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Jens Allwood

Multi- and Interdisciplinary Research

Chapter 14

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In this chapter we will take a look at some of the advantages and problems in working together across disciplinary borders. We will discuss the following issues:

1. Introduction - Why cross disciplinary borders?
2. Two Historical Processes
3. Types of crossing disciplinary boundaries and communication

1. Why interesting - Why cross disciplinary borders?

There are several reasons for why working across disciplinary borders often is desirable and necessary. Some of the reasons are the following. For at least the latest five hundred years, there has been a global increase in scientific, technological and social complexity. More human activities depend on and use science. More human needs (more than 7 billion people) are dependent on science to be taken care of. There are strong global demands for increase in productivity (GDP etc.) which often implies needs for science and technology. There are very strong environmental global challenges that require collaboration between the natural sciences, the social sciences and the humanities. In the ASEAN countries, for example, a lot of attention is being given to the UN SDGs (Sustainable Development Goals), where the goals require interdisciplinary research with participation from the natural sciences, the social sciences and humanities. There is a demand for new scientific discoveries and theories both from the general public and from politicians and business. Nearly all scientific projects, meeting these practical needs and demands, require work across disciplines. Single discipline projects are rare in the practical world.

In addition to the practical needs for interdisciplinary research, there has always also been a theoretical need. We cannot fully understand reality, if we are not able to combine the contributions from different disciplines into a holistic single picture where the different disciplines fit into each and complement each other. To do this has, however, turned out to be complicated, since sometimes disciplines make assumptions which are not totally compatible with the assumptions made in other disciplines, describing and explaining the same or related areas of reality.

All these pressures have led to a growth of information claimed to be "knowledge". This has meant more types of "knowledge" to preserve and maintain, to change and improve, to extend and increase. It has also led to a growth of competence which has primarily been connected with a continuously increasing need for more people with a specialized scientific competence. But it, in addition, since it has also led to increased fragmentation and lack of overview which means that there is also a need for persons with a more general competence.

2. Two Historical Processes

From the point of view of crossing disciplinary boundaries we can distinguish two historical processes:

Process 1. - Increasing specialization

The first process has taken us from philosophy to special sciences which were earlier part of philosophy. There are many examples of this like natural philosophy becoming natural science and then further subdividing into subjects like mathematics, physics chemistry, or topology. In a similar way, humanities and social science broke out of philosophy and formed disciplines like linguistics, psychology or sociology. This process is characterized by division, specialization and fragmentation. It is connected with manageable clear criteria for new disciplines and it has led to specialist competence, based on disciplinary consensus often

protected from outside criticism. However, it has also led to decreasing overview. Very few people even have an overview of their own discipline let alone several disciplines. We have many specialists but few generalists.

Process 2. - Connection and synthesis

Parallel to the process of specialization, there has been a much weaker process of connection and synthesis producing new combinations and broader fields of investigation. Nevertheless, when it happens, it has often resulted in new areas of investigation combining several older disciplines. Because of the increase in available scientific information and the complex practical problems facing us, for example, concerning environment, over-population, food production and poverty, such attempts have lately become somewhat more common. Four recent examples of is the creation of "cognitive science" from philosophy, computer science and linguistics, "biochemistry" from chemistry and biology, "neuroscience" from many disciplines, including neurology, neuro-physiology, psychology and computer science and very many of the projects dealing with environmental questions (SDG). See also chapter 15.

In the long run, we need both processes – both specialization and connection and synthesis across disciplinary boundaries. We should remember that without disciplines, there can be no interdisciplinary work. So, the question is how should we proceed to meet the demand for innovation and improvement of both disciplinary and interdisciplinary knowledge, both specialist and generalist competence. How can we manage, preserve and maintain the knowledge we believe we have? How can we provide knowledge overviews? How can we achieve practical usefulness by combining specialist competences?

In this chapter, we will focus on this process and describe some types scientific boundary crossing, some problems that may arise in such processes and some ways to facilitate the work.

