IDENTITIES

Enlightening
Interdisciplinarity
in STEM
for Teaching

# Interdisciplinarity at the service of society: Interpreting the evolution of COVID-19

Co-funded by the
Erasmus+ Programme
of the European Union

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**Submodule 2**

Role of **student experiencing interdisciplinarity**

Let **participants experience an adaptation of a teaching proposal** (in her own shoes) to make interdisciplinary emerge

**Submodule 3**

Role of **interdisciplinary analyst**

**Collective analyse the teaching experience** that comes to be experienced

Epistemological analysis of interdisciplinarity

Linguistic analysis of interdisciplinarity

**Submodule 4**

Role of **interdisciplinary designers and teacher**

Immersion in **Secondary school practices** related to the activities developed previously

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Make explicit with participants the **initial question(s) related to interdisciplinarity on the selected topic** and first look for answers

**Adaptation of the submodules' structure of the Study and Research Paths for Teacher Education** (Ruiz-Olarría, 2015; Barquero, Bosch & Romo, 2018)

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Science and interdisciplinarity

← → Society ← → Secondary school

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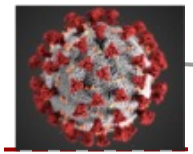
# Interdisciplinarity at the service of society
## Interpreting the evolution of COVID-19

**Q0.1:** How have the S-T-E-M disciplines interacted to investigate the evolution of COVID-19? What answers have been given and how have their advances spread to society?

**Q0.2:** What role does it play and how can we analyze interdisciplinarity when addressing complex issues related to the evolution of COVID-19?

**Q0.3:** How can this interdisciplinary practice transposed and diffused to secondary schools?

**Interdisciplinarity**
**at the service of society**
Interpreting the evolution of COVID-19



Virus

Society

Science and scientific disciplines

Enlightening Interdisciplinarity in STEM for Teaching

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**News 8** - Five ways to ensure that models serve society: a manifesto – (24/06/2020)

https://www.nature.com/articles/d41586-020-01812-9

## **Submodule 1.** Role of **interdisciplinary 'explorer'**

- **Individual reading and analysis** of the news

LET'S DISTRIBUTE THE NEWS!

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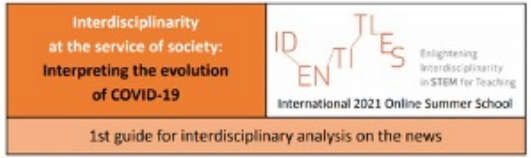
# Submodule 1. Role of interdisciplinary 'explorer'

- **Individual reading and analysis** of the news
- **Individual answers** to the **1st guide of interdisciplinary analysis** related to the news



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International 2021 Online Summer School

1st guide for interdisciplinary analysis on the news

Based on the news that has been assigned to you, you are now guided to reflect on the following aspects. To answer the questions, complete the table in Miro with all the relevant aspects.

1. Which are the main **questions** that the research/academic/educational community has been studying regarding the evolution of COVID 19?
2. Which **STEM disciplines** can you detect that have contributed to this discussion? How have these **disciplines** interacted?
3. Which are the **answers** provided on the topic by the research/academic/educational community that the piece of news highlights (in case there are)?
4. Which **tools** and **disciplinary knowledge** (concepts and/or methods) have contributed to give answers/solve/address these questions?
5. Which **specific terminology** do you recognize in the text? Which terminology was already known by the non-expert public? Which terminology is new?

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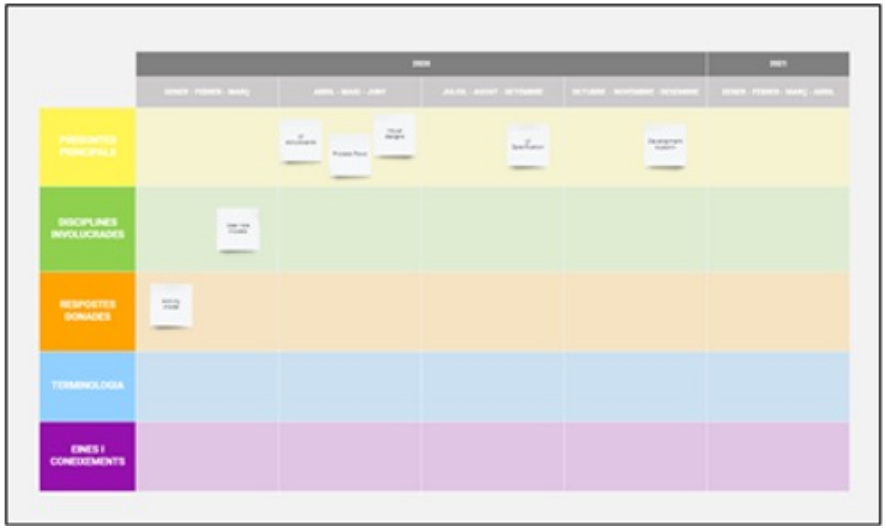
- Based on the news you are responsible of and on the different aspects asked in the guide for the analysis, **complete the table in MIRO** with all the relevant aspects



