Abstract of the keynote presentation entitled:

We pretend to have some solutions … but do we understand the problematics as a whole?

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Engineering education is an evergreen challenge. It is supposed to follow the scientific progression, aggregation of knowledge, development of technologies, industrial demands, social trends, personal interests, affordances of computerization, evolution of educational practices, and so forth. It must renew itself to comply with the changing situations, growing complexities, and quality expectations holistically and perpetually. Therefore, this keynote presentation regards innovative engineering education as a large-scale, domain-dependent, multi-faceted, and complicated problematics that has been jointly induced by technological, industrial, social, and demographic trends and factors, and that concurrently concerns research, development, and deployment issues. The talk is structured according to five fundamental questions: (i) Why is innovation in engineering education a challenging problematics (again)?; (ii) What are the currently typical forms of engineering education?; (iii) What can we regard as an enabler for a next-generation engineering education?; (iv) What can we expect from the offerings of generative artificial intelligence tools?; and (v) What is the new mindset strongly needed for next-generation engineering education? The computerization and informatization targeted by Industry 4.0/Society 4.0, and the intelligentization and autonomization sought by Industry 5.0/Society 5.0 place the trinity of engineering education into a radically new context. Hardly any retrospectively or intuitively formulated concept can offer a complete solution for the triplet of objective (why to learn), content (what to learn), and approach (how to learn). Individually or in combination, the historically evolved forms of education, such as instructional, explorative/experimental, project-based, competence-driven, team/collective-oriented, practice-placed, design-centered, virtual reality aided, on-line/communicative, or search/prompting guided approaches can fulfil the fabric of dynamically emerging requirements and objectives only partially. To complement these, the idea of experience-oriented education has popped up recently. The widely studied but much less practiced blended learning, autonomous learning, and life-long learning approaches are often questioned due to their deinstitutionalizing, responsibility transfer, methodologically under-defined, and uncertain quality management and accreditation nature. On the other hand, they seem to have a lot of unexploited potential – a fact that begs for further intense research and practical experimentation, as well as changes in the mental models of academic educators and practical coaches. In this regard, the statement of the famous Hungarian composer, Zoltán Kodály, stands: “The (musical) instruction of children must commence with that of the parents/mentors”. In the hope of efficiency, methodological innovations should be complemented with epistemological innovations. For instance, the traditional bottom-up (reductionist) knowledge transfer strategy can be combined with, or even replaced by, the progressive (top-down) holistic strategy. This strategy seems to be advantageous in the education of complex systems, such as intellectualized cyber-physical-social-human systems, which embed the knowledge of and require competencies for cross-disciplinary hardware, software, cyberware, and brainware development and their synergistic integration. However, this strategy, culminating in the third phase (university-level) education, assumes supporting first-level general and second-level professional education, which triggers organizational complexity and difficulty. A pedagogical strategy whose main objective is to delegate responsibility over the contents and processes of learning to the learners is proliferating. It intends to support the efforts of the learners by building learner-composable individual learning trajectories, course contents composed from thematic modules, learning objects-based editable courses, peer review techniques, self-evaluation frameworks, online-shared awareness spaces, and social media chatboxes. Though getting more attention and impetus, the roles of generative artificial narrow intelligence tools in next-generation engineering education are difficult to predict since, at this moment, there are positivist, realist, pessimistic, and skeptic positions taken. While it can extend human motor, perceptive, cognitive, and behavioral capabilities, it goes together with legal, ethical, motivational, and many more unsolved issues. These latter imply that there is a new mindset strongly needed for next-generation engineering education. However, instead of pretending to have some partial solutions, first, we must develop a proper understanding of the problematics of the whole.