3. Crossing disciplinary boundaries

There have been many attempts at connection and contact and cooperation across disciplines, sometimes for theoretical reasons, like in the ideal of unified science, (see Morris, 1962) but more often for practical reasons to solve practical problems which cannot be solved from the perspective of one discipline alone. In a long-term perspective, the contact between disciplines has perhaps mostly been calm and cooperative, but at other times it has been more controversial, sometimes leading to conflicts. Below, we will discuss some of the problems in crossing disciplinary boundaries but first we need to take a look at four different forms of work across disciplinary boundaries that have been recognized and given distinct names (labels).

Four Types of work crossing disciplinary boundaries

- Multi-disciplinary (pluri-disciplinary) work
- Cross-disciplinary work
- Inter-disciplinary work
- Transdisciplinary (meta-disciplinary) work

All four types can be used to speak about a kind of work and interaction, e.g. "multidisciplinary or interdisciplinary work/interaction" but they can also be used to refer to a specific kind of competence that a person or a team of persons might have, e.g. "multidisciplinary or interdisciplinary competence" which refers to the ability to cross disciplinary boundaries. Let us now briefly consider the types one by one:

3.1 Multidisciplinary work/interaction or competence

Multidisciplinary (in Romance language areas sometimes called pluri-disciplinary) work and interaction means that people from several disciplines are working on a common problem. The disciplines are separate but, in principle, often supposed to be equal, even if they in practice, for example concerning resource allocation are not. In multidisciplinary work, the researchers could all work separately. No specific interaction between researchers, over and above working on the same problem is required. So, in dealing with the problems caused, for example, by a forest fire, one researcher or group of researchers could work on the effects on plant life (e.g. botanists), a second researcher or group on the effects on animal life (e.g. zoologists) and a third group on the effects on human life (e.g. social scientists of some type). Another example of a multidisciplinary project would, for example be a group of researchers studying a phenomenon, such as eating disorders, each one separately within their own discipline, e.g. a physiologist, a nutritionist, a psychologist and a psychologist.

The term "Multidisciplinary" just means that several disciplines are involved but does not say very much about the relations between the researchers involved. Multidisciplinary work involves coordination and awareness of each-other's work but not necessarily collaboration and cooperation. See Allwood (2008) coordination, collaboration and cooperation.

We can also speak of the "multidisciplinary competence" of a person or a group. This means that the person or group has competence in several disciplines, for instance, being good at both biology and chemistry or good at both history and linguistics. A multidisciplinary researcher could, for example, have a Ph.D. both in linguistics and psychology, thus being able to investigate phenomena using the theories and methods from both disciplines, in studying a phenomenon like developmental communication disorders.

Multidisciplinarity is the most basic of the forms of work across disciplines and is presupposed by the other forms to be discussed below, all of which require a context of several disciplines, in order to make working across disciplinary borders relevant in interdisciplinary, crossdisciplinary or transdisciplinary collaboration and cooperation.

3.2 Cross-disciplinary work/interaction or competence

"Cross-disciplinary work" can mean many things but one very common meaning is that it is work which involves comparison of methods or ideas between disciplines. An example of a comparison might be to compare the classification of plants with the classification of chemical elements or to compare historical method with anthropological method. Moving from classification and method to the subject matter of theories, we might compare a sociological account of organizations (organizational sociology) with a psychological one (organizational psychology). Cross-disciplinary research can also involve transfer of a theory or method from one discipline into another discipline, for example, when algorithms used for capturing the structure of language in linguistics were transferred into architecture and used

for capturing the structure of buildings in computer design programs for architects, or when Noam Chomsky transferred mathematical recursive rewrite rules from mathematics to linguistics to capture phrase structure (Chomsky, 1957).

