

Submodule 2. Role of student experiencing interdisciplinarity

Presentation of the three lines of ID inquiry

Work in group on the three lines of ID inquiry (3 groups of 4 students each) following the three guides of the activity [2h]

Preparation of the group sharing [30 min]

Interdisciplinarity at the service of society: SUBMODULE 2: Role of students who experience interdisciplinarity

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Interdisciplinarity at the service of society: Interpreting the evolution of COVID-19
1st interdisciplinary line of inquiry
Analyse data to understand the evolution and formulate hypotheses.

INTRODUCTION

The emergence of the COVID-19 pandemic has put the scientific community in the spotlight of society as a whole. Their studies have been one of the main tools for establishing measures to address the situation and have had a direct impact on daily life. Good examples are statistical analyses to extract relevant information from data, the development of mathematical models to make predictions, and computational simulations to understand virus diffusion.

In this second submodule we will focus on the first topic: **data analysis to extract relevant information from data**. The idea of this submodule is to make some questions about COVID-19 you would like to answer. Then you will have the opportunity to analyse data and some analysis done by experts about the pandemic in order to answer the initial questions (if possible).

The generative question of the module that will guide your investigation as students in this interdisciplinary line is the following:

What can data reveal about COVID-19's evolution?

PART 1: Presentation of the interdisciplinary line of research

To start, we suggest you consult the [COVID-19 Dashboard of John Hopkins University](#) that contains data and graphics about the pandemic worldwide, please visit the information that

1st interdisciplinarity line of inquiry

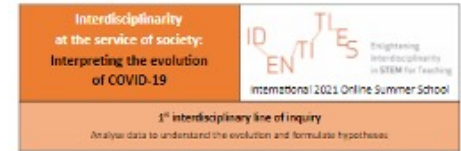
Analyse data to understand the evolution and formulate hypotheses

Main question to address

What can data reveal about the evolution of COVID-19?

Available media and resources

- Worksheet explaining the 1st interdisciplinary line of inquiry
- Databases:
 - CONVENIENT_global_confirmed_cases.xlsx
 - CONVENIENT_global_deaths.xlsx
 - Kaggle with visualization analysis done by experts
- Presentation development template to expose your work



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To start, we suggest you consult the [COVID-19 Dashboard of John Hopkins University](#) that contains data and graphics about the pandemic worldwide, seeing what information they embed and their potential. Once you have made your first contact with the data and have seen what they offer, we suggest you compile a list of questions that you would like to answer with these data. We report here three as an example:

What was the evolution of COVID-19 in Asia in 2020?

What differences can be found between different countries?

Which has been the effect of the vaccination process?

PART 2: Research development

Now, discuss in group and decide which is most interesting questions you have found and use the data to try to answer it. You have two main options:

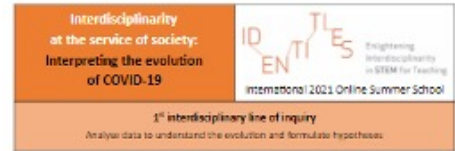
1st interdisciplinarity line of inquiry

Analyse data to understand the evolution and formulate hypotheses

What and how to expose your work and answers?

To share your work, we ask you to prepare **three slides** to show the rest of the groups the work you have done, each slide needs to focus on one of the following aspects:

1. What were the **main questions** you investigated about?
2. **Which data** have you used? What research have you done? How have you used the **data to provide answers** to the aforementioned questions?
3. What **answers** have you obtained?



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Now, discuss in group and decide which is most interesting questions you have found and use the data to try to answer it. You have two main options:

2nd interdisciplinarity line of inquiry

The role of mathematical models in studying the evolution of the pandemic

Main question to address

What is the role of models and modelling in investigating the evolution of COVID-19?

Available media and resources

- Worksheet explaining the 2nd interdisciplinarity line of inquiry
- Databases:
 - First_Wave_Data.xlsx (February_March_April; Early_May)
- Two videos to learn the basics of Excel and GeoGebra works
- Presentation template to expose your work



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In this second sub-module we will focus on the second topic: **modeling to make predictions**. Based on the evolution of the number of COVID-19 infections accumulated in Spain during the first wave, we propose that you model these data with the goal to make predictions for the days following the first wave.

The generative question of the module that will guide your investigation as students in this interdisciplinarity line is the following:

What is the role of models and modelling in investigating the evolution of COVID-19?

PART 1: Formulation of the interdisciplinarity line of research

To get started, we suggest you answer these questions in order to define a little bit the task proposed:

What does it mean to model some data?

What is a model? What is a "good" model? What would be a "good" model for understanding the evolution of COVID-19?

What can be the goal of modeling some data? What is, what do we intend to study when modeling the actual data on the evolution of COVID-19?

