Involving multiple disciplines in research and problem solving is becoming increasingly popular. The goal of this website is to provide a brief overview of the ideas, definitions and issues relevant to interdisciplinary collaboration. Real world problems and complex research questions rarely fit nicely inside a single area of knowledge; to overcome this complexity, it is important to build bridges between disciplines and embrace multiple perspectives. If you’re interested in learning more about how expert knowledge is borrowed, shared and integrated, this is a good place to start.

DISCIPLINARITY 2
MULTIDISCIPLINARITY 2
INTERDISCIPLINARITY 2
TRANSDISCIPLINARITY 3
CHALLENGES FOR INTERDISCIPLINARY TEAMS 3
CHALLENGES FOR INTERDISCIPLINARY SCHOLARS IN ACADEMIA 4
CRITERIA FOR THE ASSESSMENT OF INTERDISCIPLINARY WORK 4
COMMUNICATION IN INTERDISCIPLINARY COLLABORATION 5
INTERACTIONAL EXPERTISE 6
TACIT KNOWLEDGE 6
PATTERNS OF COLLABORATION 6
QUICK DEFINITIONS 7
STANDARDIZING TERMINOLOGY 8
BIBLIOGRAPHY 8
ABOUT THE COMPENDIUM 9
DISCIPLINARITY

A discipline is a “self contained and isolated domain of human experience which possesses its own community of experts” (Nissani). Each discipline uses specific tools, methods, assumptions and knowledge gathering practices that distinguishes them from other fields. Experts inside a discipline develop powerful methods for a specific kind of problem. For example, engineers are really good at solving certain problems, such as designing bridges, vehicles and advanced materials. However, even though each discipline has appropriate methods for solving problems in their domain, those methods won’t be appropriate for every type of problem. Because of this, each discipline needs to rely on other disciplines to solve problems that fall outside their domain. Together, disciplines can address a huge variety of problems, from predicting death rates to creating art to searching for extraterrestrial life. However, there exist many problems for which no single discipline can generate an appropriate solution.

Sources: Nissani, Repko

MULTIDISCIPLINARITY

Multidisciplinary collaborations occur when experts from different disciplines work together on a project without integrating their concepts or methods. In multidisciplinary collaborations, experts interact by cooperating with other disciplines and appreciating the value of the contributions of other disciplines. Each expert makes their contribution only using their own disciplinary perspective, and then those contributions are brought together after the fact. As a result, despite having several disciplines represented in the project, a new understanding does not emerge from the interactions between experts. Multidisciplinary projects are advantageous because they use diverse disciplinary perspectives without the challenges of interdisciplinary research, such as the extra time required to understand the paradigms of their collaborators.

Source: Leavy

INTERDISCIPLINARITY

Interdisciplinarity brings together the knowledge, insights and methods of multiple disciplines. In an interdisciplinary project, the individual or team will draw on multiple disciplines in order to create the basis of their work. However, just drawing on different disciplines does not make a project interdisciplinary; it must as also integrate insights and methods from the disciplines. An interdisciplinary project creates a unique perspective that wouldn’t be possible with knowledge from only one discipline. In interdisciplinary work, even though knowledge from different disciplines is brought together to create new perspectives, each expert functions as a member of their own respective discipline.
**TRANSDISCIPLINARITY**

Transdisciplinary collaborations are independent of the disciplinary structure and attempt to transcend disciplinary boundaries. Transdisciplinary collaborators work together to create a new understanding that is shared by the entire team; this understanding is built on disciplinary knowledge, but exists outside of any discipline. Transdisciplinary projects focus on solving real world problems, and their research questions create knowledge that is meaningful to everyone, not just disciplinary experts. Transdisciplinary teams usually bring together experts from different fields who openly share the knowledge that they bring to the problem. When these collaborations are successful new methodologies, understandings and theoretical frameworks emerge from their shared expertise. Innovative transdisciplinary ideas don’t happen all at once: they through multiple forms, or iterations, before the final transdisciplinary understanding is created.

Source: Leavy

**CHALLENGES FOR INTERDISCIPLINARY TEAMS**

Interdisciplinary teams face many unique challenges which they must address in order to be successful. For example, since communication between disciplines can be difficult, an interdisciplinary team must set aside time to learn how to speak to one another without confusion. They also must ensure that they are able to meet in person, and must set aside time in order to do so. This becomes more difficult the further apart the collaborating team is from one another.

Also, an interdisciplinary team must give experts from every discipline an equal amount of respect. Unfortunately, many people have assumptions about other disciplines, which can damage interdisciplinary collaborations. The power balance in an interdisciplinary team will reflect the power structure of the outside world, unless the team intentionally identifies these imbalances and structures the team so that every discipline has equal status. This is important to ensure that each member’s knowledge, experience and understanding is being represented in the team’s work.

