community organizations, and/or participants). In these circumstances different research partners may come to the analysis process with different skills and perspectives. This should be accounted for when determining an analysis protocol. Examples of strategies include:

cross-checking preliminary findings (which can be repeated in cycles) (Flinterman et al. 2001), also referred to as "analysis cycles" (Tenni, Smith & Boucher 2003);[3] having one party take responsibility for analysis/coding and then circulating the analyzed data to the other research partners for comment; and continuous feedback loops and re-checking assumptions (Flinterman et al. 2001). Following any of these strategies may result in the building of "intersubjectivity," which builds validity and trustworthiness into the data. In a transdisciplinary project achieving "intersubjectivity" is particularly meaningful because it implies that the various disciplinary perspectives came together to move beyond their individual disciplinary capabilities. In short, intersubjectivity is a major achievement in transdisciplinary research.

Earlier in this chapter we saw the building of intersubjectivity in "The Household, Gender, and Age Project" in which researchers spent a year coming to shared definitions of key concepts, such as the household, that would work across highly diverse cultural contexts. In the following chapter on community-based research we will again see intersubjectivity at work in Lukehart's recounting of a large-scale project on community development and segregation in Chicago. The large research partnership of twelve academics and many professional, activist and lay participants was broken down into smaller teams, each designated a study within the larger project (much like "The Household, Gender, and Age Project"). At multiple points the smaller research groups returned to the larger group to discuss strategies and findings. By disavowing individual "authority" and engaging in feedback loops, the team was able to build intersubjectivity into the eventual findings (which importantly were used to impact local public policies).

By researchers engaging in analysis loops and related strategies, rigor may be achieved and later evidenced. *Rigor* is often held as a primary evaluative standard in social research. Nicolescu (2002) posits that the three characteristics of a transdisciplinary perspective are rigor, opening, and tolerance. Engaging in cycles of analysis and feedback in some form can promote these dimensions of transdisciplinarity. Nicolescu (2002) writes:

> Rigor is… the result of [a] perpetual search continually nourished by new knowledge and new experiences. The rigor of transdisciplinarity is of the same nature as scientific rigor but the languages are different. One can even assert that the rigor of transdisciplinarity is a deepening of scientific rigor to the extent that it takes into account not only things,

> but also beings and their relation to other beings and things. Taking account of all of the givens present in a particular situation is a characteristic of this rigor. It is only in this way that rigor is truly a safeguard against all possible wrong turns. Opening brings an acceptance of the unknown, the unexpected and the unpredictable. (p. 120)

Truly collaborative analysis processes will involve the questioning and challenging of assumptions. This can be a difficult process. One of the hurdles researchers working collaboratively may experience is letting go of sole ownership of the analysis process. Frisch (1990) coined the term "sharing authority" which denotes sharing ownership in the meaning-making process. As will be reviewed in chapter 6, fully engaging with an iterative process or "responsive methodology" is another way of achieving rigor and building trustworthiness into the data. So, too, researchers must consider carefully the extent to which their methodology has effectively addressed their research questions. Also discussed in chapter 6 are a range of other benchmarks, such as "vigor," which may be a goal in arts-based research, for example.

To summarize, strategies of analysis may include:

- computer-assisted analysis programs
- crosschecking preliminary findings
- analysis cycles
- one party initially analyzes the data which has been circulated to other research partners and/or differently positioned stakeholders
- continuous feedback loops and rechecking assumptions (as a part of an iterative or "responsive" approach)
- "sharing authority"

A transdisciplinary approach to data interpretation, whether in collaborative or individual research, involves the use of multiple bodies of literature. Earlier immersion in transdisciplinary literature (used during research design) also comes to bear in the interpretation process. Literature from relevant (meaning useful) fields can be used to make sense out of the data. During this process, theories on the macro level might be used to help make sense of micro level data and vice versa.

As different disciplinary viewpoints are being brought in to help make sense out of the data, it is important to remain reflexive about one's own disciplinary perspective. Reflexivity is necessary in order to be able to "see" the big picture from multiple vantage points. In a collaborative project it

is important to be open to differing interpretations. While respect and openness are necessary, productive debate and negotiation may be assets as well—not debate for the sake of being "right" but as a means of working out alternative interpretations and stretching one's vision. A robust interpretive process will strengthen the research findings.

