



ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA



“Time is out of joint”: re-imagining time rituals in science teaching/learning

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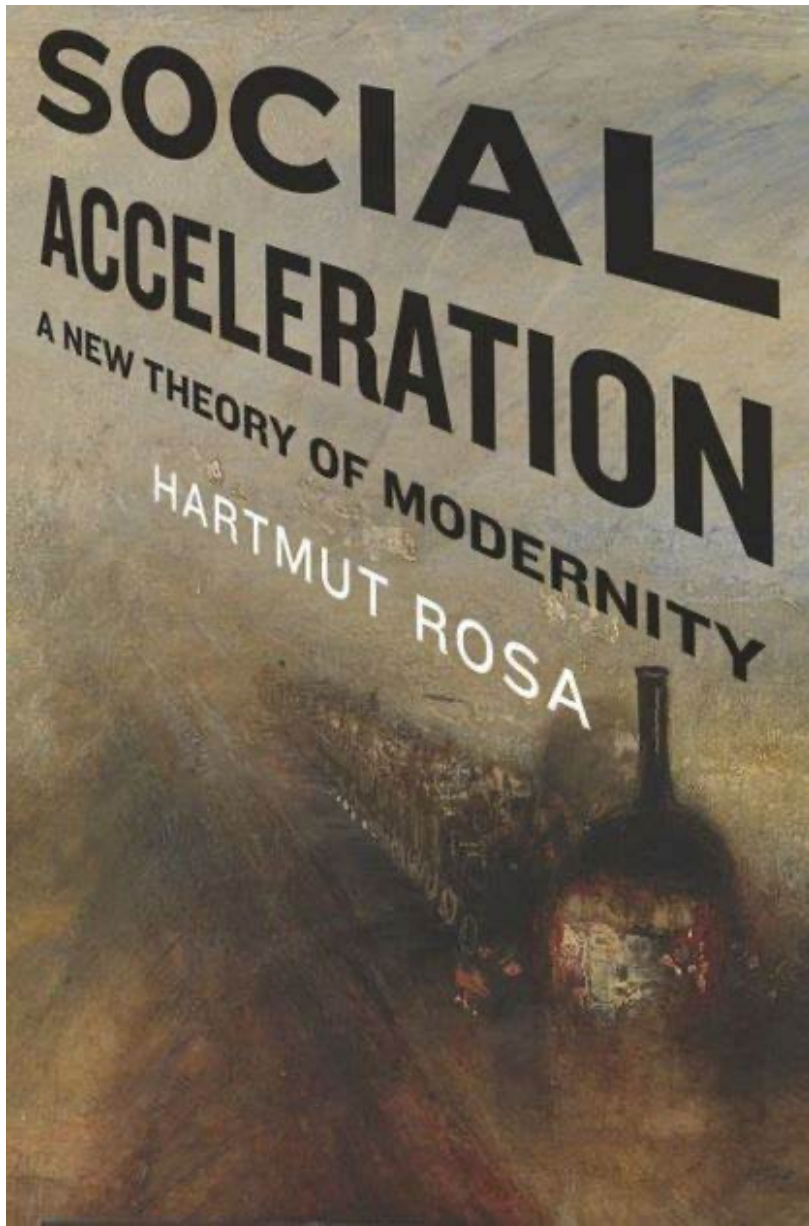
«The time is out of joint» (Hamlet)

When dramatic events happen, the deep change acts immediately at the level of our perception of time.

Time as a sociological construct

Social actions and interactions, cultures, institutional and power dynamics (also in schools and science education classes) can be analyzed for their temporal structures, like rituals, images of the futures and relations with the past.





The “society of acceleration” (H. Rosa, 2013)

“Future shock”:

