

Critical issues in education and innovation

Ioannis Liritzis

Vice President, European Academy of Sciences and Arts, Salzburg, Austria

ABSTRACT

Education and innovation play essential roles as drivers of economic growth, societal advancement, and international competitiveness. This study delves into the intersection of education and innovation within Europe, concentrating on the diverse initiatives, regulations, and approaches embraced by European nations to stimulate innovation through education. Through an extensive examination of scholarly literature, policy papers, and empirical research, this paper investigates the function of education in cultivating the competencies, expertise, and mentality vital for innovation and entrepreneurship. It scrutinizes the changing landscape of education in Europe, encompassing the transition towards digitalization, continuous learning, and multidisciplinary methodologies. Moreover, the paper assesses the repercussions of educational regulations and transformations on nurturing an environment conducive to innovation, encouraging research and development, and enhancing the capability for technological progress. Additionally, it deliberates on the contribution of higher education establishments, research institutions, and collaborations between the public and private sectors in propelling innovative ecosystems and knowledge-centered economies. It also highlights the strategic directions that education and innovation in Europe should pursue, including reducing educational disparities, strengthening comprehensive innovation ecosystems, promoting balanced interdisciplinarity, and adapting to rapid technological change while integrating insights from the humanities. Finally, it offers recommendations for policymakers, educators, and stakeholders aimed at reinforcing the links between education and innovation, fostering cross-sector collaboration, and ensuring that Europe maintains its leadership in global innovation throughout the 21st century. Numerous scholarly articles and online resources address the challenges and trajectories of contemporary education.

Correspondence: Ioannis Liritzis, Vice President, European Academy of Sciences and Arts, St. Peter-Bezirk 10, A-5020 Salzburg, Austria.

E-mail: ioannis.liritzis@euro-acad.eu

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Introduction

The content of the present short presentation comprises of six issues (Figure1). Education and learning are a lifelong process which echoes the classical Socratic phrase saying, "I grow old always learning".

The purpose of my presentation about the subject is to introduce some thoughts bridging Education and Research.

A thoughtful academic policy work on this subject has been developed by the European Academy of Sciences and Arts¹ (Liritzis *et al.*, 2022). The bridge between Education and Innovation presumes Research. Hence, the third cornerstone of the twin Education and Innovation is research.

These three columns interact with other scientific and social fields, so that any coupling is combined interdisciplinary. Each meaning cannot be analyzed independently.

In any case, we should admit that the goal of education is the advancement of knowledge, recognizing and setting aside suspicions and prejudices; by applying behaviors based on ethics, justice, and equality. And as rational beings to protect our planet, humanity and reach out and spread even more the knowledge of the truth.

The handbook of the Organization for Economic Co-operation and Development (OECD)² for innovative learning Environments, questions various aspects regarding optimizing learning, or getting the most from technology, and evaluating our innovation or thinking through whether our change initiative will bring about its desired results.

¹ www.peasa.eu

² <https://www.oecd.org/education/innovation-education/>

CONTENT

"Do not use compulsion but let early education be a sort of amusement; you will then be better able to find out the natural bent". (Plato, The Republic, 7. BOOK VII).

- Critical connection between education and innovation
- Some key aspects of Education and Innovation in Europe
- The Education-Research-Innovation may develop a new didactic model
- Educational umbrella onto R&I
- Challenges from New Technologies Boosting Modern Education
- Toward a Global Certificate



Figure 1. Content of the presentation. Source of image: Raphael, Philosophy (School of Athens), Stanza Della Segnatura, Vatican Palace, Rome, Italy, 1509-1511.

Critical connection between education and innovation: a breakdown of this connection

The critical connection between education and innovation lies in their symbiotic relationship: education fosters the skills, knowledge, and mindset necessary for innovation, while innovation drives advancements in educational methods, tools, and opportunities.

In essence, education and innovation are interconnected forces that drive progress and prosperity. By investing in education and fostering a culture of innovation, societies can unlock human potential, spur economic growth, and address the pressing challenges of our time³. (Figure 2). However, issues of Education and mobility, also Education, innovation and technology.