"Cross-disciplinary competence" means that you are able to cross from one discipline to another with a high level of competence and that you are able to compare, that is, see similarities and differences between the disciplines. Cross-disciplinary competence is thus different from multicultural competence in not only implying competence in several disciplines but also an ability to compare them with regard to similarities and differences. Crossdisciplinarity, thus involves several disciplines as well as coordination and collaboration, i.e. awareness of each other + comparison of something from one discipline to another.

3.3 Transdisciplinary work/interaction or competence

The term "transdisciplinary" is the least used of the terms and has like "cross-disciplinary" been used in several different meanings.

1) In one meaning, it means transferring ideas or methods from one discipline to another which can also be part of cross- disciplinary work. In this meaning, we can also speak of transdisciplinary work or competence. Here "trans-disciplinary" and "cross-disciplinary" can have similar meanings, for example, Noam Chomsky's transfer of mathematical recursive rewrite rules from mathematics to linguistics (Chomsky, 1957), Leonard Bernstein's transfer of Chomskyan transformational rules to describe music (Bernstein, 1976) or the transfer of ethnographic methods of observation from anthropology and ethnography (see chapter 4) to informatics (applied computer science) and studies of business. "Transdisciplinary competence" is, in these examples, the ability to transfer something from one discipline to another.

2) In another meaning, "transdisciplinary" means going beyond disciplinary work to a kind of common method and basis for all disciplines. In this sense, it is synonymous with the term "meta-disciplinary" and part of "a discipline of disciplines". This could be a general description of similarities and differences between disciplines but it could also be more practically concerned with what is valid in all or most disciplines, like logic or statistics, independently of specific disciplinary empirical data, beyond present disciplines. For example, the last stage in the "eating disorder" project or the "AgeCap" project which was concerned with a joint interpretation of empirical data about aging from several disciplines. The first stage here is multidisciplinary, involving separate reporting of data on eating or aging from several disciplines. The last stage involves putting all the diverse data together in a joint model, going beyond any of the initial disciplines.

3) In a third meaning, "trans-disciplinary" refers to relating academic research concerns to more practical concerns coming from technology, industry or other fields of society, going beyond academic studies to practical interests (see also chapter 15 on "action research").

3.4 Inter-disciplinary work (Integrating several disciplines for a joint purpose)

Interdisciplinary work involves integrating several disciplines for a joint purpose. It presupposes not only several disciplines (multidisciplinarity) but also coordination, collaboration and cooperation, where "cooperation" involves collaboration (awareness of each

other + joint purpose) as well as ethical consideration and trust. Interdisciplinary cooperation is therefore a more intensive and complete form of work than the three previous forms that we have described.

Thus, interdisciplinary research requires close cooperation between researchers from different disciplines working together towards solving a problem. In the example of studying eating disorders above, the psychologist, physiologist, nutritionist and psychiatrist would work as an integrated team, which requires that they gain some insights into each other's disciplines and can address the problem from a wider perspective.

"Inter-disciplinary competence" means that you are competent in using several disciplines jointly. It therefore goes beyond multidisciplinary and cross-disciplinary and transdisciplinary (at least in meanings 1 and 3, above) competence, in the sense of being able to work in and with several disciplines. This means that collaboration and ethical concerns become important and enable trust between the cooperating researchers. Cross-disciplinary and trans-disciplinary competence involves several disciplines and the ability to compare or transfer some aspect of a discipline to another discipline but not necessarily the ability to work in and with several disciplines. The four forms of discipline crossing research we have discussed, thus focus on slightly different aspects, but all of them imply multi-disciplinarity. However, below, we will, if the differences between the different forms are not important, mostly use the term "interdisciplinary" to refer to all forms, since this term to a large extent also allows for the other forms. Below is a table (table 1) presenting the four different forms of inter-disciplinarity we have discussed.

Most, if not all the forms of discipline crossing we have considered, involve communication. If it involves several persons working in a common interdisciplinary area, it always involves communication and if there is communication, it can be successful or less successful. In the next section, we will take a look at some of the problems that can arise in the interaction between disciplines.

