

# TRANSCIÈNCIES

## Participatory design of educational resources for transdisciplinary science

Luce Prignano, Emanuele Cozzo

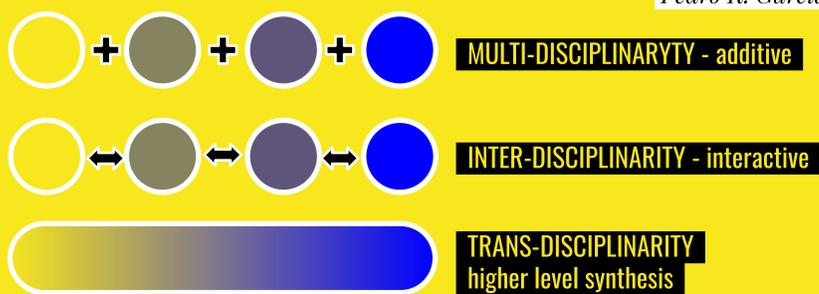
Universitat de Barcelona Institute of Complex Systems (UBICS) Universitat de Barcelona

Departament de Física de la Matèria Condensada, Universitat de Barcelona

Asociación Heurística

*"We are entering an era of **transcience**" in which disciplines are becoming blurred while some training in areas dominated by mathematics, computing and the principles of logic is required. [...] The great complex and global current challenges, in a world that is close to seven and half billions souls, require strategies that integrate the knowledge of engineering, physical, life, economic, social sciences"*

Pedro R. García Barreno



*Transciències* is a project of **Heurística** and represents a proposal to complement and update from a transdisciplinary perspective the teaching of natural and computer sciences in the final stages of secondary education and in high school (15 - 18 years).

A **team** composed of teachers, researchers, other experts and, later on, students will produce, through a **participatory design process**, **teaching materials** suitable to be used by teachers, both autonomously and in collaboration with the experts from **Heurística**.

This project will contribute to reveal to teenage students the reality of current scientific research beyond disciplinary barriers. By means of specific examples, it will be shown how nowadays a degree in mathematics, computer science or physics enable to help addressing any of the **grand societal challenges**.

### GOALS

- Help promote a **cultural change** and contribute to training the society of the future so that it can effectively face the challenges that lie ahead.
- Transcend disciplinary limits to **stimulate curiosity, counteract dogmatism**, encourage new generations to approach science from **critical thinking** and with a global perspective.
- We also intend to promote **scientific and technological vocations**, especially **among girls**, presenting the scientific work in a realistic way, as teamwork based on collaboration between diverse people whose skills are complementary, in connection with other sectors of society.

### WHAT'S WRONG WITH DISCIPLINES?

The issue with disciplinary segregation in education and, even more, with focusing "on a separate logic between science and humanities until they become a menu of options that are mutually exclusive" is twofold: On the one hand, it projects a **false image of knowledge** fostering conflicts between students' interests and skills; On the other hand, this approach does not enable people to solve **complex problems**" (David Bueno, 2019).

"When the problems are complicated, it is necessary to deepen the disciplinary investigation. But when they are complex, as is the case in our world, the interaction between the approaches and languages of different disciplines is necessary to be able to solve them".

The philosopher Marina Garcés suggested that "education must be transformed at the base". Meanwhile, we consider that the urgency of the matter makes it essential to experiment in the classroom with innovative proposals of a more limited scope. *Transciències* can be seen as a first step in this direction.

The paradigm of **COMPLEXITY SCIENCES** - post-disciplinary by definition - is the common theoretical umbrella that unites all the contents that will be presented. A first introductory module will cover its origin, meaning and implications. The conceptual tools provided by this paradigm will be explained and a brief review of the main problems to which

the complexity paradigm has been applied so far will be made. Next, some of these problems will be delved into, choosing among those that may arouse greater interest among students due to their connection with their daily lives or concerns, such as:

- Opinion dynamics, emergence of consensus, misinformation and political polarization;
  - Spread of epidemics, vaccinations, and herd immunity;
  - Dynamics of climate systems and/or ecosystems;
- among other possibilities.

**Heurística** is an autonomous space for research, training and techno-scientific mediation whose members are researchers, trainers, teachers, and journalist.

### WHAT IS PARTICIPATORY DESIGN?

Participatory design is an approach to design products. It is called Participatory Design because it **involves the active participation** of several people (namely researchers, end-users, designers, partners, citizens, employees, and overall **stakeholders**) in the design process of a product.

### TEACHING MATERIAL

Types and format of teaching material that could be designed include:

- Visual thinking videos ⇒
- Explorable Explanations
- Slideshows and manuals
- Teaching unit guides
- Websites



Visual thinking video of the Shelling model by Irene Ferri and Sara Teller. UBICS 2019. Source: <http://ubics.ub.edu/complexifica/complexificables/shelling/index.html> or QR code

### COLLABORATING ORGANIZATIONS

**Ars Games** (<https://arsgames.net>). A cultural association based in Barcelona that develops cultural projects at the crossroads between art, science, technology and pedagogy with video games.

**UBICS - University of Barcelona Institute of Complex Systems** (<http://ubics.ub.edu/>). UBICS focuses its mission on stimulating a greater capacity for dialogue between disciplines; promote synergies between researchers from different fields; increase the social visibility of research on complex systems.

**Espai Llavors** ([espaillavors.cat](http://espaillavors.cat)). Cooperative bookstore, meeting and exchange point, space for community reflection and awareness through books and social and cultural activities.

**Canòdrom - Ateneu d'Innovació Digital i Democràtica** is an open and participatory laboratory (<https://canodrom.barcelona/>). Its challenge is to link digital culture with democratic innovation as well as with the territory, being a meeting point for organized communities, social projects, research centers and citizens.



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