Collaborative Research (RCR-Basic)

Introduction

Learning Objectives

- Explain the importance of collaborative research and why it is increasingly common
- Discuss challenges associated with interdisciplinary research collaboration and ways to address them
- Describe ethical considerations in international collaborative research in academic-industry partnerships
- Identify regulations, policies, and ethical guidelines that affect collaborative research
- Describe practices for establishing and maintaining effective research collaborations

Definitions and Key Concepts

Collaborative research generally means joint work on a research project or program that benefits from the knowledge, perspectives, and resources of many individuals, disciplines, or organizations. Research collaborations may involve activities such as consultation, educational exchanges, shared access to resources or data, development of joint publications, cooperative hosting of conferences, and participation in research networks.

The term partner is a synonym for collaborator that is used frequently in community-based collaborations. Partnership often implies a contractual or other legal relationship as well as common work. The term community partnership is often applied to collaborations between researchers and community groups, civic associations, non-governmental organizations, and local service agencies that address problems in the community.

Collaborators may refer to themselves as a team, particularly in laboratory-based research. Team science typically reflects the work of an organized group of researchers with different skills and set roles. Team science is not necessarily large-scale research; teams may be composed of only a few individuals with complementary knowledge and skills.

The Growth of Collaborative Research

Many factors are responsible for the shift from individual to collaborative research over the past few decades:

- Increasingly complex questions
- New opportunities for translating research findings into commercial products (collaborations between academic researchers and industrial partners)
- Tighter governmental budgets for research and increase emphasis on cost-effectiveness.
- Large numbers of international graduate and postdoctoral trainees have created new pathways for collaboration.
- The internet, improvements in long-distance communication, and transfer of digital data and resources have enabled collaboration across vast distances, even among researchers in remote locations.
- Collaboration accelerates discovery. Collaborative research explores questions from multiple vantage points. However, the increased speed of collaborative research, combined with increase complexity of communication among collaborators, can also raise the risk of misinterpretation and error.

Types of Collaborations

Collaboration Across Disciplines

Collaboration with Industry

Since the passage of the Bayh-Dole Act (Government Patent 1980) and the Federal Technology Transfer Act (1986), U.S. academic researchers and universities have been able to patent the results of federally-funded research and license the patented technology to others for commercial development. When academic researchers patent promising research findings, ownership of the patent and the income that it produces are usually divided between the researcher or research team and the university.

Many universities have Technology Transfer Offices that identify research projects with potential for commercialization. "Tech transfer" facilitates research collaborations that can make financial profit for institutions and researchers by bringing new findings to market.
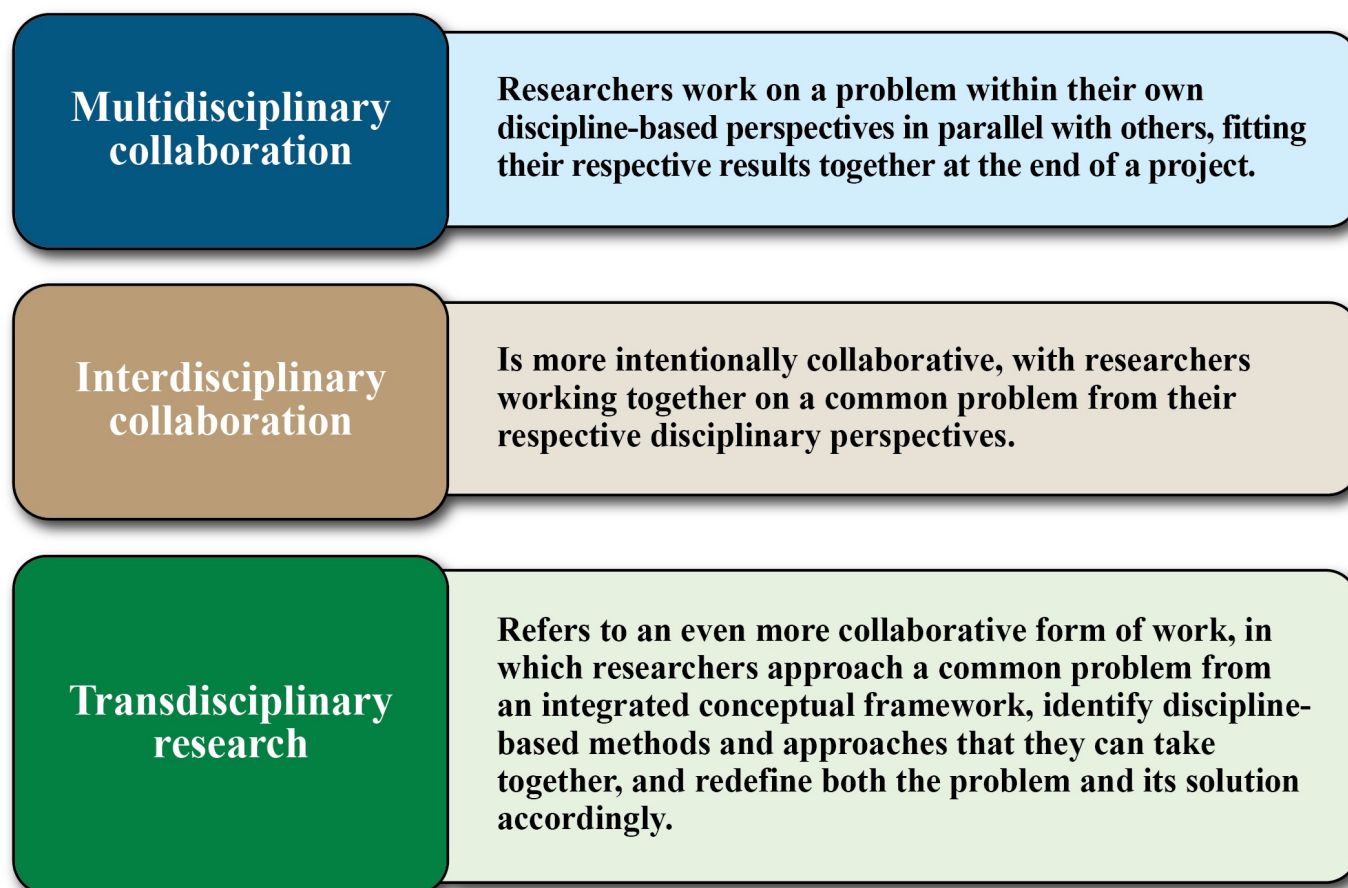
Figure 1: Multidisciplinary, Interdisciplinary, and Transdisciplinary research