Table 1. Overview of multi-, cross-, inter- and trans-disciplinarity

Type of interdisciplinarity	Need/requirements	Purpose	Advantages/disadvantages	Example
Multidisciplinary	Several disciplines	Coordination of several disciplines	Easiest to start but lack of interaction	"AgeCap" start Independent contributions from several disciplines to a data base
Cross-disciplinary	Several disciplines Desire to cross	Comparison transference	Rewarding but more difficult requires in-depth understanding of at least two disciplines	Chomsky adapted Mathematical rewrite system to Linguistics

Transdisciplinary	Several disciplines	Transference transcendence	Moving to new research area	"AgeCap" joint Interpretation of results from several disciplines
Interdisciplinary	Several disciplines Knowledge of other disciplines than your own + interaction	Cooperation	Requires understanding of other disciplines, trust and willingness to interact also critically between disciplines	Planning of new hospital

4. Some problems in the interaction between disciplines

In a long-term perspective, the contacts between disciplines have perhaps mostly been calm and cooperative, but at other times they have been more controversial, sometimes leading to conflicts. Here we will now consider some of the problems in crossing disciplinary boundaries.

4.1 Lack of understanding and misunderstanding

Understanding basically involves perceiving some input information, e.g. through hearing or seeing something and then connecting what you have perceived with information you have stored in your memory, in a meaningful and correct way (background information), see Allwood and Abelar, 1984 and Allwood, 1986. If you are able to do this in a correct and meaningful way, you have understood. If you are not able to correctly perceive the information that you are receiving or are not able to connect it with your background information meaningfully and correctly (either because you lack the relevant background or are making the wrong connection) you will experience lack of understanding or misunderstanding.

If we apply this analysis of understanding to interaction across disciplinary boundaries, a very basic problem that may occur in this interaction is "lack of understanding". This can easily occur between researchers from different disciplines. They often lack the shared background which is necessary for a shared understanding. This could be because they don't understand each other's terminology (e.g. linguistics, chemistry, medicine) or they don't have the background to understand the theories of the other discipline, especially if the theories are formalized using equations and statistical calculations. In some cases, they might even think they do understand but, in fact, they don't. They make the wrong connections and as a result misunderstand.

Because of differences in theoretical background and interests, they also often have different perspectives on what is seen as relevant and what should be done. Such differences can often be found in multidisciplinary work and can lead to different degrees and levels of understanding, lack of understanding and misunderstanding.

When researchers actually start to interact in an interdisciplinary way, the flexibility and context dependence of language offer possibilities both for understanding but also for lack of understanding and misunderstanding. Some of the possible linguistic problems can be connected to such phenomena as *vagueness – precision*, *abstract* (unspecific) – *concrete* (specific), *metaphor* (see glossary), *metonymy* (see glossary), *ambiguity* (has several meanings) and *polysemy* (many different but related meanings, e.g. the term *morphology* which has different but abstractly related meanings in cellular biology, linguistics and

geology or *homonymy* (two words which share the same word form, e.g. "bank"; (side of a river) or (financial institution) but where the meanings are not really related.

Such linguistic problems are one of the reasons (there can be others) that "lack of understanding" can become "misunderstanding". This happens when you interpret and think you understand, but the interpretation is mistaken and you have misunderstood. One example of this, which is caused by polysemy, is the following. The term "force", in physics, like in the equation "F = M x A" (Force equals Mass times Acceleration), is often misunderstood by many school children and perhaps by others, because of the many meanings of the word "force". The misunderstandings can be of different degrees and levels of understanding and can be compounded by the lack of understanding and misunderstanding being combined.

