

Under the UNESCO World Higher Education Conference (WHEC2022)

[Section for Higher Education](#) | Division for Education 2030

Type: One organisation  | Alliance

**TITLE “Our common future” for different subjects: How accounting, engineering and pedagogy courses enhance sustainable development literacy**

Calvano Gabriella, Dr, Università degli Studi di Bari

Moggi Sara, Dr, Università degli Studi di Verona

Bonoli Alessandra, Prof., Università degli Studi di Bologna

Giuseppe Pirlo, Prof, Università degli Studi di Bari

Angelo Paletta, Prof, Università degli Studi di Bologna

Date [15/03/2022]

**Abstract**

Considering the pedagogical need for sustainable development the present study presents the results of an explorative study considering how a common framework for teaching sustainable development can affect students from different disciplines, such as accounting, engineering and pedagogy. Through a survey, data collection has been developed looking for the level of students literacy and their perception on sustainable development issues. A first survey collected data at the beginning of three different courses that, despite their different subjects (accounting, engineering and pedagogy), propose a specific section on sustainability. The same survey was proposed at the end of these courses for determining the change in the level of sustainable development literacy of the attending students. First results underline how the same approach can obtain different results on the literacy level of students underlining the importance of a tailor-made education according to different subjects

**Content**

Abstract ..... 1

Content..... 2

Introduction ..... 3

Education for sustainability at university level: meanings and perspectives for action ..... 3

Sustainable futures: developing skills at university ..... 5

Methodology ..... 6

Results: A selection ..... 7

    5.1 Sample Description ..... 7

    5.2 Level of sustainable development literacy..... 7

Discussion and Conclusions..... 9

References..... 9

## Introduction

Universities are one of the most important *drivers of* global competitiveness (Schwab, 2013). They are called upon to adapt to the profound changes and social, environmental, and economic challenges of the local and global context by responding to stakeholders' demands.

As such, the challenges of sustainable development call for universities to be engaged in greening their campuses, reviewing curricula, public and social engagement activities and addressing the needs of local and urban communities (Bergan et al., 2019; Leal Filho et al., 2015; Trencher et al., 2014). Moreover, it is precisely this proximity of universities to the territorial communities to which they belong that has generated a series of highly relevant practices and processes of participation and collaborative learning (Tilbury, 2011; Trencher et al., 2016). That is, sustainability invites universities to be places of critical resistance in which nothing is safe from being questioned (Derrida, 2001).

As the 2030 Agenda highlights (UN, 2015), building a sustainable world requires a profound cultural change, in our lifestyles but also in the ways we think and act. In this process, education assumes a key role because it has the task of forming active and responsible citizens, of forming 'citizens of sustainability' (Wals, 2015; Leicht et al., 2018). This is also true and important at university level (Piza et al., 2018). Indeed, it is precisely universities that are called upon to: rediscover their civic role; recover their natural predisposition to educate on citizenship; create spaces for discussion about problems that have to do with the city and the places where they live, striving to co-construct solutions. As catalysts for change, universities must increasingly ensure that students are active citizens, with a clear idea of what the challenges of the future are and how they should be addressed. For these reasons, education for sustainability at university level cannot be translated into an exclusive transfer of knowledge: it is education that looks to the future and aims to support its construction by taking a global perspective (UNESCO, 2009; Barth et al., 2007).

Considering the pedagogical need for sustainable development the present study presents the results of an explorative study considering how a common framework for teaching sustainable development can affect students from different disciplines, such as accounting, engineering and pedagogy. Through a survey, data collection has been developed looking for the level of students literacy and their perception on sustainable development issues. A first survey collected data at the beginning of three different courses that, despite their different subjects (accounting, engineering and pedagogy), propose a specific section on sustainability. The same survey was proposed at the end of these courses for determining the change in the level of sustainable development literacy of the attending students.

The remainder of this paper is as follows: Section 2 and 3 presents an overview on the literature review on education for sustainable development. Section 4 describes the methodology and how data collection was carried out. Section 5 presents findings of the present study, rather Section 6 presents discussion, conclusions and suggestions future research development.

## Education for sustainability at university level: meanings and perspectives for action

Today, more than in the past, the challenges of sustainability have such a high impact on people's lives that they require a special and constant commitment from all educational institutions and agencies. They are called upon to promote and guide a profound and radical change in lifestyles and consumption. These changes must be accompanied by changes in the way we relate to the world and to people. Sustainability, we should always reiterate, becomes concrete to the extent that economic and environmental issues are fully balanced with social

issues through the guarantee of rights, justice, and equal opportunities for all. Moreover, sustainability is not a static, stable, and unambiguously definable concept (Wals & Jickling, 2002), but a highly dynamic one. It is "learning to live, in an equitable perspective shared with all human beings, within the physical and biological boundaries of the only planet we are able to inhabit: the Earth" (Bologna, 2018, p. 41). This means that sustainability is itself education, a constant process of change and systemic co-evolution. This observation has considerable implications for the education for sustainable development that is proposed and implemented at university level. These processes, in fact, must be evolutionary, adaptive, historically, and geographically determined, built on the needs of the context of reference but at the same time capable of inducing reflection on the repercussions and consequences that every single action produced at local level has inevitable reverberations on a global scale.