Companies often hire academic researchers as consultants and as promotional speakers. Companies may establish agreements with academic researchers to do certain experiments or analyze specific data. In some cases, they may fund a larger project or an entire line of research.

Common challenges when collaborating with industry relate to conflicts between the academic goal of pursuing generalizable knowledge and the industry goal of applying specific knowledge to generate profit.

In an academic collaboration with industry, individual researchers and institutions are subject to conflicts of interest and commitment. Studies over the last decade have shown, for example, that industry-sponsored research is much more likely to report positive outcomes than are federally-funded studies (Ridker and Torres 2006). Editors' concerns about publication bias have led many journals to require authors to disclose the funding sources of their work (ICMJE 2018).

Collaboration with Community Partners

Many researchers collaborate with the communities they hope to benefit. True collaboration with community groups goes beyond simply recruiting members as research subjects. In community-engaged research, members of the targeted community may be instrumental in setting research priorities, defining study questions, designing protocols, collecting and analyzing data, and even writing manuscripts and giving presentations. Community-engaged approaches are particularly common in social, behavioral, and public health research, but efforts to collaborate with the end users of research are evident in engineering and the life sciences as well.

Collaboration Across National Borders

Factors that can impact international collaborations include:

- The use of animals in research is subject to little oversight in some countries but is highly regulated in others. This variability is due in part to cultural views on the legitimate use of animals. Although the Declaration of Helsinki provides widely recognized international ethical guidelines for biomedical research (WMA 2013), national regulations on research with human subjects vary worldwide as do cultural interpretations of vulnerability and protection (OHRP 2019; Loue and Loff 2013). Expectations for original work, concern about the unattributed use of others' text or data, and attitudes about plagiarism can vary markedly among researchers from different countries (Vasconcelos et al. 2009). Similarly, there is significant diversity among national policies on research misconduct more generally (Resnick et al. 2015).

Some communities have developed their own research review committees, and insist on reviewing both research proposals that plan to involve their members and the final reports from completed projects.

Communities may see themselves as the owners of data collected about them, and may seek to control access to research material and the presentation of findings, especially those that may be negative or perceived as stigmatizing.

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Community members who contribute to data collection may expect to be listed as authors of any resulting report.

Including community members as researchers on a project may subject them to federal or institutional requirements for formal training and oversight in the protection of human subjects, disclosure of conflicts of interest, and research integrity. The content, level of detail, and source of such training may vary significantly from community to community (Anderson et al. 2012).

Figure 2: Benefits and challenges in research collaborations with community partners

- International collaborations may be affected by national export controls that limit or prohibit sharing research data, materials, or training with citizens of countries seen to pose risks to national security. National security concerns may be especially prominent in collaborative research with potential for "dual use," in other words, for use as weapons or harm as well as human benefit (IAP 2012). The U.S. government has become increasingly concerned about foreign influence in research activities and related issues (such as the protection of intellectual property). In response, academic institutions are seeking to develop guidelines and policies for addressing the matter (AAU and APLU 2019).
- Language barriers may persist even among collaborators who use English in their professional work. In addition to disciplinary jargon, there may be concepts in one culture for which other languages have no word or multiple words with important nuances.

