



Fostering Academic Interdisciplinarity: Italy's Pioneering Experiment on Sustainability Education in Schools and Universities

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The world needs a systemic transformation from a social, economic and environmental point of view in order to deal with present and future challenges, which are crosscutting in nature. Education and research can become powerful drivers for this radical change, provided they can break free from narrow disciplinary approaches and cultivate the interconnectedness of knowledge. With a view to repurposing teaching and research toward an integrated approach, Italy has introduced a number of reforms, including a mandatory module for all schools and an interdisciplinary course for universities, largely modeled on the interdisciplinary concept of sustainability. Italy was the first country in the world to do so and the news had resonance throughout the globe, indicating a thirst for innovative methods in education and research. This article discusses the approach and the obstacles faced, with the aim of encouraging debate over its structure and contents and potentially replicating its implementation in other parts of the world.

Keywords: interdisciplinarity, transdisciplinarity, integration, education, schools, university, sustainability

INTRODUCTION

The world needs a systemic transformation from a social, economic, and environmental point of view in order to deal with present and future challenges, which are crosscutting in nature. This is clearly indicated by the United Nations, whose *The Future We Want* declaration acknowledges “the need to further mainstream sustainable development at all levels, integrating economic, social and environmental aspects and recognizing their interlinkages, so as to achieve sustainable development in all its dimensions” (UN, 2012). Against this backdrop, education and research can be powerful drivers of a systemic transformation (UNESCO, 2019), especially in so far as they contribute to shift our beliefs, behaviors and approaches, provided we can break free from narrow disciplinary separation and foster the integration of knowledge.

With a view to repurposing teaching and research toward an integrated approach, Italy has introduced a mandatory module for all schools and an interdisciplinary course for universities, largely modeled on the inherent link between interdisciplinarity and sustainability.

In this article, we provide a first tentative analysis of this pioneering approach (the country was the first in the world to make the study of sustainable development mandatory in all schools) and highlight the main approach, policy impacts as well as obstacles. The Covid-19 crisis, which broke out just a few months after the country had introduced these innovative reforms, has significantly delayed the implementation process (schools and universities were shut down for most of 2020 and 2021), thus delaying the timing of the project and the scope of any possible analysis at this stage. We feel, however, that these reflections may be very useful to the current debate on how to repurpose education and research institutions to deal with the 21st century needs and challenges and also to other countries interested in pursuing similar policies.

FOSTERING INTERDISCIPLINARITY IN SCHOOLS AND UNIVERSITIES: A BRIEF REVIEW

Although social and natural processes have always been and are ever more characterized by systemic dynamics in an age of globalization and unprecedented impacts of humans on the biosphere, conventional approaches to education are still largely based on sectoral knowledge, limited cross-fertilization among subjects and a lack of understanding of how different areas of expertise can be integrated to help address societal problems. The concept of interdisciplinarity is therefore key to repurpose education institutions with a view to making them more capable of responding to contemporary pressures and needs (Davies and Devlin, 2010).

But what is interdisciplinarity? According to Boix Mansilla et al. (2000, p. 219), interdisciplinarity is defined as “[t]he capacity to integrate knowledge and modes of thinking in two or more disciplines or established areas of expertise to produce a cognitive advancement—such as explaining a phenomenon, solving a problem, or creating a product—in ways that would have been impossible or unlikely through single disciplinary means.” A number of scholars believe that interdisciplinarity holds forth great promise in so far as it helps teaching and research connect strands of knowledge with a view to improving our understanding of complex, multifaceted dynamics (Klein, 1990; Hicks and Katz, 1996; Spelt et al., 2009; Jones, 2010).

Interdisciplinarity has grown in popularity in academic debates during the past fifty years (Crookall, 2000), shifting from an intellectual effort to integrate knowledge and freedom of inquiry to becoming the basis for a purposeful approach to problem-solving, as demonstrated by Future Earth, a global network of scientists linking research and innovation through an interdisciplinary focus with a view to promoting sustainability-based solutions (www.futureearth.org). Yet, despite its potential virtues, a truly interdisciplinary agenda has thus far struggled to become mainstream (Ledford, 2015). Even when different disciplines collaborate, they struggle to integrate fully and give birth to new areas of knowledge, a process perhaps better exemplified by the concept of “transdisciplinarity” (Choi and Pak, 2006).