Currently, it is widely accepted that education, regardless of inherent aptitude, plays a crucial role in driving innovation and technological advancements, as well as contributing to enhanced productivity and economic development. An essential component of this phenomenon lies in the significance of education in embracing the technologies that foster innovation. The educational background of parents and individuals significantly impacts productivity, either directly or indirectly, irrespective of various other attributes. As a result, policymakers in nations aim-

ing to sustain competitiveness in the globalized market must ensure that the education system considers and reinforces both quantitative measures (such as enrollments) and qualitative aspects, such as the quantity of Ph.D. recipients, which serves as a prominent educational gauge for technology and innovation.

Investment in the field of education contributes to the enhancement of innovation. This holds significance as the research findings pertain to the influence of innovation and educational policies on individual career decisions and overall productivity. Recent research suggests that government support in the form of subsidies for Research and Development, a common strategy to promote technology and innovation, has a significant immediate impact which diminishes over time. Conversely, subsidies directed towards education exhibit a more enduring impact on technology and innovation in the long run. In all the idea of education apparently inheres uncertainties in definition, as at present era for motivations and employment opportunities the further education seems equally nonplussed as regard its purpose or *raison d'être* (Preston 2003).

Some key aspects of Education and Innovation in Europe

Education and innovation are key pillars of Europe's strategy for economic growth, competitiveness, and social development. European countries have historically placed a strong emphasis on education as a means of fostering innovation and driving progress with certain key aspects (Figure 3). Achieving these aspects in European Education Research Innovation, we should move forward towards a new didactic model⁴.

³ <https://blogs.worldbank.org/en/education/why-education-more-important-today-ever-innovation>

⁴ <https://education.ec.europa.eu/education-levels/higher-education/innovation-in-education>