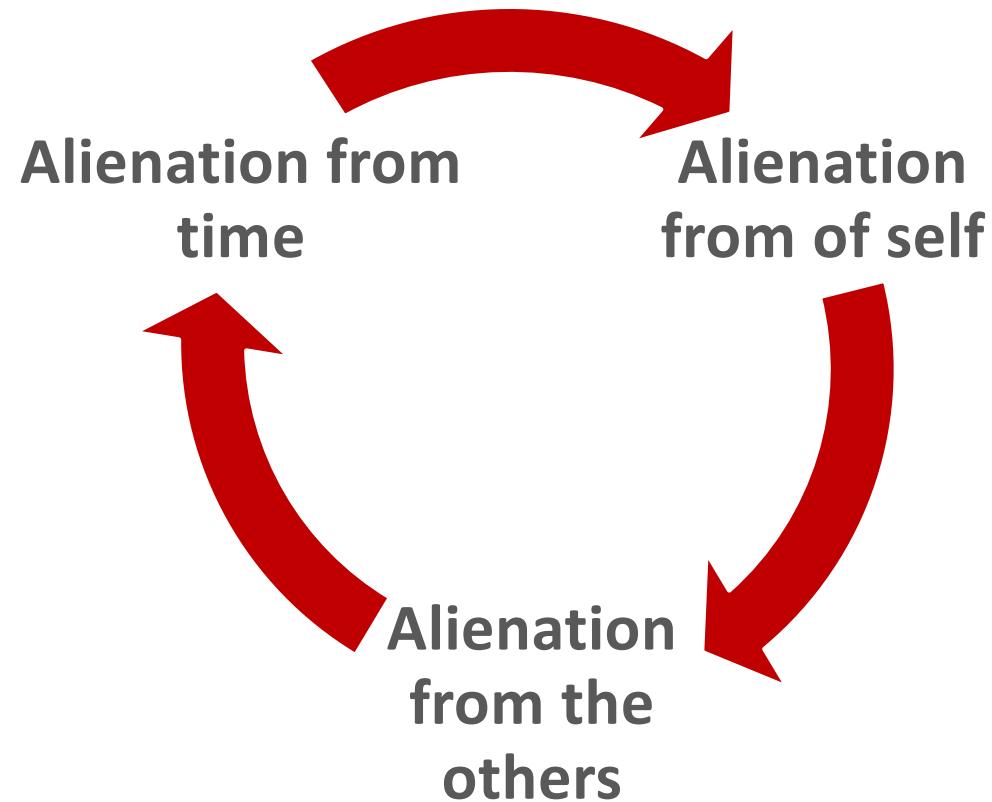
«too much change in too short a period
of time» (Toffler & Toffler, 1970)

Frenetic standstill and sense of directionless

*«The dynamism of classical modernity, characterised by **a strong sense of direction** (perceived as **progress**), is replaced by **a sense of directionless**, frantic motion that is in fact a form of **inertia**.»*

(Rosa 2009; p.101)

that state in which people pursue objectives and follow practices that no external agent or factor oblige them to do but they do not feel like doing or want to do (Rosa, 2010).




Our identity and sense of self and the others derive from our actions, experiences and from how we situate them in the social and material world and in their space-time fabric.

Time rituals during lockdown (March 2020): the PRESENT SHOCK

Global time was accelerated by a natural phenomenon (the virus evolution), and we had become witnesses of the dynamics of social institutions (policy, health systems, educational systems, economics) trying to run as quickly as possible to slow down the speed of the epidemic.

Our **individual time** was suspended in a bubble of present that had to be redefined in its inner rituals.



Disclosure of time structures and paces (of nature, research, politics, society, individual) that were invisible before the pandemic or diminished as trivial rituals.

The bubble and polarization effect in the pandemic era (Levrini et al. 2021)

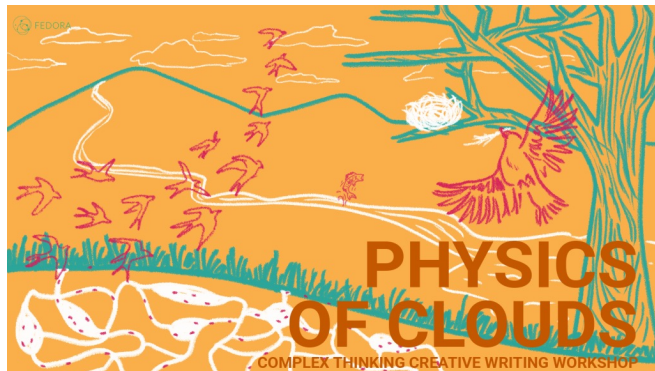


“Time appropriation” of teen-agers in the present shock time occurred by re-arranging daily-life rituals to search for a **sense of agency** or **sense of directionality**

Deep detachment in the personal and the social dimension

Mathematics and Physics as sources of certainty

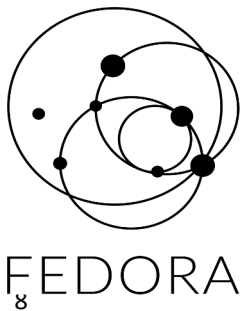
Follow-up studies in the post-pandemic period



Physics of
clouds



Kairos



High school level (10-11 grades)



«e-Fractures study group»