Polysemy and homonymy can also lead to the problems of thinking you agree when you don't - "seeming agreement" accompanied by underlying interpretative disagreement, as when a logician and an organization researcher agree on investigating the "logic of power", meaning different things by the word "logic". It can also lead to the problems of thinking you disagree when you don't - "seeming disagreement", e.g. disagreement about terminology but partial agreement about the object of interest as when researchers in computer science, sociology, linguistics and psychology discuss "frames", "scripts" or "schemata", terms which all refer to types of shared background information. These terms have been used, for example, to describe what people need to know in order to participate in an auction as the "auction frame", the "auction script" or the "auction scheme". They have also been used to describe what you need to know when visiting a restaurant as the as the "restaurant frame", the "restaurant script" or the "restaurant scheme", without the researchers always realizing that they are talking about the same or very similar things using different terms.

4.2 Disagreements and conflicts

Differences between disciplines are dependent on researchers having different perspectives which lead them to being interested in different aspects (objects, properties and relations) of reality. Often, but not always, this is connected with believing that the aspect you yourself are interested in is the most important and that other aspects are less important. This, in turn, can be further connected with believing that the theories and methods of the discipline you represent are superior to other approaches. This can become problematic if two different disciplines that are interested in different aspects of the same area of reality have to interact and agree. An example of this can be found in studies of human sex differences where a biological, genetical perspective is often thought to disagree with a social constructivist perspective (using the term "gender", instead of "sex") and both disciplines think that their perspective is the most important and most relevant.

So, when do scientific disagreements and conflicts occur? Some but not all are based on lack of understanding and misunderstanding in combination with different perspectives on what is interesting and relevant and with desires to dominate scientifically, economically and politically.

Often the disagreements are connected with extra-scientific concerns of the following types:
- A desire for socio-political hegemony (leadership or dominance, especially by one group over other groups) which makes the leaders of a disciplinary paradigm unwilling to give up their claims and perspectives

- A desire for an individual career which makes you adhere to a disciplinary paradigm in which you can be supported
- National, cultural, linguistic factors which make certain disciplines or methods more popular in certain countries and increase the risk of the occurrence of lack of understanding, misunderstanding and disagreements.
- In interdisciplinary projects which are also intercultural, in addition to the disciplinary differences, we have to deal with national-ethnic differences, so we have to have strategies not only for overcoming interdisciplinary differences but also for overcoming intercultural differences.

Interdisciplinary controversy and conflict are often fueled by attempts to establish "epistemic hegemony" (dominance concerning which view of what is correct science should prevail). When establishing epistemic hegemony for your approach you want your supporters to have the same perspective, the same terminology, the same relevant research, same cited authors and journals. You have nothing against negligence of other relevant perspectives and research. You should all have the same recommended methods and the same rejection of other methods. This can then have consequences in terms of claims for money, time, students etc., which can motivate controversies, disputes and conflicts.

Interdisciplinary Controversy and conflict can be pursued in different ways and there have been several ways of describing these. The interdisciplinary philosopher Marcelo Dascal (1998), for example, suggested a taxonomy for interdisciplinary disagreements, distinguishing "discussion", "dispute" and "controversy". Dascal writes "A polemical interchange can follow and take the form of for example
- Discussion - A discussion is a polemical exchange whose object is a well-circumscribed topic or problem
- Dispute - A dispute is a polemical exchange which also seems to have as its object a well-defined divergence
- Controversy - A controversy is a polemical exchange that occupies an intermediate position between discussion and dispute"

One could also describe these disagreements using the rhetorical (see Kennedy, 1997 and Toye, 2013) terms "ethos" (establishing trust), "pathos" (evoking a reaction from the audience or the readers) and "logos" (The factual, logical structure of the content), see chapter 2 and 12). What Dascal calls "discussions" are usually "dialectical", i.e. focused on "logos" (facts and descriptions and explanations of facts), while controversy and dispute involve other rhetorical means such as "ethos" (for example trust, distrust and mistrust) and "pathos" (evoking and expressing strong feelings)). Unfortunately, also other means can be used in interdisciplinary conflicts such as spreading of rumors, slander, denial of promotions, grants, publications, jobs etc.