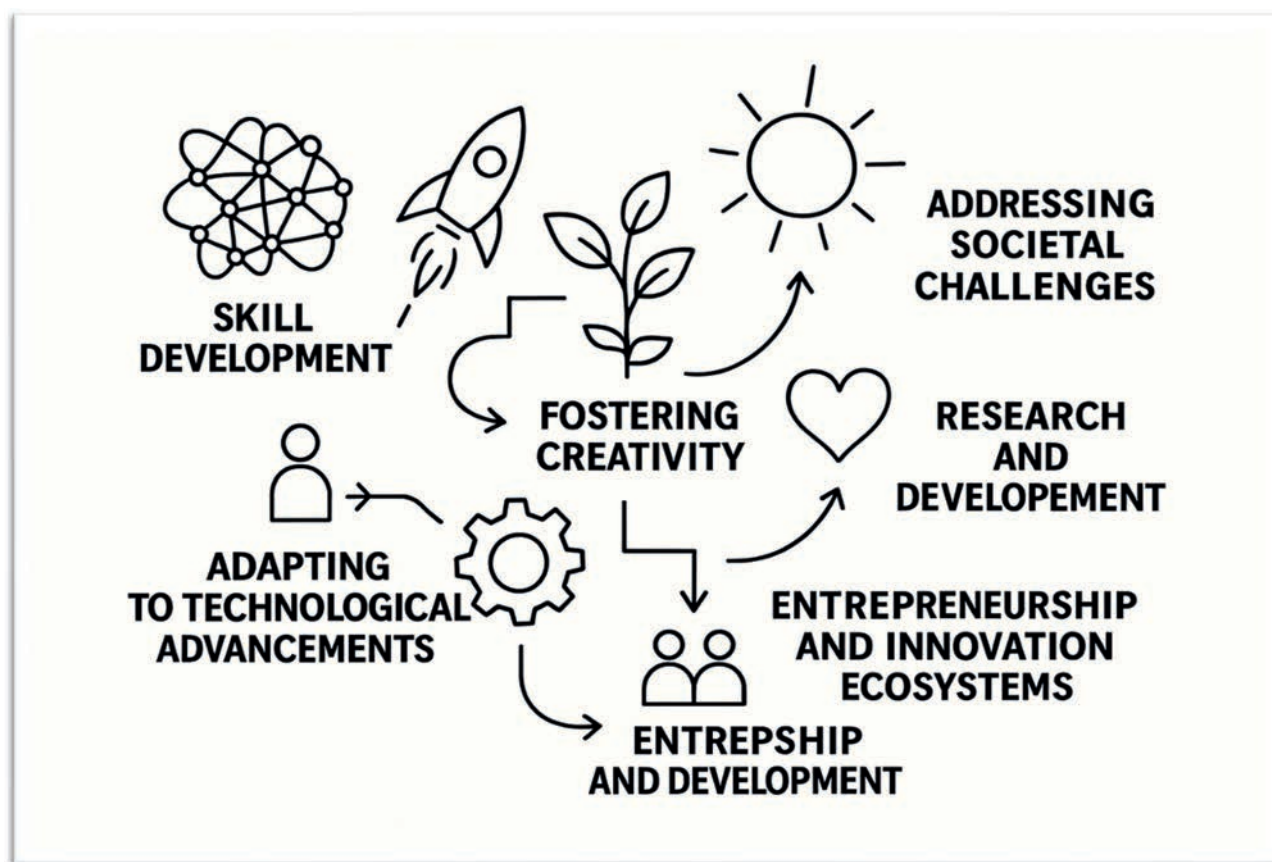


Figure 2. Critical connection between education and innovation: a breakdown of this connection. Image generated by the author using ChatGPT AI.

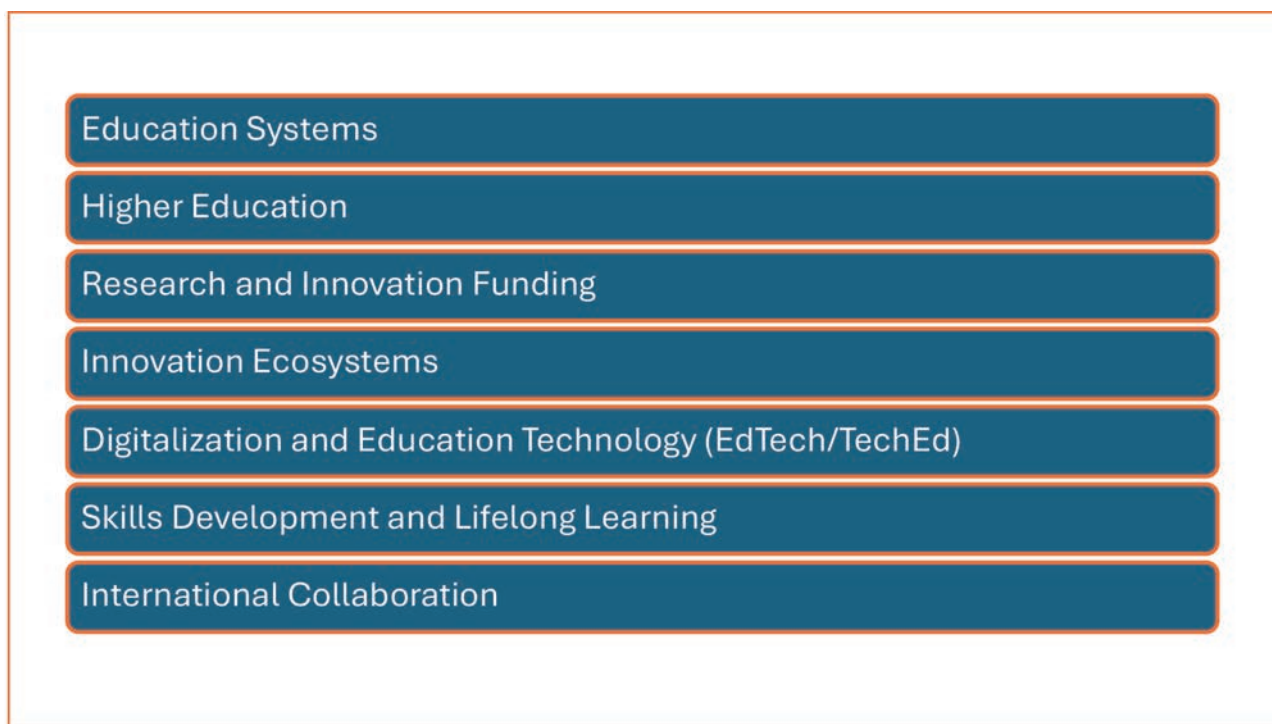


Figure 3. Some key aspects of Education and Innovation in Europe.