It is easier to collaborate with people in your immediate geographical area. This isn’t just true of interdisciplinary collaboration; proximity is a potential barrier that collaborators in all domains need to overcome. Simply put, if you never see your collaborators face to face, it is very difficult to accomplish your collective goals. Epstein labels in-person meetings “face time”. According to her, face time is both what begins a collaboration and what keeps it alive. Face time puts social
pressure on collaborators, helps collaborators control distractions and amplifies individuals’ ideas, leading to insights that no individual could have on their own.

Source: Klein, Epstein

**CHALLENGES FOR INTERDISCIPLINARY SCHOLARS IN ACADEMIA**

Interdisciplinary work requires more time and effort than disciplinary work of the same scope. This is because becoming comfortable with the required skills, knowledge and vocabulary is a lot harder for interdisciplinary problems. The way that academia is structured has big incentives for high productivity, usually defined as how many journal articles or books a researcher publishes over time. Since interdisciplinary scholars need more time to publish their work, researchers would often receive greater career benefits for staying inside their disciplines and publishing more frequently.

The funding structure of academia further disincentivizes interdisciplinary work. Funding agencies are often structured to fund particular disciplines, so it is often unclear or difficult for interdisciplinary teams to know which agency to approach for support.

Universities will also use traditional disciplinary definitions to structure their hiring practices. Interdisciplinary scholars will sometimes be hired jointly by multiple disciplines at a university. However, if expectations are not made clear, the scholar may experience negative consequences. It is not possible for one scholar to make a full contribution to two disciplines. It is important for colleagues to understand that a jointly appointed scholar isn’t two disciplinary scholars.

Source: Pfirman & Martin

**CRITERIA FOR THE ASSESSMENT OF INTERDISCIPLINARY WORK**

One of the advantages of working within disciplines is that people inside the discipline can develop consistent strategies for evaluating project outcomes. For example, psychologists generally know what a good psychology paper looks like and mathematicians know how to identify a good or bad mathematical proof. However, interdisciplinary projects usually have methods, goals and outcomes which do not fit nicely into any discipline, and thus cannot be evaluated using only one discipline’s assessment criteria.

To solve the problem of assessing student creations that don’t fit disciplinary boundaries, Boix-Mansilla suggested three criteria to assess their work. Firstly, the project must make good use of the contributing disciplinary insights that the project is drawing on and meet the relevant
standards of evaluation from each contributing discipline. To properly employ disciplinary insights, one needs to understand the knowledge, methods, goals and outcomes of a discipline; an interdisciplinary project’s quality depends on the quality of the disciplinary insights that it is based upon. Secondly, the project needs to integrate these disciplinary insights into a new understanding. The integration of disciplines must create a perspective on the project which none of the disciplines could achieve individually. Thirdly, it is important for the project to be self-critical. The project should identify potential problems with the new interdisciplinary understanding it creates and it should also document the steps taken to reach the new understanding.

Source: Boix-Mansilla

COMMUNICATION IN INTERDISCIPLINARY COLLABORATION

Disciplinary experts spend lots of their time talking with other similar experts about issues relevant to their field. Because of this, each discipline develops its own “language” for communicating ideas. Disciplinary languages can have major differences, and interdisciplinary collaborators need to be aware of those differences to communicate effectively. These specialist languages are usually full of discipline specific jargon that won’t be understood by non-experts without translation. Experts in different fields may even use the same word to refer to different ideas entirely. Because of this potential for misunderstanding, it is extremely important for interdisciplinary collaborators to discuss the language they use at the beginning of any project, to clarify what words mean and to agree upon how to use words with conflicting or ambiguous meanings. If collaborators do not clarify language at the beginning of a project, it is possible for team members to have different interpretations of what is being said, and yet think that they have reached a common understanding. If misunderstandings aren’t caught early, it can cause major problems later in the project.

It is also important to ensure that the language used by the group reflects each group member’s experience fairly and adequately. If the language of one discipline dominates a collaboration, it undermines the contribution of other disciplines whose language is underrepresented.

Source: Epstein
INTERACTIONAL EXPERTISE

People who have deep knowledge of a discipline, but who can’t contribute to the work of the discipline, are called interactional experts. Interactional experts have enough knowledge in a domain to converse intelligently with the experts working in that field. Interactional experts have enough knowledge that experts in the discipline often can’t tell that interactional experts are not experts in their discipline. However, despite being knowledgeable, an interactional expert doesn’t participate directly in the work of a discipline. Interactional experts are important because they can provide disciplines a valuable outside perspective, by questioning assumptions that a novice wouldn’t be aware of but that experts may take for granted. It is important to clarify interactional expertise because when people refer to “experts”, they are usually referring to contributory experts, who contribute directly to the work of their discipline.

