TCSL-70130 Lecture 01: Interdisciplinarity 跨領域概念與議題

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Lecture Topics

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- What is disciplinarity?
- Characteristics of traditional disciplines
- What are the problems with traditional disciplines?
- **What** is interdisciplinary?
- **Why** interdisciplinary?
- **Characteristics** of interdisciplinary
- **Types** of interdisciplinarity
- Interdisciplinary **learning** and **education**

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Before We Start …

- Let's take a look at a video

Did You Know (Officially updated for 2020) #2020

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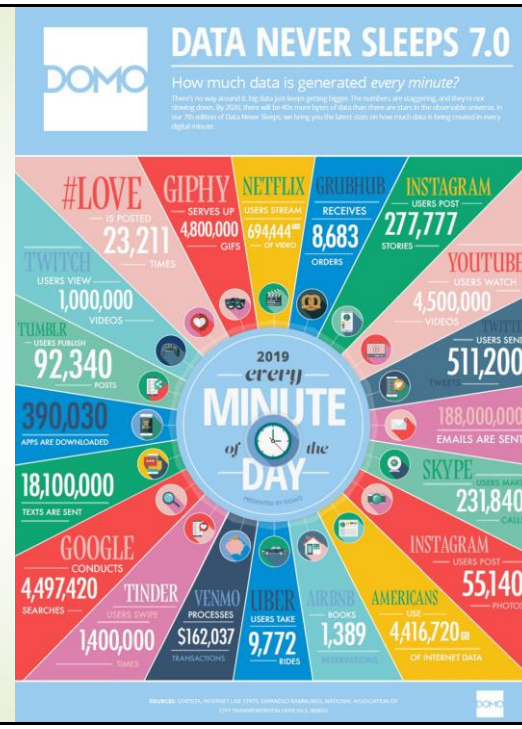
Also take a look at what happens every minute of the day?



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Knowledge Explosion

- **Tim Sandle** reports in *Digital Times*, "by 1950 human knowledge doubled every 25 years. In 2000, human knowledge would double every year. Now, our knowledge is almost doubling **every day**."

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What does IT ALL MEAN?

- We are living in exponential times!
- We are living in a world where:
  - Everything is connected
  - Data never sleeps
  - Knowledge explosion
  - Changing faster than ever
- How do we educate students to face even harsher challenges in the future?

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Students Must be …

- adaptive to changes
- able to deal with ambiguity
- able to deal with mass amounts of info
- able to adapt to different work environments and skill requests
- able to see things from different perspectives
- What others can you think of?

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Interdisciplinary Education

- Develops skills and traits that help students to cope with the demands.
- Equips students to be responsive to change.
- Teaches students skills that are transferable beyond the classroom.
- A key instructional strategy to equip students for a fast changing world.

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Disciplinarity

- The concept of interdisciplinarity cannot be fully understood without an understanging of disciplinarity.
- The term "discipline" has been in use since the Middle Ages(中世紀), when universities first appear in the western world.
- The history of disciplines, their definitions, goals, … varies by country.

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Formation of Disciplines

- Formation of disciplines has its origin in two human's tendencies:
  - tendency to separate, classify and conceptualize the surroundings
  - to accumulate knowledge
- It also comes from the belief that citizens should be educated in specialized fields in order to participate in the economic life.
- Disciplines also served to identify different areas of study.

Characteristics of Disciplines (1)

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- Aram(2004): disciplines are "thought domains – quasi-stable, partially integrated, semi-autonomous intellectual conveniences – consisting of problems, theories, and methods of investigation"
  - **Quasi-stable**: continually changing & evolving
  - **Partially integrated**: internally fragmented and specialized
  - **Semi-autonomous**: boundary cannot be clearly defined.

Characteristics of Disciplines (2)

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- Parker(2002): a discipline is "a complex structure: to be engaged in a discipline is to shape, and be shaped by, the subject, to be part of a scholarly community, to engage with fellow students – to become 'disciplined'"
- Subject vs discipline: former is skill and knowledge based, while the latter is modelled more on the lines of wisdom, which provides the value and rationale for the acquisition of the former

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Scientific Disciplines

- Boisot(1972) argues that a discipline is a structure with three elements:
  - observable and/or formalized objects, both manipulated by means of methods and procedures
  - phenomena that are the materialization of the interaction between these objects
  - laws – whose terms and/or formulation depend on a set of axioms. These account for the phenomena and make it possible to predict how they operate.

