**How individual learning models and didactic methodologies will change after the Coronavirus pandemic:**

**the case of Concurrent Engineering**

*M. Lisi1, M. Recchioni2, I. Roma3*

1. Independent Consultant (formerly ESA and European Commission), Roma, Italy

E-mail: [ingmarcolisi@gmail.com](mailto:ingmarcolisi@gmail.com)

1. University of L’Aquila, Roma, Italy
2. European Space Agency – ESTEC, Noordwijk, The Netherlands

**Abstract**

Numerous scientific and theoretical contributions from authoritative researchers have addressed and analyzed in detail the impact on the mechanisms that regulate the levels of individual learning and on the teaching methods of social interaction processes.

According to these theories, individual learning, considering the human being, in a systems theory perspective, as a living system dynamically interacting with its environment, does not depend only on individual factors [such as “motivation to learn” (Mo), “emotional convolution” (Em) and “memorization processes” (Me)], but also on the effects of “social interaction” (Is).

So the level of individual learning (Ai) depends on the multiplicative combination of individual factors and social interactions:

Ai = (Mo, Em, Me) \* Is

As shown by A. Bandura in his studies on individual learning processes and on the impacts from mutual observation between individuals, learning depends on those contents of knowledge and technical skills (“know-how”) that people acquire by observing others. In other words, learning is based, “inter alia”, on strong competing social interactions.

The role of social interactions is particularly evident in concurrent and collaborative environments, such as the Concurrent Design Facility (CDF), developed and successfully operating at ESTEC.

Concurrency and collaborative approaches are as much cultural as social mind-sets and a key factor in the success of concurrent engineering practices lies in establishing the right alchemy between technical challenges and social interactions.

Nowadays we are faced with the need to reformulate our theories and best practices as a result of two paradigmatic and disruptive changes: the digital revolution on one side and the global social-economic effects of the Coronavirus pandemic on the other. Both move in the same direction of change, amplifying its effects: virtualization/remotization of learning and working interactions and social distancing.

The final paper will analyze in detail the effects on people's processes and learning levels as a result of the transformations caused by the digital revolution and the global pandemic, highlighting some potentially positive evolutions.

In this respect, the pandemic, with all its tragic effects, is just accelerating an already existing societal transformational process: the progressive dematerialization and virtualization of many productive activities, mainly in the service sector.

The challenge we are now facing is that of extending this paradigm to activities highly dependent on intellectual interactions and knowledge-intensive: engineering, medicine, and education.

In the educational field, as a matter of example, universities have managed in a short time, during the pandemic, to replace the traditional classroom teaching with a virtual one, betting on the possibility to compensate - through e-learning - training and educational activities, for which the physical presence was considered so far a "sine qua non" requirement.

The effectiveness of these educational/training approaches (as well as that of, e.g., remote concurrent engineering) will depend on how they will be able to take into account the importance of social interactions. One possible way to enhance the emphatic involvement of individuals could be the adoption of innovative technologies, such as augmented and virtual reality. Along with technologies, innovative approaches will have to be conceived and explored.