To summarize, strategies of interpretation generally include:

- using literature to make sense out of the data
- applying theory to the data
- collaboration, discussion and negotiation with research partners and/or differently positioned stakeholders

During the interpretive process it is important to remain reflexive about how your disciplinary perspective comes to bear on your understandings and assumptions.

Representation and Dissemination

Transdisciplinary research is intended to be useful—to address some real-world issue or problem. Therefore, it is vital to circumvent the typical academic publishing routine, where research is published only in highly specialized journals with very limited audiences. Rather, transdisciplinary research findings should be represented in accessible formats and disseminated in appropriate contexts and communities. While it *is* important to publish academic journal articles so that the research community can draw on previous research, it is unlikely that a traditional academic article would be the only outcome warranted.

First and foremost transdisciplinary research should reach diverse and public audiences (in addition to relevant audiences within the research community). When engaging in a transdisciplinary project there is an ethical obligation to ensure that the groups we aim to serve have access to the research findings. Making research accessible to non-academic audiences requires 1) new representational forms and 2) new venues for dissemination.[4]

Making the research findings useful beyond the academy, while a subject that receives a fair amount of discussion at a theoretical level, is an objective that is often under-realized in disciplinary and interdisciplinary research practice. Transdisciplinary researchers, however, have made enormous strides in this regard, creating a host of new ways to represent and disseminate research findings. Representational forms

beyond traditional academic prose (research articles) may include (but are not limited to):

- newspapers articles (such as op-ed articles)
- pamphlets
- newsletters and other informational booklets
- bulletin board postings
- radio broadcasts
- public lectures (in community-based organizations and other community locations)
- conference presentations (which may follow traditional or innovative formats)
- books (which may be trade non-fiction or fiction as well as academic books)
- art installations/displays
- photographic installations/displays
- dramatic, musical, dance or spoken word performances
- written or read poetry
- fictionalized writing in short or long formats
- documentary films
- websites or video diaries

For example, in the following chapter on community-based research I review two projects that addressed cancer disparities in black Floridian populations. In order to best serve the relevant communities and advance future research, the findings were represented in multiple forms, including culturally and literacy sensitive informational pamphlets, local news and traditional academic articles.

The different formats for representation also signal the different venues (beyond academic journals) in which research findings may circulate. For example:

- local newspapers
- local radio broadcasts
- community centers
- art galleries
- local performance centers
- churches and other community spaces

- the Internet
- poetry and literary magazines
- other venues

Returning to the Florida cancer study example, the researchers distributed the findings in local newspapers, community spaces (barber shops) and other venues.

The Internet has created a host of "publishing" possibilities that did not formerly exist. For example, online journals and other online forums allow for the relatively inexpensive publishing of photographic and other visual materials (made even easier with the proliferation of digital cameras). Likewise, sound and audiovisual files are also easily published online. In this regard, *YouTube*, *Facebook*, and other free (or low-cost) websites make the sharing of these kinds of materials far simpler than ever before, and more accessible to wider audiences.

These new or "alternative" forms of representation and avenues for dissemination should be selected for their fit with the particular project objectives. As you determine appropriate representational forms and venues, consider the following questions:

- Who are you trying to reach?
- What "languages" are going to be most understandable, informative and helpful to those populations you are trying to reach?
- What forms will make the research findings come to life? What are you trying to accomplish (bridging differences, breaking stereotypes, building critical consciousness, education, empowerment, and so on)?
- What forms will be most able to achieve those goals? (Of course practical issues such as time, funding, access to needed resources, and so forth also come into the process, as elaborated in chapter 6).

Often transdisciplinary research will result in more than one outcome. When there are multiple outcomes, they may take different representational forms (Austin et al. 2008). Typically researchers do publish research articles out of their findings (which in team research may result in multiple articles with different disciplinary audiences in mind). However, researchers often use the other formats noted in addition to academic articles, allowing them to work and advance within the traditional academic career trajectory while also making their findings more accessible to, and useful for, broader audiences.