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## **Submodule 1.** Role of **interdisciplinary 'explorer'**

- **Big group sharing**:
  - Participants report the results of their analysis on the news - vertical analysis of the MIRO board.
  - If you see any relation between your analysis and the analysis presented of any of the news, please share these thoughts with the rest of participants.

**Group discussion** about the **evolution of the news throughout time** - horizontal analysis of the MIRO board

- Evolution on the questions addressed
- Evolution on the S-T-E-M disciplines intervening
- Evolution on the answers provided
- Evolution on the tools and disciplinary knowledge
- Evolution on the specific terminology

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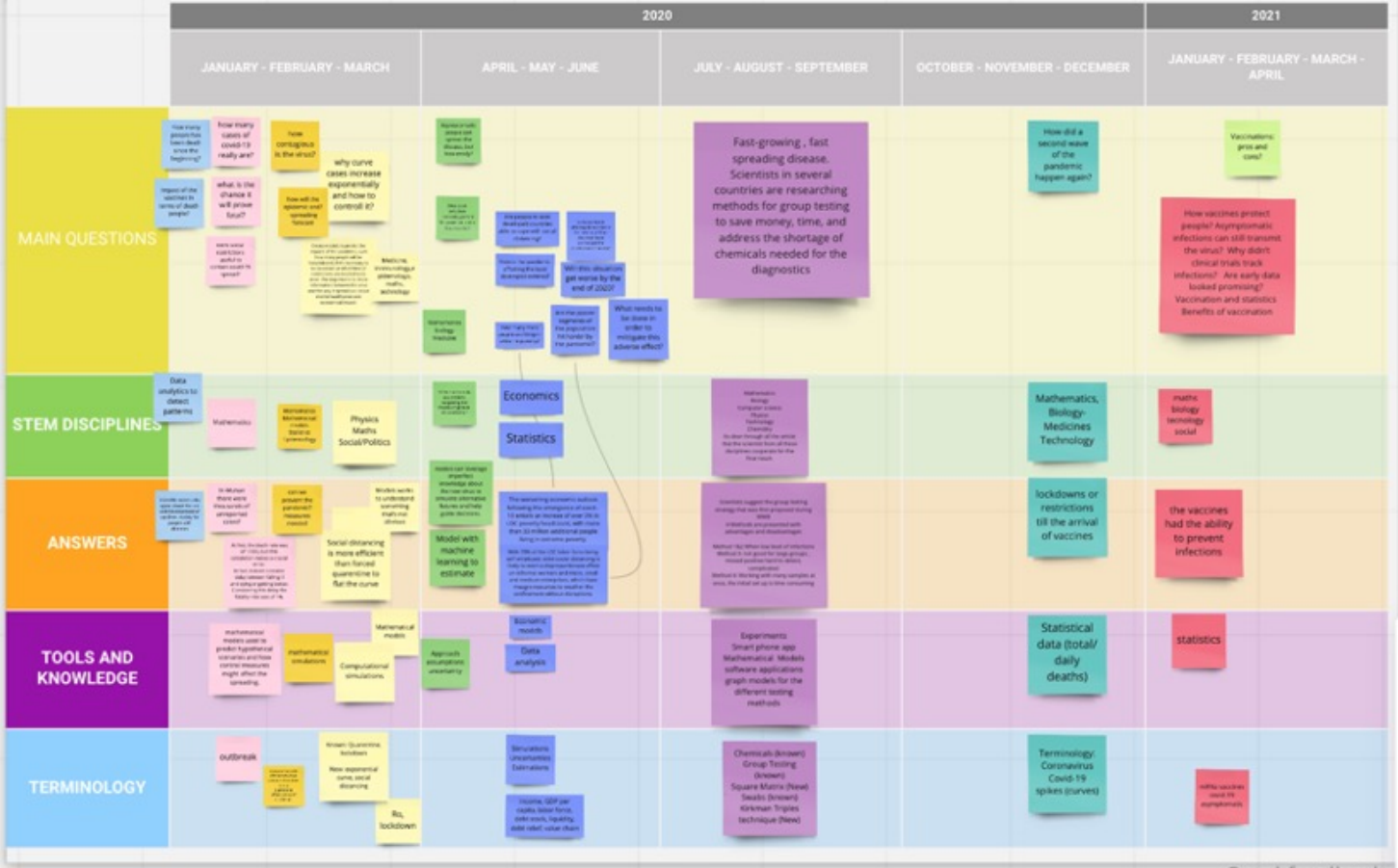
# Analysing the news



