IDENTITIES

Enlightening
Interdisciplinarity
in **STEM**
for Teaching

Introduction to IDENTITIES project

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

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Integrate Disciplines to Elaborate Novel Teaching approaches to InTerdisciplinarity and Innovate pre-service teacher Education for STEM challenges (IDENTITIES)

September 2019 - December 2022

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ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA

UNIVERSITAT DE
BARCELONA

ΠΑΝΕΠΙΣΤΗΜΙΟ ΚΡΗΤΗΣ
UNIVERSITY OF CRETE

UNIVERSITÀ
DI PARMA

www.identitiesproject.eu

Goals: concrete INTELLECTUAL OUTPUTS

- Teaching modules on emergent interdisciplinarity in advanced STEM topics (coronavirus evolution, nanotechnologies, climate change, quantum technologies, artificial intelligence…) (O2 modules)
- Teaching modules on curricular interdisciplinary topics (cryptography, parabola and parabolic motion) (O3 modules)
- Guidelines to design and implement modules on curricular interdisciplinarity and STEM emerging interdisciplinarity in pre-service teacher education
- Open Education Resources for Blended modules and MOOCs
- Recommendations for policy makers to promote interdisciplinarity and innovate prospective teachers education for STEM challenges”

Society of acceleration (H. Rosa)

The world is accelerated by an impressive scientific-technological development

- Inter-multi-trans-disciplinary “emergent knowledge fields” (climatology, AI, data science & computation; digital humanities, …)

- New *modus operandi* of science and science communication (multi-actor, inter-multi-trans-disciplinary and *open science*)

Challenges to the current forms of knowledge organization

- forms of knowledge organization (objectified/reified knowledge in textbooks)
- forms of institutional organization (the organization of the schools in "subject matters", the universities in "departments", the research in Areas and ERC sectors)
- forms of social organization (ex. Liberal arts vs. and Vocational/Technical/ Trade schools)
- cultural community of practices and identity element («I am a physicist», Laura is a mathematician», Michael is a “computer scientist”)

Culture as “the constellations of practices historically developed and dynamically shaped by communities in order to accomplish the purposes they value. Such practices are constituted by the tools they use, the social networks with which they are connected, the ways they organize joint activity, the **discourse** they use and **value** (i.e. specific ways of conceptualizing, representing, evaluating and engaging with the world)” (Nasir et al., 2006).

LEADING QUESTIONS

- How can school and university education prepare students to deal with the societal challenges and “stay in conscious and competent way in inter-multi-trans-disciplinary contexts”?
- What do we mean by interdisciplinarity? And by multi- and trans-disciplinarity?
- What about disciplines? Are we sure we don’t need them?

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“IDENTITY” ASSUMPTION:
WE NEED DISCIPLINES BUT WE NEED TO REFINE THEIR ROLE AND IDENTITY

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Challenges to the current forms of knowledge organization
“Future shock: too much change in a too short period of time”
(Toffler & Toffler, 1970)

Future shock and time perception

In this post-modern age of **social acceleration** (Rosa, 2013) and **uncertainty** (Morin, 2001):