Indeed, there are a number of barriers hindering integration among disciplines, including standardized education assessment models, insufficient time and resources, limited knowledge base and diversity of language and cognitive approaches (Kysilka, 1998; Bradbeer, 1999; Woods, 2007; MacLeod, 2018). School attainment assessment methods are an important tool for education advancement, but it has long been noticed that teachers, whose own evaluation and career expectation often depend on test results, may focus on increasing success rates rather than on facilitating higher-order thinking skills, thus reinforcing disciplinary divisions (Herman, 1992). Moreover, integrated thinking requires time, which is notoriously in short supply in schools and universities, especially if one considers that new syllabi may require approval from the rest of faculty before they can be introduced, which makes the process particularly lengthy and uncertain. In many countries, academic work is often underpaid and devaluated, which discourages innovation and propensity vis-à-vis new areas of work and experimentation. Additional barriers include limited knowledge base, as the same teachers and researchers who should develop interdisciplinary approaches have been educated mostly within the rigid borders of disciplines, thus erecting cognitive “walls” around their academic learning process, resulting in languages that can hardly be translated into one another. As reported by Annan-Diab and Molinari (2017), there is a fundamental problem of teacher training and education, which is still based on traditional approaches and methodologies. All of this requires a radical transformation if we are to develop the teaching skills needed for a new school and university curriculum based on the “interconnectedness” of knowledge.

It is important to recognize that a number of universities—almost exclusively in the Anglo-Saxon world—have made important strides toward interdisciplinarity over the past decade, with the emergence of crosscutting teaching and research areas such as ecological economics, geoethics or sociolinguistics, to name a few examples (Davè et al., 2016a,b). Moreover, a number of donors, including private foundations and the European Union, have launched important research funding programmes to support, if not full-fledged interdisciplinary projects (Gleed and Marchant, 2016), at least multidisciplinary endeavors, that is, research partnerships were different disciplines are involved, although most of them may still operate in parallel tracks (e.g., producing separate outputs). At the same time, despite the growth of issue-based scientific journals and with the limited exception of leading interdisciplinary publications like *Science* and *Nature*, most highly-rated publication outlets jealously defend their disciplinary approach, making it quite hard (if not impossible) for a mainstream journal to welcome submissions by authors with a different background, with unorthodox approaches or focusing on crosscutting topics.

Integrated education and research are not only necessary for scientific progress, but ever more so to deal with the complex problems facing humanity, which—by nature—do not recognize disciplinary or departmental boundaries. In particular, the compound challenges of climate change and sustainability require a completely new way of thinking, including new horizons for interconnected research in a variety of fields,

from energy production to ecological protection, from urban development to societal organization (Bhaskar, 2010; Tejedor et al., 2018; de Bruin and Morgan, 2019). Despite its obvious interdisciplinary nature, education for sustainable development is still often carried out through a specific disciplinary lens: For instance, as reported by the UNESCO report titled “Education for sustainable development: a roadmap” (UNESCO, 2020, p. 9) Education for Sustainable Development has been mostly associated with the teaching of scientific knowledge on environment in 10 Countries.

SUSTAINABILITY EDUCATION: AN INTEGRATED FRAMEWORK AND POLICY APPROACH

Italy is one of those countries in which a rigid separation across disciplines is deeply rooted. Researchers compete in a tight publish-or-perish system based on formally defined “sectors,” which further fragment disciplines into almost 400 relatively obscure areas of expertise: according to the Ministry of University and Research, there are currently 383 scientific disciplinary sectors in Italy (MUR, 2020). These sectors are vital for any academic, as they dictate the scope of their scientific evaluation, teaching responsibilities and career prospects. For instance, research publications falling outside a specific sector may be excluded from the “national scientific habilitation,” which is the assessment process all academics must pass to access tenure-track positions, thus undermining the professional development of researchers, especially in the early stages of their career. Moreover, scientific journals are rigidly divided into “tiers” according to disciplinary preferences, which tends to downgrade articles published in interdisciplinary outlets, irrespective of their Impact Factor.