Case Study

For several years, Dr. Walker and her research team at a state university have been working to explore the effects of chemicals on the environment and on animal health. A private company offers funding to Dr. Walker to examine the relative safety and environmental impacts of one of its products. The company's lead chemist has designed a version of a study that Dr. Walker's research team plans to refine. In order to conduct the work as quickly as possible, Dr. Walker arranges to collaborate with other researchers in Europe and Asia.

The project is well underway when Dr. Walker emails her collaborators to report that a committee at her institution has halted the project until significant changes are made. The committee concluded that it would be unethical to carry out the project as planned since the chemical's toxic effects are already well established. The entire research team meets virtually to discuss what the committee's decision means for the project and how to proceed from here.

- How can international collaborators identify differences in national regulatory standards before they encounter conflicting rules that may affect their work?
    - The research team needs to read and understand each partner organization's relevant policies. They should also work with their administrative offices to understand the regulations that affect international research collaborations. The research team can save time and prevent conflicts by talking with administrative officials about policy questions before starting a collaborative project.
- When an industry sponsor funds academic researchers to carry out a specific project, what are a researcher's professional responsibilities with regard to the design, ethical review, and implementation of the project?
    - Researchers have a responsibility to act professionally, which includes disclosing data and other research findings honestly. They also have a responsibility to uphold the terms and conditions of an agreement with the entity that funds their work. At times, these responsibilities can be in conflict, which may mean that the researchers need to know the provisions of their funding in advance and seek advice from trusted colleagues or legal entities about how to manage situations that arise.
- If the project is allowed to move forward, should the sponsoring company be allowed to review the data before the research team publishes its findings?
    - It depends on the original funding agreement among the researchers, the researchers' organizations, and the industry sponsor. In general, an industry sponsor will include stipulations in written agreements with academic researchers that it has the right to review research data prior to publication.

Potential Challenges in Collaboration

The differences in disciplines is one potential challenge to collaboration.

Examples of Collaboration Challenges

- Researchers' experience with discipline-based grants or national funding systems may lead to different expectations about whether and how much external funding they need for a collaborative project, appropriate sponsors, the nature of grant writing and peer review, and the policies that may affect their work.
- Practical dimensions of data collection, management, and analysis in different fields or languages may require new approaches to joint work to ensure that results are not lost, corrupted, or misinterpreted.
- "Normal misbehaviors" (De Vries et al. 2006) that are tolerated or ignored in one field or country may be seen as overt misconduct by collaborators in another.
- Differing standards of productivity, including the number of experiments conducted, amount of data generated, number of manuscripts published, and amount of grant funding acquired, may cause collaborators to question the quality of their partners' work and commitment to integrity.
- Variable standards for authorship across disciplines and countries, and the valuation of specific kinds of contributions, may lead to tension among team members who all need to publish work that is credible to their own peers.
- The expected roles of trainees and technical staff in a collaborative research project may vary across disciplines, organizations, and nations. Significant differences in trainees' and technicians' perceived authority or opportunity, or the credit their work receives, may affect morale and the willingness to work together.

Regulation, Policy and Guidelines

Most collaborations benefit from written agreements that outline roles and responsibilities. A memorandum of understanding may be written broadly to document an open-ended relationship or may detail expectations and commitments on a time-limited project. A memorandum usually spells out the goals of the collaboration, the contexts and time period in which the research will occur, the people bound by the document, ownership of intellectual property, responsibilities of authorship, trainees' roles and supervision, and who bears certain financial costs.

One of the most important steps in establishing a collaboration is to determine who is accountable for the various components of the project and create a leadership plan that describes processes for making important decisions.