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Distinguishing Characteristics

- Heckhausen(1972) lists seven criteria:
  - "material field" (set of objects of study)
  - "subject-matter" (point of view)
  - "level of theoretical integration"
  - "methods" it uses
  - "analytical tools"
  - "applications of a discipline in fields of practice"
  - "historical contingencies(歷史偶然性)"

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Change in Disciplines

- Disciplines change both in terms of space (geographical differences) and time (historic changes).
- Disciplines are not static wholes that exhibit constant character. They are variable in space and recombination in time.
- Disciplines still possess and retain characteristics that make them identifiable as disciplines.

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Debate on Disciplinarity

- There has be continuous debate for and against disciplinarity.
- From scientific viewpoint and from social viewpoint
- Disciplinarity successfully facilitates the acquisition and accumulation of knowledge.
- However, discipline-based education also limits the students to a single(or narrow) area of study and skills.

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Problems with Traditional Disciplines (1)

- Limiting in the quest for truth.
- Often seen the pursuit of "more of the same", creativity and innovation may occur less within disciplines.
- Disciplinary practitioners can very often be so socialised into their disciplines that they lose their reflexivity.
- Disciplinarity tends not to address problems in the real world.

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Problems with Traditional Disciplines (2)

- Disciplines tend to lose sight of the amount of knowledge not accessible to it by the very limitation of its boundaries.
- Disciplines without hybridisation are eventually likely to become "crowded", yielding less and less knowledge.
- Negative social and organizational aspects may hinder the goals of disciplinarity.

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What is Interdisciplinary (1)

- Klein and Newell (1998) offer the following widely-quoted definition: "*A process of answering a question, solving a problem, or addressing a topic that is too broad or complex to be dealt with adequately by a single discipline or profession… [It] draws on disciplinary perspectives and integrates their insights through construction of a more comprehensive perspective.*"

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What is Interdisciplinary (2)

- The National Academies definition: "*Interdisciplinary research (IDR) is a mode of research by teams or individuals that integrates information, data, techniques, tools, perspectives, concepts, and/or theories from two or more disciplines or bodies of specialized knowledge to advance fundamental understanding or to solve problems whose solutions are beyond the scope of a single discipline or area of research practice.*"

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Why Interdisciplinary (1)

- Creativity often requires interdisciplinary knowledge.
- Immigrants often make important contributions to their new field.
- Disciplinarians often commit errors which can be best detected by people familiar with two or more disciplines.
- Some worthwhile topics of research fall in the interstices between the traditional disciplines.
- Many intellectual, social and practical problems require interdisciplinary approaches.
- Interdisciplinary knowledge and research serve to remind us of the unity-of-knowledge ideal.

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Why Interdisciplinary (2)

- Interdisciplinarians enjoy greater flexibility in their research.
- Interdisciplinarians often treat themselves to the intellectual equivalent of travelling in new lands.
- Interdisciplinarians may help breach communication gaps in the modern academy, thereby helping to mobilise its enormous intellectual resources in the cause of greater social rationality and justice.
- By bridging fragmented disciplines, interdisciplinarians might play a role in defence of academic freedom.

Nissani (1997)

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Key Components of Interdisciplinary (1)

- Interdisciplinarians focus on particular problem or questions that are too complex to be answered satisfactorily by any one discipline. (problem-solving)
- Interdisciplinarians draw upon the insights of specialized research. Specialized research is performed by communities of scholars who share a set of guiding questions, concepts, theories, and methods.

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Key Components of Interdisciplinary (2)

- Interdisciplinarians evaluate the results of specialized research.
- Interdisciplinarians utilize multiple theories and methods.
- Interdisciplinarians appreciate that each discipline is characterized by an (evolving) 'disciplinary perspective' or way of looking at the world.
- Interdisciplinarians integrate the best elements of disciplinary insights in order to generate a more comprehensive appreciation of the issue at hand.