Against this backdrop, when we headed Italy’s Minister of Education, University and Research in 2018–2019, we introduced a set of policy reforms designed to create new incentives and mechanisms for interdisciplinary collaboration and research. First of all, we discussed with the National University Council, an elected organism representing university staff and students, a fundamental simplification of disciplines aimed at overcoming the bottlenecks of such a multitude of scientific sectors. We also approached the National Agency for the Evaluation of Universities and Research (ANVUR), which is the institution overseeing the assessment of individual researchers as well as universities as a whole, to request a different approach toward the so-called “evaluation of the quality of research” (VQR), with a view to including not only direct teaching and research outputs, but also broader products of the overall academic activity, including policy reports, media contributions, patents, entrepreneurial spin-offs and any activity that benefits the local community and the population at large (a process known in Italy as the “third mission” of universities). Finally, we launched a national online research “repository” where all scientific and practice-based activities by each individual researcher could be tracked and assessed in terms of impact, thus going beyond more conventional parameters such as scholarly citations to

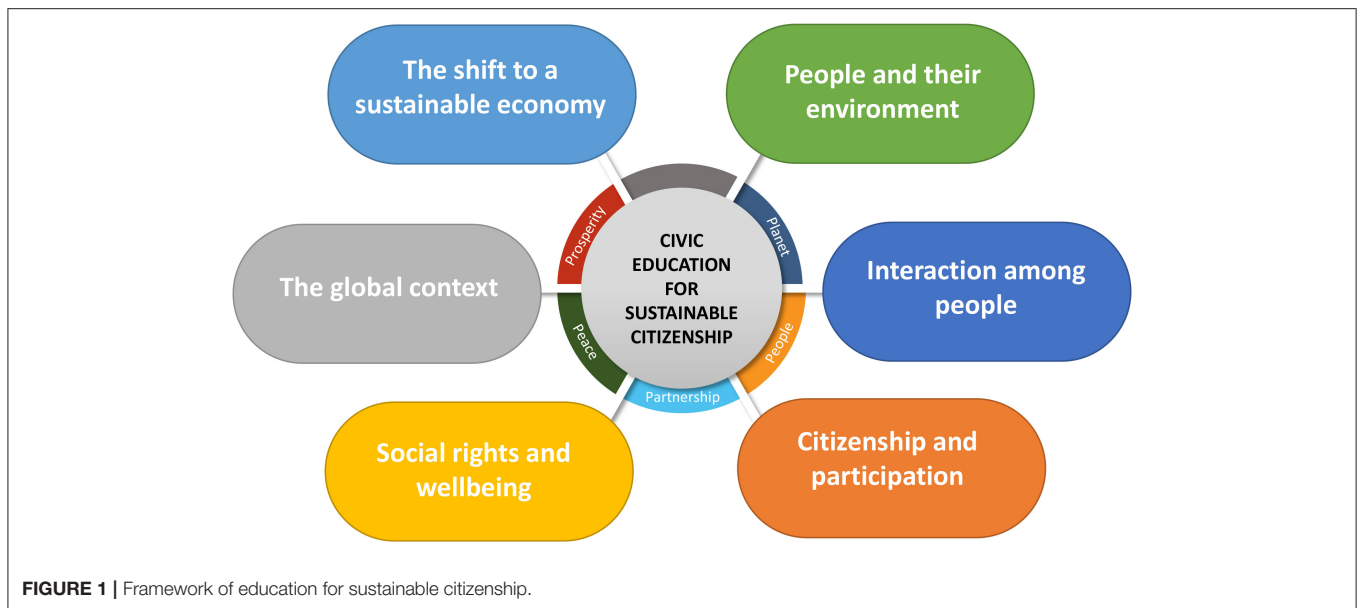
include qualitative dimensions such as the societal effects and policy use of research. All these shifts were designed to help liberate academics from the more traditional evaluation of teaching and research outputs, which generally tends to exclude any activity that does not fall within the remit of a narrow understanding of “academic work” by any given disciplinary sector.