Bachelor Degree in Physics



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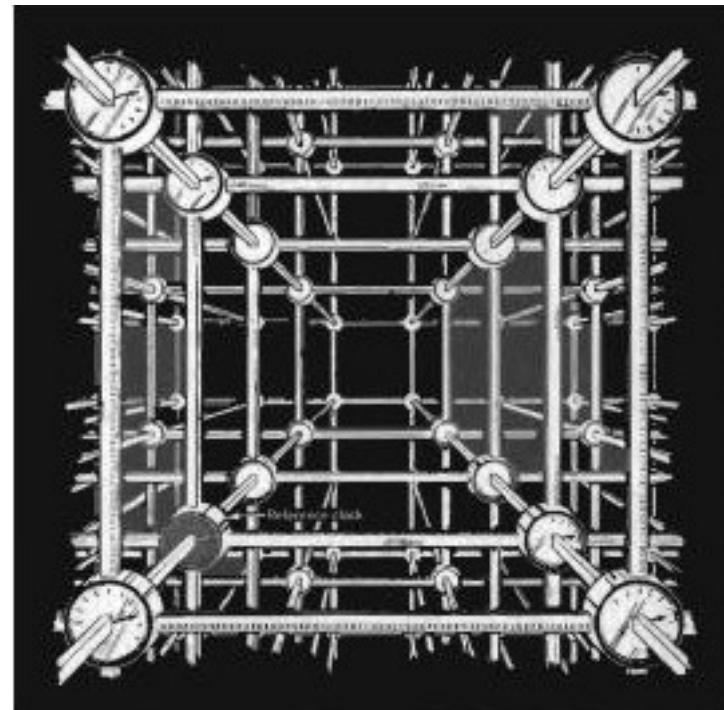
Focus: «Quality of time rituals»

Lens: «external vs. internal time» (from I. Prigogine*)

External time: (*Chronological-Newtonian*) time

1. It describes events and processes in the physical world by organizing them a conventional structure
2. The clock-time, quantified by measuring it using clocks and calendars
3. It marks a linear and continuous progression

(Ilari, V. (2023). Master thesis, in progress, with Fantini, P., Moresco, S., De Zuani, F.)



From Taylor & Wheeler, Spacetime physics



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Internal (experienced) time (*Kairological*-dynamical systems) time

- It describes the temporal behavior of complex systems that are not in equilibrium
- These systems exhibit patterns and behaviors that are not simply predictable based on their initial conditions.
- It captures the notion that these systems exhibit their own inherent temporal order that emerges as a result of their internal dynamics
- It can be translated as the time of the experience, triggered by a contingency or a form of disequilibrium, that keeps together past, present and future
- A source that, potentially, can generate change, transformation and the establishment of new forms of equilibrium

Preliminary results:

Struggling with external time:

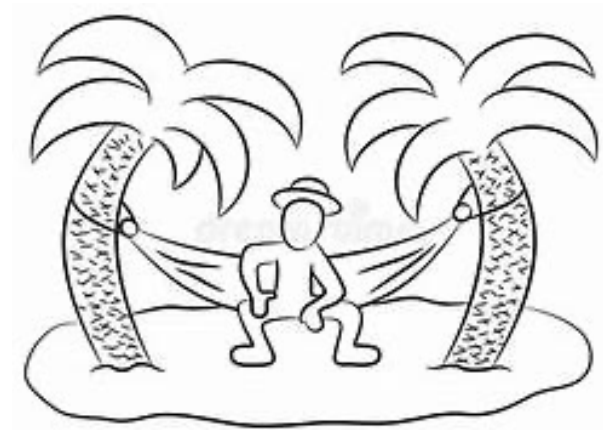
- The search for *optimizing* “time planning”;
- The need to *modulate* it more and more efficiently (decomposing it into modules) (e.g. splitting time into free time, working time, family time, social time..);
- *Quiet-quitting*;
- Increased sense of *directionless*



Preliminary results:

Struggling with internal time:

The search for (or dreaming) deep personal experiences to dive into *isolated and time-space ideally disconnected places...*



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Preliminary results:

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Struggling with internal time:

Search for (or dreaming) deep personal experiences to dive into in *isolated and time-space ideally disconnected places...*



Difficulties to cultivate «moments of being» (V. Woolf), «epiphanies» (J. Joyce), «Erfahrungen» (W. Benjamin)



**Alienation from
time**

**Alienation
from of self**

*Difficulties to cultivate
«moments of being» (V.
Woolf), «epiphanies» (J.
Joyce), «Erfahrungen»
(W. Benjamin)*

*Burning out,
fragmented identity,
decline in motivation*

**Alienation
from the
others**

«Otherness as resource depletion» (Social real experiences as mentally and emotionally taxing due to the cognitive and emotional load involved)



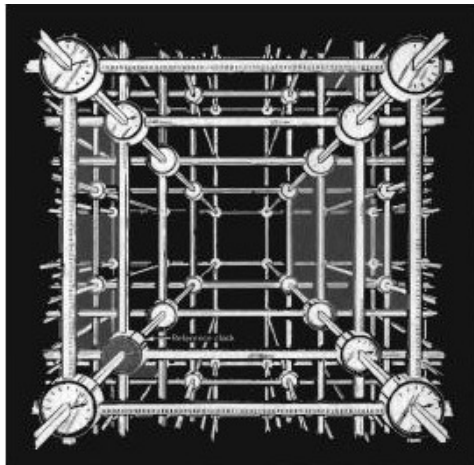
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Lesson learned 1: The CLASH *between*