- **About the evolution on the questions addressed**

  First comment: more questions opened than answers disseminated

  - News 1: How many people has been **death since the beginning**? How many….?
  - News 2: How many cases of covid-19 **really** are? how many cases are not counted?
  - News 3: How **contagious** is the virus? Is the virus similar to any virus already known?
  - News 4: Why curve cases **increase exponentially** and how to control it?
  - News 5: How to create **models to predict the impacts** of the pandemic, such how many people will be hospitalized?
  - News 6: **Asymptomatic people** can spread the disease, but how easily? Does **post-infection immunity** persist for years, or just a few months?
  - News 7: Is the pandemic **affecting al countries** in the same way? How is the pandemic affecting the least developed countries? Are the poorer segments of the population hit harder by the pandemic?
  - News 8: Fast-growing , fast spreading disease. What scientists are progressing in **researching methods for group testing** to save money, time, and address the shortage of chemicals?
  - News 9: How did a **second wave** of the pandemic happen again? Can we **predict it**? How? Do all **countries follow the same "evolution"**?
  - News 10: How vaccines protect people? Asymptomatic infections can still transmit the virus? Are early data looked promising? **Benefits of vaccination**.

## "HOW MANY" questions

Issues of **quantity**

about numbers of the epidemics: number of cases, deaths, countries, vaccinations...

## "WHAT/HOW" questions

Issues of **description**

about the nature of the disease: infectivity, what happens to asymptomatics, what protection do vaccine provide

## ...

## "WHY" questions

Issues of **explanation**

exponential increase of the curve, modelling the epidemic, second wave

## "WHAT TO DO" questions

Issues of **decision-making**

testing, creation of models for prediction, vaccination strategies

- **About the evolution and dialogue among the disciplines intervening**

  - New 1: Data analytics to detect patterns
  - New 2: Mathematics
  - New 3: Mathematics. Mathematical models and modelling. Statistics. Epidemiology
  - New 4: Physics. Maths. Social/Politics
  - New 5: Medicine, immunology, epidemiology, maths, technology
  - New 6: Mathematics, Biology, Medicine
  - New 7: Economics, Statistics.
  - New 8: Mathematics, Biology, Computer science, Physics, Technology, Chemistry. What it is clear through all the article that the scientist from all these disciplines cooperate for the final result.
  - New 9: Mathematics, Biology-Medicines, Technology
  - New 10: Maths, Biology, Technology, Social knowledge

- The bis absent: **computer science**
  - In the module we will explore the different ways in which **computation** in its different forms can constitute strategies of modelling and inquiry on the topic

- How to we **define** a **discipline?**
  - Are there univocal definitions?
  - Do the boundaries between disciplines pre-exist?
  - Do they evolve?
  - Do our background influence how we define the disciplines?

- **About the evolution on the disciplinary tools and knowledge**

  - Mathematical models
  - Use of mathematical models to predict hypothetical scenarios and to know how control measures might affect the spreading
  - Mathematical simulations / Computational simulations
  - Approach / Explicit and Implicit assumption / Uncertainty
  - Economic models / Mathematical models / Other models / Validation / Contrasting
  - Experiments / Mathematical Models / Software applications / Graph models for the different testing methods
  - Statistical data (total/ daily deaths)

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**model as a key-word**

- **About the evolution on the specific terminology**
    - Counting infected / recovered /people
    - Outbreak
    - Reproduction rate (for coronavirus compared to other virus) / Quarantine / Effectiveness of restrictions
    - Known: Quarantine, lockdown / New: exponential curve, social distancing
    - Ro, lockdown
    - Simulations / Uncertainties / Estimations
    - Income, GDP per capita, labor force, debt stock, liquidity, debt relief, value chain
    - Chemicals (known) / Group Testing (known) / Swabs (known)
    - Square Matrix (New)
    - Kirkman Triples technique (New)