Federal Regulation and Related Policy

Research collaboration is not regulated, but general research regulation policies address various aspects of collaboration. These are summarized in Figure 3.
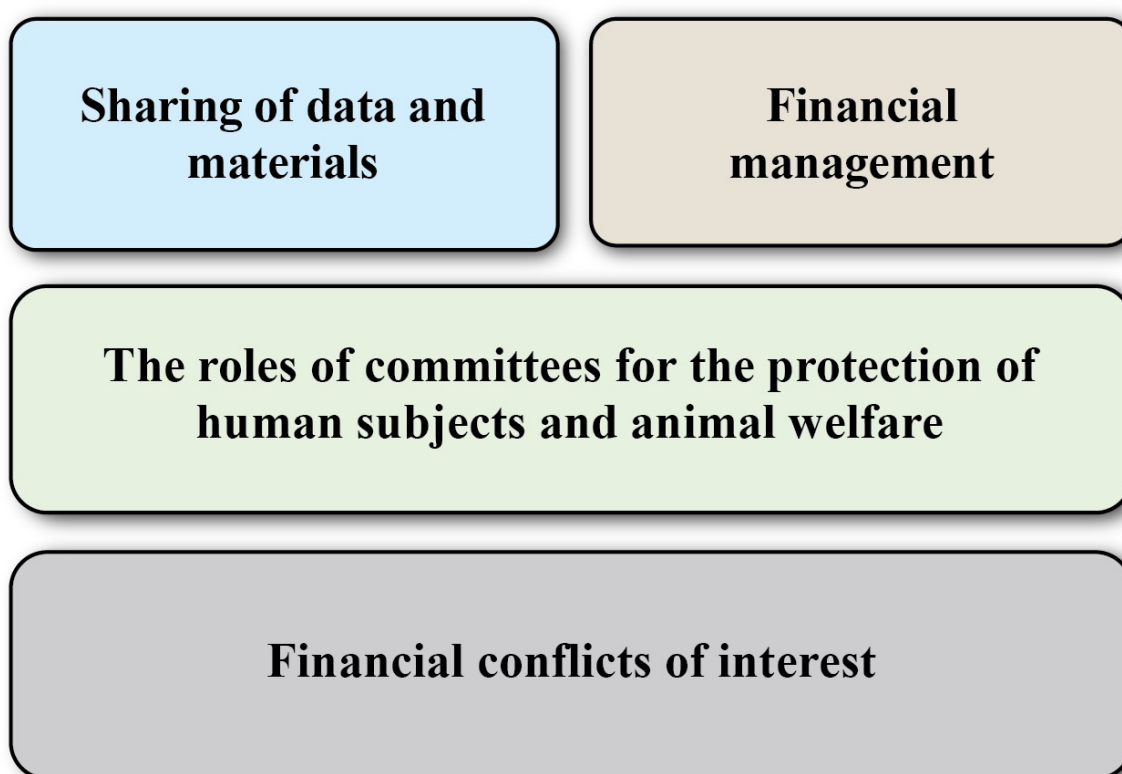

Figure 3: Aspects of collaboration that are regulated

The ownership and sharing of data generated in federally-sponsored research is regulated by the granting agency. In collaborations involving research with human subjects, animals, or renomination of DNA, the principle investigator's institution typically takes the lead in reviewing the approving joint work. However, collaborators from different institutions are also responsible to their respective Institutional Review Bead, Institutional Animal Care and Use Committee, and Institutional Biosafety Committee.

Establishing and Maintaining a Successful Collaboration

Case Study

Dr. Zachary is a doctoral student who has just successfully defended his dissertation. In a few weeks, he will start a postdoctoral fellowship at a state university. His boss during the fellowship will be a longtime department chair named Dr. Carlton. Dr. Carlton has a small research team and has a reputation as an excellent research mentor.

Dr. Zachary's current advisor, Dr. Prabhu, introduced him to Dr. Carlton. The two professors have been good friends and occasional collaborators.

Before Dr. Zachary leaves graduate school, he wants to make sure that he can continue his research at the new institution. He has a manuscript underway as well as two innovative ideas that he hopes will lead to a grant proposal. His research thus far has been supported by Dr. Prabhu's grant.

Dr. Zachary knows that he will need ongoing access to Dr. Prabhu's database. Although Dr. Carlton uses different data management software than Dr. Prabhu, Dr. Zachary believes that he can transfer the necessary data once he sees Dr. Carlton's computer system first hand.

- Who should Dr. Zachary talk to about his plan to build on his dissertation research during his postdoctoral fellowship with Dr. Carlton? What information or advice should he ask for?
  - Dr. Zachary needs to discuss his plans with both Dr. Prabhu and Dr. Carlton, who need, for example, to agree to a data sharing plan for his future research. Dr. Zachary needs to determine whether he has permission to have continued access to Dr. Prabhu's database.
- An undergraduate student has been talking to Dr. Prabhu about working with his research team as part of a summer research program. Dr. Prabhu suggests that she analyze the results of a side project that Dr. Zachary had conducted. If the undergraduate student prepares a manuscript as part of the summer project, how should authorship on the manuscript be handled?
  - Dr. Prabhu and the undergraduate student should meet with Dr. Zachary to discuss authorship issues. They should construct a plan for manuscripts that involve reporting methods or data that Dr. Zachary developed for his dissertation.
- How can Dr. Zachary prevent differences between policies at his graduate institution and at his new university from hindering the progress of his research?
  - Dr. Zachary should ask people at his new university, including Dr. Carlton, about which policies, including those relating to data management, he needs to read and understand. Dr. Zachary could also find out whether his new university has a postdoctoral services office or any opportunities for training where he can learn more about research policies.