The transformative power of policy incentives and assessment mechanisms can be further strengthened if the targets have been socialized within an education process that upholds interdisciplinarity as an active way of learning. This is why, together with the Sustainable Development Universities Network (RUS), we promoted the introduction of an elective online module for all university students of all disciplines, shaped around the interdisciplinary nature of the concept of sustainability, focusing on the intersection of economic, social and environmental dynamics. This module, known as “lecture 0,” was designed as propaedeutic to any course of further specialization, with a view to training students to think in an integrated fashion across natural and social sciences.

In order to take the same principle even further, we then decided to tackle interdisciplinarity at the level of basic education. Schooling has a number of effects on society’s social capital, including potential impacts on collective attitudes, behaviors and lifestyles. A module of civic education was first introduced in Italy in 1958, as a crosscutting theme focusing on rights, responsibilities and social norms, but over time it lost popularity in schools and became a marginal topic, often neglected by teachers themselves (as it did not require a separate grade for students).

With the digital revolution and the adoption of the Agenda 2030 by the United Nations, it has become clear that any approach to the rights and responsibilities in today’s world cannot be confined to learning parts and processes of the national legislation. Local actions affect global dynamics, while global processes reverberate also at the local level. The concept of “glocal” has thus become central to any approach to civic education, especially in the digital age, when the flow of information and the impacts of our actions inevitably transcend boundaries. Against this backdrop, we introduced a new mandatory teaching module on “education to sustainable citizenship,” based on the European Union’s recommendation on key competences for lifelong and cross-discipline learning (Council Recommendation of 22 May 2018 on key competences for lifelong learning, 2018) and using the window of opportunity opened by the crosscutting political support toward a fundamental revision of the traditional civic education approach, which led to the approval of the Act.92 of 20 August 2019 by a large majority in parliament (GU (Serie Generalen195 del 21-08-2019). LEGGE 20 agosto, 2019).

In order to ensure that all components were fully integrated with each other and synergies across the different topics were found, a team of pedagogues, professional educators and sustainable development specialists elaborated a framework divided into six crosscutting “spheres” of learning, mixing social and natural sciences and making it adaptable to the



various grades in terms of complexity and sophistication, from kindergarten to high school (**Figure 1**).

1. People and their environment. The relation with the territories: towns, regions and the use/abuse of natural resources; the role of digital devices in re-defining proximity and exploring the daily life territory.
2. Interaction among people. The relation with “the others,” including the virtual community.
3. Citizenship and participation. The relation with institutions, focusing on rights, active participation and democracy in the digital age, with a view to building action for change and sustainability transformation in the local community.
4. Social rights and wellbeing. The relation with personal and collective needs, including decent work, healthy lifestyles and the implications of the technological revolution.
5. The global context. The relation with the world, focusing on international organizations (e.g., the European Union and the United Nations), including how they manage peace, climate stability, the Internet, international rights and the role of a connected, civil society.
6. The shift to a sustainable society. The relation with social transformation, with a focus on inequalities, consumption choices and production patterns (from the local to the global).

A DISCUSSION OF PUBLIC RECEPTION, IMPLICATIONS AND POLICY OBSTACLES

The general audience as well as the academic community welcomed all changes introduced during our tenure with excitement, indicating a rather widespread need for innovation in the field of education and research. Italy’s decision to make the interdisciplinary study of sustainability mandatory in all schools and elective at the university level was reported by all major international newspapers, from *The New York Times* (2019) to

The Washington Post (2019) and *The Guardian* (2019). It was mentioned by the UN top leadership, agencies like UNESCO and it was given significant prominence at the climate summit COP 25 in Madrid in December 2019. Youth movements like the Fridays for Future and their spokesperson, Greta Thunberg, publicly praised the decision as an example for the whole world.

A number of spin-off initiatives were also carried out autonomously by many schools, which dedicated a special focus to the detrimental impacts of climate change and how collective action can help mitigate the most severe effects while adapting to a different relationship with natural resources. In collaboration with a number of associations, research institutes and private companies, thousands of trees were planted in schoolyards and new collaborative projects were developed with a view to applying “green” technologies to the school environment, for instance, to improve the energy efficiency and health profile of buildings.