5. Facilitating interdisciplinary work

5.1 Why interdisciplinary work?

In spite of the possible problems and challenges that can be connected with interdisciplinary work there are many good reasons to attempt such work, and not give up; the most basic reason perhaps being that the division between disciplines is historically somewhat arbitrary. After all, we live in one shared reality – even if the different disciplines carve it up.

We need a wider perspective in the light of increasing complexity and fragmented knowledge (synchronically and diachronically). We need to capture what has been left over between the disciplines (the grass is greener in the chinks between the stones). We need more general and deeper theories crossing the boundaries of the present disciplines. We should not "reinvent the wheel" again and again, which is often the consequence of a lack of orientation about other disciplines than your own. Also, the complexity of the modern world demands interdisciplinary cooperation. In fact, very often, in most practical projects, we have no other option – we don't have a choice. Many of the research needs in Laos connected with for example health programs, malnutrition, deforestation, electrification or the many needs connected with SDGS (sustainable development goals) are of this type and require interdisciplinary research with participation from the natural sciences, the social sciences and humanities.

Some of the outcomes we can expect from successful interdisciplinary work are results in new areas, more general (and deeper) theories e.g. in biochemistry or cognitive science. Concerning method, we can expect novel combinations of methods – "triangulation", making possible interdisciplinarity. We can also expect more insight concerning the aspects/parts of methods that are common to all disciplines. Some of these are the classical ideas of knowledge like consistence, completeness and non-redundancy which all, in fact, demand interdisciplinarity and some type of "unified science". See chapter 2.

So how can we stimulate interdisciplinary work and make multidisciplinary work become cross/inter/transdisciplinary work? How can we harbor discussion and controversy without allowing them to lead to dispute and conflict? How can we make multidisciplinary interaction not merely coordinated but collaborative or cooperative, possibly transcending present disciplines? Facing these challenges is, in fact, one of the most important tasks of research governance.

5.2 Facilitating interdisciplinarity on the individual level

Some of the factors contributing to successful interdisciplinary interaction are the following: the researchers who work together should increase their understanding, not only of their own discipline but also of the disciplines they are collaborating with, and in this way work toward in-depth shared understanding. Shared background in each other's disciplines, thus, involves learning more than one discipline. It involves individual multi-disciplinarity and if you are not working alone, in addition, it will involve also interdisciplinary interaction and possibly individual cross/trans-disciplinarity (see above section). But the researchers must also have a joint goal for their work, be good at abstraction, have sufficient resources for their work and have working relations that are characterized by trust and ethical consideration, tolerance of controversy and dispute. So, if you are interested in doing interdisciplinary work you should
(i) not only gain an overview of your own discipline, so that you can explain your discipline to researchers outside of your discipline, but also
(ii) try study the discipline(s) with which you would like to interact, collaborate or cooperate, so that joint understanding is facilitated
(iii) find a problem which seems to require interdisciplinary work and
(iv) find researchers from other disciplines you think you could work together with concerning the problem as well as
(v) look for interdisciplinary funding, if this is required.

These steps can be taken by individual researchers, bottom-up, on their own but can also be facilitated by university interdisciplinary research governance carried out by university or faculty boards (see below).

Concerning the researchers there are two kinds of persons who can fairly easily be combined in interdisciplinary work: (i) People with a wider perspective on both theory and method, they are individuals who have several competences and who are aware of the abstract methods that are common to all disciplines and who are willing to make sacrifices concerning career and grants and (ii) People with a practical-pragmatic perspective who are concerned with solutions to practical problems and but are willing to be guided by persons in the first group concerning theory and method.

5.3 Facilitating interdisciplinarity through research governance

In a university, that through its research governance wants to encourage different types of interdisciplinary work, several things can be done both from a top-down perspective (university, faculty and department) and from a bottom-up (individual researcher and department) perspective.