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Levels of Disciplinarity

- Intradisciplinary: working within a single discipline.
- Crossdisciplinary: viewing one discipline from the perspective of another.
- Multidisciplinary: people from different disciplines working together, each drawing on their disciplinary knowledge.
- Interdisciplinary: integrating knowledge and methods from different disciplines, using a real synthesis of approaches.
- Transdisciplinary: creating a unity of intellectual frameworks beyond the disciplinary perspectives.

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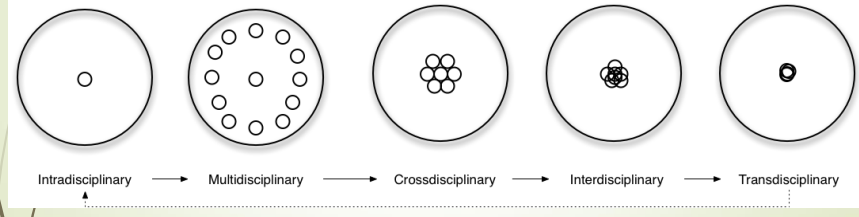
Levels of Disciplinarity

- An interesting sketch of different disciplinarities by Alexander R. Jensenius



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Classes of Interdisciplinarity

- OECD (1972) identified four classes:
  1. Multidisciplinary […] juxtaposition of various disciplines, sometimes with no apparent connection between them, e.g. music + mathematics + history.
  2. Pluridisciplinary […] juxtaposition of various disciplines, assumed to be more or less related, e.g. mathematics + physics, or French + Latin + Greek: "classical humanities" in France.
  3. Interdisciplinary […] an adjective describing the interaction among two or more different disciplines. This interaction may range from simple communication of ideas to the mutual integration of organising concepts, methodologies, procedures, epistemologies, terminologies, data leading to an organisation of research and education in a fairly large field
  4. Transdisciplinary […] establishing a common system of axioms for a set of disciplines.

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Types of Interdisciplinarity

- Heckhausen (1972) identifies six types:
  1. Indiscriminate interdisciplinarity: "encyclopaedic endeavours" that end up in "curriculum mix-ups".
  2. Pseudo-interdisciplinarity: disciplines sharing the same analytical tools such as mathematical models or computer models are claimed to be interdisciplinary.
  3. Auxiliary interdisciplinarity: method used by one discipline yields data that has an "index-value" for another discipline at its level of theoretical integration.

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Types of Interdisciplinarity

4. Composite interdisciplinarity: different disciplines are brought together to apply different techniques in an effort at problem solving.
5. Supplementary interdisciplinarity: disciplines in the same field develop a partial overlapping in certain subject matters.
6. Unifying interdisciplinarity: when there is a consistency between two disciplines in subject matter, levels of theoretical integration and methods.

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Another Classification

- Boisot (1972) provides another classification
  1. Linear interdisciplinarity: when crude phenomena from one discipline is legalised by laws in another discipline.
  2. Structural interdisciplinarity: when "interactions between two or more disciplines lead to the creation of a body of new laws".
  3. Restrictive interdisciplinarity: when there are no interactions among disciplines.

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Benefits of Interdisciplinary

- Students are highly motivated as they have a vested interest in pursuing topics that are interesting to them.
- Students cover topics in more depth because they are considering the many and varied perspectives.
- Critical thinking skills are used and developed as students look across disciplinary boundaries to consider other viewpoints and also begin to compare and contrast concepts across subject areas.
- Students begin to consolidate learning by synthesising ideas from many perspectives and consider an alternative way of acquiring knowledge.

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Benefits of Interdisciplinary

- Exploring topics across a range of subject boundaries motivates students to pursue new knowledge in different subject areas.
- Transferable skills of critical thinking, synthesis and research are developed and are applicable to future learning experiences.
- Interdisciplinary knowledge and application of different disciplines can lead to greater creativity.
- Worthwhile topics of research can fall in the 'spaces' between the traditional disciplines.