During the same period, the RUS network expanded rapidly from 50 universities in 2017 to almost 80 in 2019 (out of less than 100 public and private universities overall), 500 members and several working groups, covering topics such as waste, energy, climate change, food and inclusion and social justice. In 2019, a “pact for sustainability” was signed by all university presidents and facilitated by the Ministry and a national “technopole” for interdisciplinary research on sustainable development was launched.

Despite the positive reception and the widespread excitement, policy implementation was not straightforward nor devoid of complications and bottlenecks. Moreover, the outbreak of the global COVID-19 pandemic has had a detrimental impact on the process, with significant delays and shifting priorities. As schools were closed for most of 2020, the training programmes designed for the teachers involved in the new sustainable citizenship module were postponed. As universities limited their teaching and research activities to the minimum requirements, only a

minority of RUS members (that is, less than 20 universities) has introduced a full-fledged “Lecture 0” thus far.

In addition, a change of leadership at the Ministry, which was split into basic education on the one side and university/research on the other, caused further delays and some degree of disintegration of common initiatives. As a result, the reform of the scientific disciplinary sector is still pending, while the new national research repository is yet to develop from its embryonic stage.

Lack of resources was also a significant problem. The 2019 law on education for sustainable citizenship made it clear that the reform should not have any additional cost for the State and should not increase the existing workload of teachers. As a result, schools could not expand their teaching curriculum and had to carve out one hour per week for the module by reducing other activities. Without a dedicated cohort of specialized teachers, the new module was entrusted to personnel already teaching other subjects, from law and economics to natural sciences and history. To overcome such “gap” in terms of resources and skills, schools were requested to appoint a sustainability coordinator in charge of overseeing the teaching module and the potential spin-off activities and the Italian Alliance for Sustainable Development (Asvis) was brought onboard to provide know-how and act as a reference network for the school community.

CONCLUSION

There is increasing awareness that the challenges of the present and the future require integrated thinking. In this regard, education institutions play a pivotal role as they help shape our understanding of reality and how to act to address problems that transcend disciplinary boundaries, from climate change to public health and technological transformation.

To foster interdisciplinarity (that is, the collaboration of different disciplines) and, ideally, transdisciplinarity (that is, the creation of new areas of knowledge beyond conventional disciplines), we need to change practices and incentives in teaching and research, which are still designed to strengthen disciplinary segmentation. Moreover, we need to develop new tools to help socialize students (and teachers) into patterns of integrated knowledge. It is unlikely that, without policy reforms in terms of cultural shifts, new practices and different incentives, our academic institutions will change on their own and, above all, that they will do so quickly enough to help address current and future challenges.

Against this backdrop, Italy adopted number of reforms in research and teaching. It encouraged interdisciplinary

research by changing assessment procedures, rewarding initiatives that had practical impacts and breaking down rigid disciplinary sectors. Moreover, it introduced new specific teaching modules conceptualized around the interdisciplinary field of “sustainability,” becoming the first country around the world to make the crosscutting study of sustainable development mandatory for all schools nationwide.

These reforms were welcomed by all sectors of society and by the academic community at large, with strong reverberations globally, thus indicating a widespread need for a new approach to education. However, without dedicated resources (in terms of funds, time and personnel), it is uncertain whether the experiment will produce more far-reaching impacts across the entire education curriculum, influencing how we teach and research in all areas. This is indeed its ultimate goal: not simply generate a new field of academic activity but cross-fertilize all scientific subjects, toward a new integrated approach to knowledge.

More research will be needed on this policy experiment when the current Covid-19 crisis will be over, so as to gauge the extent to which the approach has been successfully implemented and the impacts it may have generated on school and university curricula. It will also be crucial to conduct comparative analyses in other countries that may be in the process of adopting similar strategies, while adapting them to different cultural and geographic settings.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author/s.

AUTHOR CONTRIBUTIONS

LF is the main author of the article and wrote most sections. CG assisted in the literature review and helped conceptualize the approach. FB was one of the main architects of the approach from an implementation point of view and helped develop the methodology. All authors contributed to the article and approved the submitted version.

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