

# Title: Quantum physics literacy aimed at K12 and general public

Authors: Caterina Foti, Daria Anttila, Sabrina Maniscalco, Maria Luisa Chiofalo \*

**Abstract:** Educating to quantum physics K12 students and general public represents a no longer evitable must, while quantum technologies are going to revolutionize our lives. Quantum literacy is a formidable challenge and an extraordinary opportunity for a massive cultural uplift, where citizens learn how to engender creativity and practice a new way of thinking, essential for smart community building.

Scientific thinking hinges on analyzing facts and creating understanding, then formulated with the dense mathematical language for later fact checking. Within classical physics, learners' intuition can be educated via classroom demonstrations of everyday-life phenomena. Their understanding can even be framed with the mathematics suited to their instruction degree. For quantum physics instead, we have no experience of quantum phenomena and the required mathematics is beyond non-expert reach. Therefore, educating intuition needs imagination. Without rooting to experiments and some degree of formal framing, educators face the risk to provide only evanescent tales, often misled, while resorting to familiar analogies.

Here, we report on the realization of QPlayLearn, an online platform conceived to explicitly address challenges and opportunities of massive quantum literacy. QPlayLearn's mission is to provide multilevel education on quantum science and technologies to anyone, regardless of age and background. To this aim, innovative interactive tools enhance the learning process effectiveness, fun, and accessibility, while remaining grounded on scientific correctness. Examples are games for basic quantum physics teaching, on-purpose designed animations, and easy-to-understand explanations on terminology and concepts by global experts. As a strategy for massive cultural change, QPlayLearn offers diversified content for different target groups, from primary school all the way to university physics students. It is addressed also to companies wishing to understand the potential of the emergent quantum industry, journalists and policy makers needing to seize what quantum technologies are about, and all quantum science enthusiasts.

**Keywords:** Quantum physics education; Methods for physics teaching; Games with a purpose

---