Source: Collins & Evans

TACIT KNOWLEDGE

Reading books and articles are an important part of becoming an expert in many disciplines. However, disciplinary experts have a lot of knowledge that cannot be captured in books alone. This is called tacit knowledge; knowledge that is embedded in the community of experts and must be learned by interactions with that community. The tacit knowledge of a discipline often includes fundamental assumptions of the discipline. It is important to be aware of tacit assumptions because if they are not being discussed in the literature they are more likely to be taken for granted. Taking certain assumptions for granted helps get work done efficiently, but can also conceal the limitations of a disciplinary perspective.

Source: Collins & Evans

PATTERNS OF COLLABORATION

Collaboration is the interaction of two or more individuals for the purposes of working together to solve applied or theoretical problems. According to Epstein, the relationship between collaborators tends to follow four main patterns:

DISTRIBUTED COLLABORATION:

In distributed collaborations, researchers who have similar interests work together without formal roles. In these collaborations, experts share opinions and perspectives freely, responding to the knowledge of their collaborators.
COMPLEMENTARY COLLABORATION:

In complementary collaborations, each contributor is like a piece of a puzzle that fits together with other team members to fulfill the needs of a project. Work for the project is split up according to the strengths and skills of the contributors.

FAMILY COLLABORATION:

Members of a family collaboration share similar expertise. Having similar expertise allows collaborators to easily switch roles, teach collaborators and learn from other collaborators.

INTEGRATIVE COLLABORATION:

Integrative collaborations bring together members with diverse skills and abilities to create a new way of thinking. In these collaborations tasks are completed as a group, instead of being divided up. The ideas that an integrative collaboration creates cannot be traced back to a single person, because everyone in the group has contributed to it.

Source: Epstein

QUICK DEFINITIONS

INTEGRATE:

Integration is the act of meaningfully combining two or more disciplines’ methodologies, paradigms, or research. By meaningfully, we mean that the sum of the work is greater than the individual parts being contributed to the project.

PARADIGMS:

A paradigm is the world view held by the researchers in a given discipline. Paradigms define the fundamental laws which govern their work, what constitutes proper evidence as well as the appropriate methodology to find this evidence, and the standards which the evidence must be held to. Paradigms also isolate disciplines within a certain language and leave them unable to effectively communicate with other disciplines who are speaking a language native to their own paradigm as well.
METHODOLOGY:

Methodology is the set of practices within a discipline to generate new knowledge. The methods of each discipline are designed to solve the problems relevant to their domain, so they may have limited usefulness in other domains. For example, people sometimes criticize social scientists for being unable to attain the level of certainty found in the natural sciences. However, it is not the case that social scientists are poor scientists; the methodology of the social sciences has been designed to answer different questions than the natural sciences. It is not possible or even desirable to apply the methods of physics to studying social science issues such as prejudice.

STANDARDIZING TERMINOLOGY

This website presents definitions of multidisciplinarity, interdisciplinarity and transdisciplinarity taken from reputable academic sources, but it is important to acknowledge that these definitions are not universal. Unfortunately, it is common for multidisciplinarity, interdisciplinarity and transdisciplinarity to be used interchangeably. One of the goals of this website is to encourage readers to treat these words as separate terms, referring to specific types of research.

There are several advantages for defining these words separately. Firstly, separate definitions allow people working across disciplines to communicate clearly about different levels of integration in a research project. Secondly, each separate word is also useful because it implies information about collaborative projects. Multidisciplinarity, interdisciplinarity and transdisciplinarity collaborations all have different advantages, challenges and approaches, so it is useful to distinguish between them.

BIBLIOGRAPHY


ABOUT THE COMPENDIUM

The Compendium of Interdisciplinarity was created in 2014 by three students from the University of Waterloo’s undergraduate Knowledge Integration program. The site was created as a project for Interdisciplinary Collaboration, an undergraduate course offered by the University of Waterloo’s Centre for Knowledge Integration and taught by Professor Kathryn Plaisance.

The site was created to provide a basic overview of the ideas and issues discussed in Interdisciplinary Collaboration. However, it is the hope of the original contributors that further classes of Knowledge Integration students taking Interdisciplinary Collaboration will add new content to expand the site.

CONTRIBUTORS:

Aidan Coward (2014)

Anthony Stegner (2014)

Joel Becker (2014)

This handout is a printable version of some of the information contained in the Compendium of Interdisciplinarity, as of March 2014. For supporting examples and possible updates, check out http://idcompendium.wordpress.com.