(i) From a top-down perspective grants and funding (private and/or public) can be provided for interdisciplinary projects. The topics of such projects could be decided top-down, for example, asking for projects concerned with sustainable agriculture. But the topics could also be bottom-up initiated with funding available for any good interdisciplinary project suggested by individual researchers.

(ii) There should be a flexible department structure. Not only coordination and collaboration but also cooperation is needed. This sometimes means setting up new interdisciplinary units and departments.

(iii) It could also mean setting up forums that provide meeting places for talks, seminars or other discussions for researchers from different disciplines, possibly also including non-academics who need interdisciplinary research help. This could be on a university level, for all faculties, or more limited on a faculty level or between specific faculties, e.g. between law and social science or between natural science and humanities.

(iv) There should also be career possibilities combining disciplines e.g. combining sociology and biology or career possibilities without a specific anchoring in disciplines, so that not only specialists but also some generalists can be employed and have a career.

(v) There could be an interdisciplinary publication series. This series could be general or limited to cooperation between certain disciplines.

6. Conclusions

Both disciplinary and interdisciplinary research are needed. Scientific development is moving in both directions. But relatively speaking there is a need to increase interdisciplinary, i.e. (multi/inter/cross/transdisciplinary approaches. Crossing disciplinary boundaries includes organizational and financial problems but also cognitive – linguistic problems, different types of lack of understanding and misunderstanding, different perspectives and interests as well as phenomena such as "seeming agreement" and "seeming disagreement" concerning the concepts and theories of another discipline or a new development of one's own discipline. But with some patience these problems become challenges that can be met and solved. However, in order to facilitate interdisciplinary research and make it successful, often universities have

to provide incentives like grants for interdisciplinary research, funding for interdisciplinary centers and possibilities for joint appointments in several disciplines.

Assignments

1. Design an interdisciplinary project, where your own discipline is one of the disciplines in the project.
2. Find a person from a different discipline. Form a group. Now try to plan and design a joint research project, using your own respective background disciplines.

GLOSSARY

Cooperation – – interaction where interactants are aware of each other, have a joint goal and take each other into ethical consideration.
Coordination – interaction where interactants are aware of each other.
Collaboration – interaction where interactants are aware of each other and have a joint goal.

Multi-disciplinary – involving several disciplines
Pluri-disciplinary – involving several disciplines (this term is more common in romance language areas)
Cross-disciplinary – comparing two disciplines.
Meta-disciplinary – using results and data from research already carried out as data for new investigations
Interdisciplinary – cooperation between members of different disciplines.

Ethos – establishing trust in communication (one of the three main aspects of rhetoric).
Logos – the factual content and logical structure of what is communicated (one of the three main aspects of rhetoric).
Pathos – evoking emotional, attitudinal reactions from an audience in communicating.
Polemical - a (controversial) argument, against some opinion, doctrine, etc.

Hegemony - leadership or dominance, especially by one state or group over other states or groups.

Homonymy - two words which share the same word form, e.g. "bank"; "side of a river" or "financial institution" but where the meanings are not really related.
Polysemy – one word with many different but related meanings
Metonymy – is a figure of speech in which a thing or concept is referred to by a term associated with that thing or concept by closeness in time or space, e.g. *Malaysia beat Indonesia in badminton,* where *Malaysia* and *Indonesia* primarily refer to the badminton teams, not the countries.
Metaphor – is a figure of speech in which a thing or concept is referred to by a term associated with that thing or concept by similarity, e.g. *He is a lion* meaning *he has courage by being similar to a lion*

Understanding – Understanding basically involves perceiving some input information, e.g. through hearing or seeing something and then connecting what you have perceived with information you have stored in your memory, in a meaningful and correct way (background information).
Lack of understanding – there is no understanding because of missing input, missing background or missing link between input and background
Misunderstanding – An interpretation is made linking input and background but it is incorrect.

Vagueness – lack of precision and specificity. Mostly used of the meaning of terms which are hard to delimit from other terms, e.g. how do we distinguish *love* and *friendship*?

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