The different levels and disciplines could be reformed for the three broad scientific categories of *natural sciences*, *arts & humanities*, *life sciences*, applying a smoothly increased and broad spectrum of difficulty. The teaching of pupils for a human style of life balanced, between human relations, principles and values (development of virtues) in a practical sense, and, with technological / economic growth. Thus, fundamental principles of philosophy should become an inseparable entity to every educational stage. For a round knowledge person and cultural progress based on human dignity & cooperation, but human autonomy too, in the exploration of the micro-and macro-environment. After all, these concepts are in the best of European philosophical and educational traditions, as well as with the leading values of European tradition.

Here a new concept of interaction and interdisciplinarity should emerge. The indispensable condition would be an experiencing style training with hands-on and contact with the subject. The transition of education to the Digital world raises new challenges as experimental sciences are intrinsically challenging to experience online and via remote learning. The digital (VR, etc.) component is the first preparatory stimulus stage to trigger interest (for earth / environmental sciences, biological, landscapes, sophisticated instrumentations, space environment). But a step still needs to be taken regarding how to transform this initial stimulus into a practical high-quality education providing skills applicable to real-life problems. The digital presentation suffices for the lack of costly infrastructures.

Indeed, *economics*, *infrastructures*, *innovative* models should balance the various tools used especially digital coupled with humanities (distance learning, virtual reality in education, *STEM*, *STEAM*, *STEMAC* (*STEM in Arts and Culture*, active hands-on apprentice participation, etc.) to achieve a more sus-

tainable world and an integrated balanced citizen-scientist-worker in these three models.

Interdisciplinarity and Synergy

Education-Research - Innovation

Natural Sciences, Arts and Humanities, Life Sciences

Economics, Infrastructures, Society

Education-Research-Innovation axes must develop a new didactic model to focus on learning dynamics

New promising technologies in every research direction should be developed and applied to enhance Europe's position in the worldwide competition of Innovation and Education. An Education that should include the experiencing dimension - in the class, in the field, and in the virtual educational environment (Liritzis *et al.*, 2022).

At any rate the educational treatment may recall the Platonic recommendation: "*Do not use compulsion but let early education be a sort of amusement; you will then be better able to find out the natural bent*" (Plato, *The Republic*, 7. BOOK VII)⁵ (Figure 4).

⁵ The Republic, trans. Benjamin Jowett (Minneapolis, First Avenue Editions; 2015), p. 186.