PART 2: Research development

Once you have discussed the questions, we ask you to propose, in groups, a "good" model to understand the evolution of COVID-19. Specifically, we propose that you **model the cumulative number of infected people during the first wave to make predictions** for the following five days.

2nd interdisciplinarity line of inquiry

The role of mathematical models in studying the evolution of the pandemic

What and how to expose your work and answers?

To share your work, we ask you to prepare three slides to show the rest of the groups the work you have done, each slide focusing on one of the following three aspects:

1. What were the **main questions** you investigated about?
2. **Which model** have you chosen? What are its characteristics? Why do you think this is a "good" model?
3. **What forecasts** does this model offer for the first days of March?



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The generative question of the module that will guide your investigation as students in this interdisciplinarity line is the following:

What is the role of models and modeling in investigating the evolution of COVID-19?

PART 1: Presentation of the interdisciplinarity line of research

To get started, we suggest you answer these questions in order to define a little bit the task proposed:

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What can be the prob. of modeling some data? What is, what do we intend to study when modeling the actual data on the evolution of COVID-19?

PART 2: Research development

Once you have discussed the questions, we ask you to propose, in groups, a "good" model to understand the evolution of COVID-19. Specifically, we propose that you **model the cumulative number of infected people during the first wave to make predictions for the following two days**.

3rd interdisciplinarity line of inquiry

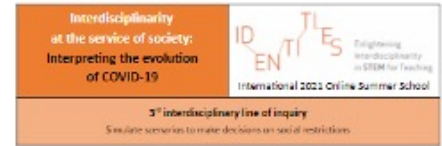
Simulate scenarios to make decisions on social restrictions

Main question to address

How can computational simulations support decision-making processes about future actions in the context of the pandemic (from political, economic, medical, etc. perspectives)? What is their validity and function?

Available media and resources

- Worksheet explaining the 3rd interdisciplinarity line of inquiry
- **Explanatory video** that introduces the basic features of agent-based modelling and of the **NetLogo** program.
- Link to download NetLogo.
- Presentation template to expose your work.



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In the second section we are going to address the third topic: the use of computational simulations to model COVID spreading, to elaborate and compare scenarios of restrictions and, on that basis, to support decision-making processes. In this sub-module you will be guided to understand the basic aspects of agent-based modelling and simulations, then to explore some NetLogo simulations that have been designed by scientists during the pandemic. The goal will be to elaborate a novel and functioning agent-based simulation (which will require an extensive training) but rather to develop competences to analyse existing materials, compare them and experiment on them.

The generative question of the module that will guide your investigation as students in this interdisciplinarity line is the following:

How can computational simulations support decision-making processes about future actions in the context of the pandemic (from political, economic, medical, etc. perspectives)? What is their validity and function?

PART 1: Presentation of the interdisciplinarity line of inquiry

To get started, we suggest you watch an explanatory video that introduces the basic features of agent-based modelling and of the NetLogo program. Please, also download NetLogo by your device.

Link to the introductory video: <https://youtu.be/0d5WU1KAZM>

Link to download NetLogo: <https://csl.northwestern.edu/netlogo/download.shtml>

After watching the video, we ask you to discuss and answer the following questions in groups:

How can we model the spread of a virus in a population using an agent-based approach? What kind of agent would you suggest? What features would these agents have? How would they behave?

3rd interdisciplinarity line of inquiry

Simulate scenarios to make decisions on social restrictions

What and how to expose your work and answers?

For the group discussion, we ask that you prepare four slides to show the rest of the groups the work you have done, explaining on each slide the answer you have given to each of the questions.

1. What were the **main questions** you investigated about?
2. What are the **main elements** of each simulation you have analysed? **What interaction models** do they incorporate? **What experiments** have they allowed you to do?
3. What **results** do we get from the simulations? Are the results consistent changing the simulations?
4. If you were **decision-makers**, would you use these **tools** as a basis for policy making? If so, how?



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The generative question of the module that will guide your investigation as students in this interdisciplinarity line is the following:

How can computational simulations support decision making processes about future actions in the context of the pandemic (from political, economic, medical, etc. perspectives)? What is their validity and function?

PART 1: Presentation of the interdisciplinarity line of inquiry

To get started, we suggest you watch an exploratory video that introduces the basic features of agent-based modeling and of the NetLogo program. Please, also download NetLogo in your device.

Link to the introductory video: <https://youtu.be/1e0WU0RAGM>

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Enlightening
Interdisciplinarity
in STEM for Teaching



Module on the evolution of the COVID

SESSION 2: Experiencing interdisciplinarity as students

Submodule 2. Role of student experiencing interdisciplinarity

SLOT 3: Presentation from the Teams A, B and C + Reaction from other teams

- Each working team A, B and C [for 7-10 minutes] presents the summary on their advances:
- During the presentation of each group, the others will be attentive to pose questions IN THE CHAT related to points in common with their lines.