*the classical, rigid, modular, linear,
measured, quantified time of (ALSO) our
educational institutions*

*(built according to a classical sense modernity, based
on a strong sense of progress and "ontological
security" (A. Giddens))*

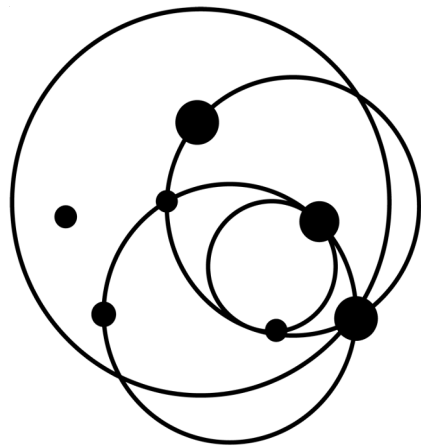


*the "liquid" (Z. Bauman), accelerated
(H. Rosa), uncertainty (E. Morin), risk-
based (U. Beck) fast-changing society*



Lesson learned 2:

**The need to regenerate science teaching in its contents,
spacetime rituals, ontological and epistemological priorities,
socio-institutional structures**



FEDORA

FEDORA - Future-oriented Science EDucation to enhance Responsibility and engagement in the society of Acceleration and uncertainty. This project received funding from the European Union's Horizon 2020 Research and Innovation program under Grant Agreement n° 872841 www.fedora-project.eu



EMPIRICAL STUDIES on students' perception of time

Levrini, O., Tasquier, G., Branchetti, L. & Barelli, E. (2019). Developing future-scaffolding skills through science education, *International Journal of Science Education*, DOI: 10.1080/09500693.2019.1693080

Tasquier G., Branchetti L., Levrini O. (2019) Frantic Standstill and Lack of Future: How Can Science Education Take Care of Students' Distopic Perceptions of Time?. In: McLoughlin E., Finlayson O., Erduran S., Childs P. (eds) *Bridging Research and Practice in Science Education. Contributions from Science Education Research*, vol 6. Springer, Cham, pp. pp 205-224 (https://doi.org/10.1007/978-3-030-17219-0_13)

Levrini, O., Tasquier, G., Barelli, E., Laherto, A., Palmgren, E.K., Branchetti, L., Wilson, C. (2021). Recognition and operationalization of Future-Scaffolding Skills: Results from an empirical study of a teaching-learning module on climate change and futures thinking. *Science Education*, DOI: 10.1002/sce.21612

Levrini, O., Fantini, P., Barelli, E., Branchetti, L., Satanassi, S., Tasquier, G. (2021). The Present Shock and Time Re-appropriation in the Pandemic Era. *Sci & Educ.* 30, 1–31, <https://doi.org/10.1007/s11191-020-00159-x>

REFERENCES

- Barelli, E., Branchetti, L., Tasquier, G., Albertazzi, L., & Levrini, O. (2018). Science of Complex Systems and Citizenship Skills: A Pilot Study with Adult Citizens. *EURASIA Journal of Mathematics, Science and Technology Education*, 14(4), 1533-1545. <https://doi.org/10.29333/ejmste/84841>.
- Branchetti, L., Cutler, M., Laherto, A., Levrini, O. Palmgren, E.K., Tasquier, G., & Wilson, C. (2018). The I SEE project: An approach to futurize STEM education. *Visions for Sustainability*, 9, 10–26. <https://doi.org/10.13135/2384-8677/2770>.
- Eurobarometer (2015). Public opinion on future innovations, science and technology, national report Italy, Eurobarometer qualitative study, June 2015.
- Leccardi, C. (2009). *Sociologie del tempo. Soggetti e tempo nella società dell'accelerazione*. Laterza.
- OECD (2018). *The future of education and skills. Education 2030*.
- Pietrocola, M., Rodrigues, E., Bercot, F. *et al.* Risk Society and Science Education. *Sci & Educ* **30**, 209–233 (2021). <https://doi.org/10.1007/s11191-020-00176-w>
- Prigogine, I., Stengers, I. (1979), *La Nouvelle Alliance. Métamorphose de la science*, Paris, Gallimard.
- Rosa, H. (2009). Social acceleration: Ethical and political consequences of a desynchronized high-speed society. In H. Rosa & W. E. Scheuerman (Eds.), *high-speed society. Social acceleration, power and modernity*. University Park, PA: Pennsylvania State University press, 77–112.
- Rosa, H. (2010). *Alienation and acceleration: Towards a critical theory of late-modern temporality*. NSU press.
- Rosa, H. (2013). *Social acceleration: A new theory of modernity (new directions in critical theory)*. Columbia University Press.
- Toffler, A., & Toffler, H. (1970). *Future shock*. New York: Random House.



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