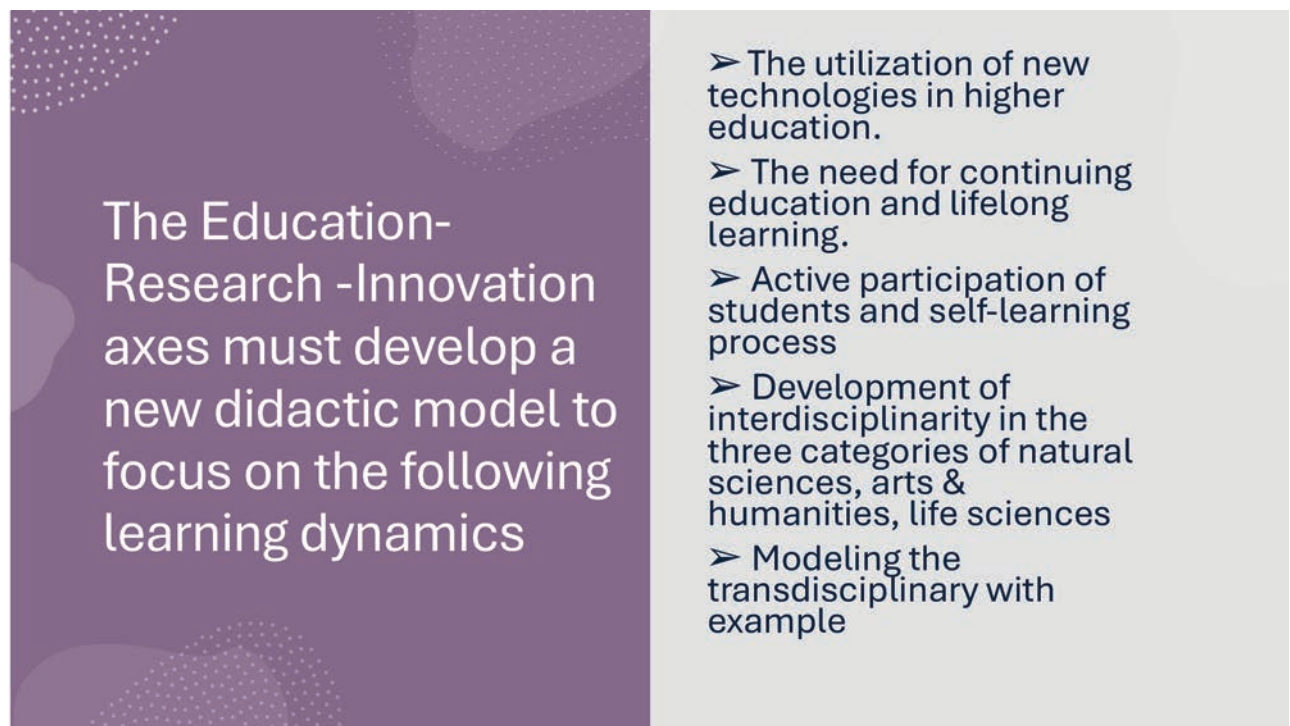


Figure 4. The Education-Research Innovation axes must develop a new didactic model to focus on learning dynamics.

New challenges boosting modern education in contemporary issues

Today, it is widely acknowledged that the educational landscape is shifting. There are more options than ever for studying, including traditional, part-time, full-time, distance, and online options.

People wish to learn in a variety of methods that suit their needs and preferences; it is critical that we answer this need by providing learners with exactly what they want, when they want it. Along this pragmatism today the research work and innovation should be coupled with the Education. New opportunities emerge for research work and moreover for springing from research the innovation spirit (Figure 5).

Modern education must cover a much broader variety of topics compared to a few decades ago. Solving contemporary world challenges in environment, climate and health requires training experts in two or more core scientific fields, as well as in the connectivity between these.

The “education at the interface” is one of the biggest challenges of the 21st century academics (Khahro and Javed, 2022; Germaine *et al.*, 2016).

First, that requires students, engineers, and scholars at large to span over a much larger body of information. We easily understand that the immediate risk is superficial and non-qualifying training. We have already seen in the past decade the proliferation of schools promoting training of engineers with very “generic” profiles and compromising on the core scientific competency. The immediate result of such a choice would be a generation of engineers unable to design advanced products and

systems. Such systems should be the cornerstone of the European economy and cannot be designed without a deep mastering of each scientific field.

Second, this recent need for multidisciplinary education comes exactly at the time of increasing digitalization. Digital education is at the same time a risk and a chance to achieve the goal of “diversity with expertise”.

These challenges inhere risk and chance. **A risk**, because in many fields requiring hands-off experience on physical systems, it results in a lack of qualifications that can be obtained so far only by lengthy and costly training in face-to-face instruction. A deep reflection has then to be made about the way digital education, remote learning, and massive online education, can evolve and introduce new tools, enabling this hands-on experience to happen in a new manner. New interfaces, not only based on video and sounds, but also, on tactile, olfactive and gustative experiences, need to be developed or are already under development.

A chance, because this “diversity with expertise” will require the design of new degrees in which experts for many different fields should serve as instructors. Digital education is a path here to preserve quality, by allowing international experts from all fields in unique degree tracks for the best of our students.

Toward a global certificate

The mastering of knowledge (theoretical and instrumental) shall be much more effective and efficient, than now, with the start to boost digital applications to these three broad cate-

New Challenges Boosting Modern Education in Contemporary Issues

Examples

1. Education, Research and Innovation in the field of **health**. The Pandemic and the virus SARS-CoV-2 have changed the research direction into more genetic approaches based on bio and nanotechnologies. We can organize proposals for the development of new tools and guidelines, for a future pandemic.
2. Education, Research and Innovation in the field of **climate change**
3. Education, Research and Innovation in the field of **energy**
4. Education/ **Training** of experts in the contemporary fields and guidelines for the society could be our educational contribution
5. **Inner Development in harmony to Sustainability Goals**