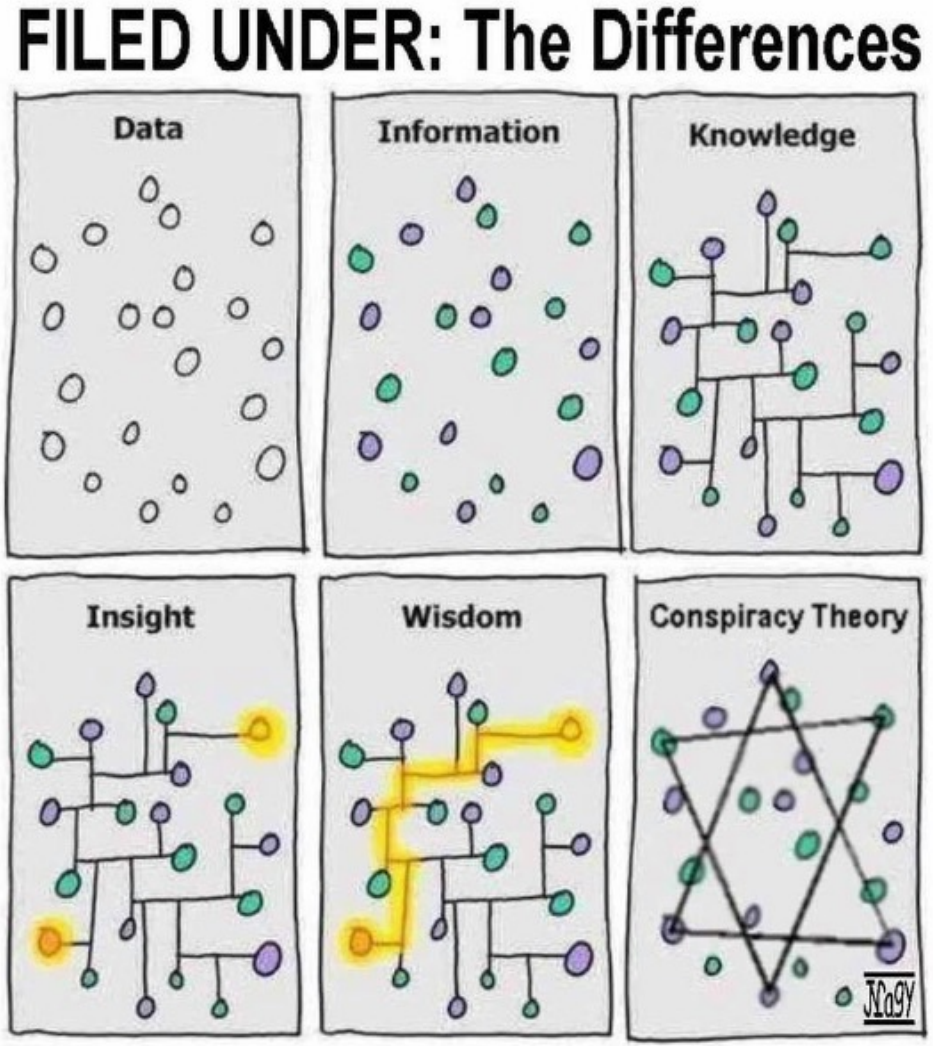
- the ***future*** is no longer perceived as a promise, but it is either ***invisible*** or as a ***threat*** (Benasayag & Schmit, 2003)
- the ***present*** becomes “dust of moving splinters” (Leccardi, 2009) "Ashes blowing in the air", in *Nowhere fast* (Eminem, 2017)
- the ***past*** appears unable to provide lenses to interpret (to re-present) the present.

The “catastrophes of immediacy”

(Merlini, Tagliagambe, 2016)

“Where is the wisdom we have lost in knowledge?
Where is the knowledge we have lost in information?”

— **T.S. Eliot,** The Rock



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Forms of knowledge organization are needed: Which ones?

"The term "**discipline**" contains the Latin root "discere", whose meaning is to learn. Disciplines are re-organizations of the knowledge with the scope of teaching it. In particular, disciplines ground their roots into the didactical necessity to re-organize knowledge in such a way that students, whilst building their knowledge, can also develop epistemic skills, like problem solving, modelling, representing, arguing, explaining, testing, sharing... Disciplines have been built to help student to make gradually sense of different categories of problems, approaches, tools and criteria to evaluate the correctness and efficiency of a procedure, a reasoning, an argument. From this perspective, disciplines can still play a relevant educational role, provided that they are explicitly pointed out as forms of knowledge organization historically developed and grounded on specific epistemologies" (Branchetti, Fantini, Levrini, 2019).

Make things easy but not too easy: Trivialization as the “new Medusa”

Medusa, by Caravaggio (1595)

“More then the complexity of the original concepts of science, it is, on the contrary, their trivialization […] that, as soon as the concepts reach non-specialized public, exerts a real spell that petrifies them.” (Levy-Leblond, *La vitesse de l’ombre*, 2006)

Two crucial forms of *tension between*

SCHOOL SCIENCE AND DISCIPLINARY KNOWLEDGE:

How can we, at the same time, simplify scientific knowledge into school science so as to make it at the reach of students and complexify it enough to develop the epistemic skills needed to structure knowledge into disciplines and to interpret the complexity of the world?

DISCIPLINARY IDENTITIES AND INTERDISCIPLINARITY

How can we, at the same time, exploit the identities of the disciplines and transgress the borders?

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