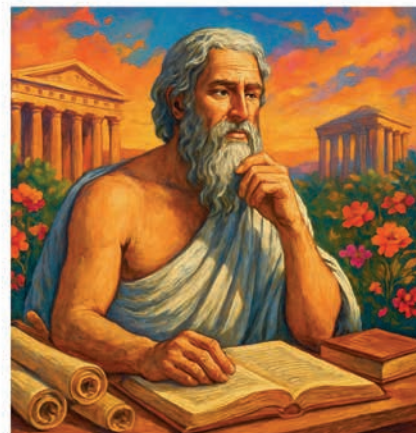


Figure 5. Greek philosopher thinking. The Greek Philosopher represents the timeless foundation of knowledge, critical thinking, and ethics that education has always been built upon. Image generated by the author using ChatGPT AI.

gories and their existing trans-category emerging disciplines (examples for such new cooperation and transdisciplinary innovation: physical sciences with biological processes, medicine and physical sciences, environmental sciences and cultural heritage, poetry/literature/music vs respective natural sciences processes, human (social) relations tuned with physical laws in nature. Through the interdisciplinarity making extensive use of digital technology the spirit of research and innovation can be developed as one educational system (Figure 6).

Beyond concrete technologies, the importance of prioritizing R&I as norms has to be considered for the future Education and a global certificate. Such a Global Engagement provides student involvement activities aimed at promoting cross-cultural interactions where domestic and international students can develop an understanding of different cultures⁶. The philosophy of a Global Citizenship and Global Leadership Certificates has been initiated by NYU Shanghai⁷. Slowly such global certificate initiatives have grown in various fields (e.g., health)⁸.

Dr Marina Gorbis, Executive Director at the Institute for the Future, provides a compelling representation of the ways in which emerging technologies empower individuals to facilitate connections and exchange resources, resulting in networks of individuals -rather than large institutions- addressing various challenges through the transformation of sectors such as business, education, healthcare, finance, governance, and scientific investigation⁹.

Kouveliotis¹⁰ also asserts that the Global Degree would lead to better knowledge of the world around us and enable us to better cope with it.

In fact, such a Global Degree uses academic skills and knowledge in practical, results driven, non-academic experi-

ences; develop leadership, through service activities, students can significantly enhance leadership skills; develop professional networks; foster community involvement and social responsibility.

On the role of technical and scientific education for European innovation and competitiveness, for the link with European cultural heritage and for the realization of the European sustainability goals

The 17 Sustainable Development Goals (SDGs)¹¹, introduced by UN are an urgent call for action by all countries - developed and developing - in a global partnership. The EU is a leading global partner for the SDGs. This issue refers to the European Cultural Heritage, which term as such is not present, it is missing from the 17 SDG.

⁶ <https://oia.osu.edu/get-involved/global-engagement/global-engagement-certificate-program/>

⁷ <https://shanghai.nyu.edu/academics/study-away/out/global-certificates>

⁸ <https://sph.umich.edu/global/certificate/>

⁹ <https://legacy.iftf.org/natureofthefuture/>

¹⁰ <https://www.un.org/en/un-chronicle/global-degree-proposal-new-institutional-model-higher-education>

¹¹ <https://sdgs.un.org/goals>



Figure 6. For a global holistic certificate.

However, I believe that the four SDG: *4 quality education; 9. Industry, innovation, infrastructure and 16. peace, justice and strong institutions, 17. partnerships for the goals*, are promoting cultural heritage, when these are connected with natural sciences for 2 reasons:

- i) The inclusion to a greater degree of STEM in an interdisciplinary manner to the three educational levels, enhances quality of education, investigatory minds and innovation, and
- ii) The interdisciplinarity of Arts and Cultural Heritage with natural Sciences and Technology/STEM enhances understanding, foster peace, development and innovation, sustainability, and necessary partnerships. Achieved with exchange of tangible and intangible heritage experiences and knowledge, and development of cultural tourism and Cultural Creative Industries (Liritzis and Korka, 2019). In any case, the primary SD goal, in my view, is to develop and sustain the inner self and to shape well-rounded, educated individuals. Such people will be able to apply the 17 SDGs much more effectively.

The world is more interconnected than ever. Improving access to interdisciplinary knowledge, caring for maintenance, preservation and deciphering our past, is an important way to share ideas and foster innovation and establish a more complete person.

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