In this perspective, universities should perceive themselves and organise themselves as a system within which governance, policies, processes, and actions are consistent with sustainability and its principles: the university community should "live" sustainability in all the dynamics that characterise it (Calvano, 2017). It should be a fertile and generative field (Magatti & Giaccardi, 2014) engaged in actions that aim to produce, in the short, medium, and long term, a strong and long-lasting social and civic impact. For these reasons, national and local governments have not infrequently found in higher education institutions and their communities the point of reference for understanding the phenomena of sustainability and for identifying the solutions necessary to address possible problems and/or needs: because universities are containers of a multiplicity of skills and professionalism but also expressions of different disciplines and knowledge; they are generators of social, as well as technological innovation, and can promote the development of critical, complex, connecting thinking (Lambrechts & Van Petegem, 2016; Stephens et al., 2008).

The central role that education plays in sustainable development processes was made explicit during the Rio Conference in 1992, in Chapter 36 of Agenda 21, a document that still represents one of the most important legacies of the Earth Summit. The Unesco Decade of Education for Sustainable Development (DESS 2005-2014) and Goal 4 of the 2030 Agenda have reinforced the idea and awareness that in order to orient behaviour towards development models with a better future, a change of mentality is needed that implies changes in the educational field, in view of the definition, implementation and evaluation of paths that are both an expression and an opportunity for education for sustainable development.

Underlying education for sustainable development, then, is a commitment to reorienting students' learning experiences so that they also understand their professional responsibilities alongside their own personal skills, motivations, and responsibilities. Taking on board international calls to rethink education through more holistic perspectives (Colonna, 2020; Hopkins et al., 2020), the aim of such educational pathways is to enable learners to adopt more sustainable lifestyles, not only in the domestic and private sphere, but also by influencing change within their own profession and wider work contexts. The focus of education for sustainable development can, then, only be of a pedagogical nature as we do not want (as it is not enough) only to 'teach' sustainable development, transferring specialist knowledge of this area, but we are aware that it is necessary to equip, even the learners, with all the tools, values, capabilities that allow them to respond to the complexity and uncertainties of the future (Mulà et al., 2017, p. 799). For these reasons, "pedagogical reflection opens up to a dimension that is both inter-trans disciplinary which, through the categories of the pedagogical, reads and interprets the social" (Mannese, 2021, p. 25). To educate for sustainability is to promote a new way of seeing the world and perceiving ourselves and being part of it (Wals, 2010), always being attentive to ethical and political issues (Makrakis, 2017) and how we deal with them.

The numerous events and documents that in recent years have contributed to the emergence and consolidation of the strategic role of education for sustainable development (Calvano, 2017) have strongly sanctioned the importance and urgency of revising not only the content, but also (and perhaps above all) the teaching practices, still predominantly of a transmissive type, currently used in university contexts, to leave more space for transformative educational experiences.

In this regard, it is worth recalling Stephen Sterling's (2006) distinction between 'education to/about sustainable development', 'education for sustainable development' and 'sustainable education'. Only a truly transformative education, which has learning for change as its main purpose, is able to encourage behaviour and lifestyles that are more compatible with the survival of life on the planet, in all its forms. But it is the university itself that must propose itself as a transformative institution, where the transformative university "is a reflective and critical university, which seeks to transform the world so that it assumes the democratic values of freedom, inclusion, equity and justice. It is a university that is against the status quo and the establishment and that promotes within and outside its walls a more equitable society in which citizens can express the diversity of visions and values" (Guzmán-Valenzuela, 2016, p. 673). In it, there are pedagogical spaces where students are no longer considered exclusively as 'consumers of knowledge' but become producers of the same since, also together with other members of the university community, they question existing problems and work with the aim of identifying possible solutions, including regarding issues of sustainable development (Calvano et al., 2019).

### **Sustainable futures: developing skills at university**

In the transition from solid to liquid modernity, people are suggested to find alternative ways of organising their lives as existing social forms can no longer be considered as frames of reference for their actions (Baumann, 2011). In this 'liquid' and multifaceted context, the skills traditionally developed through university education may become obsolete. The university must choose "whether to train a one-dimensional man, the competent but politically indifferent producer, disengaged and conformist, or the complete man: a participatory and reflective citizen, and producer at the same time" (Baldacci, 2019, p. 11). It is appropriate, therefore, to start setting more ambitious learning goals, capable of preparing students to be resilient and to go beyond the environmental, economic, social, and health shocks we will increasingly face in the future (Giovannini, 2018).

According to Rieckmann (2012), there can be two intersections between sustainable higher education institutions and the future:

Sustainable universities aim to develop the skills needed to tackle complex problems, helping to build a more equitable and just future.

through its work, universities should contribute to building sustainable development.

To these two intersections we can add a third. Universities train the professionals of the future and therefore those who have the task of imagining and implementing sustainability policies and actions: for these reasons, universities should profile new professional figures (green and sustainable) and design their training courses in such a way that they are able to guarantee not only prepared and flexible professionals but also responsible citizens. In this way, universities would also recover their educational role (Calvano, 2021).

The development of sustainability skills is, therefore, the response that universities can give to the need to educate about uncertainty and complexity (Fedeeva & Mochizuki, 2010). Wiek et al. (2011) describes a framework of seven key and transversal competences that are found to be fundamental in the field of sustainability: problem solving, strategic, social, and

interpersonal, systems thinking, normative, predictive skills. Unesco (2017) adds others to this list: collaborative competence, critical thinking, self-awareness. Moreover, through the DeSeCo project, the OECD has also emphasised the role that key, transversal and citizenship skills play in sustainable development and social cohesion processes (OECD, 2005).

The university of competences, the discussed, ambitious, and as yet unachieved outcome of the Bologna Process, cannot but focus on sustainability competences, which have been at the centre of the international debate in the field of education for sustainable development research for a few years now (Wiek et al., 2011; Fedeeva & Mochizuki, 2010; Rychen, 2003). They do not, of course, replace those of the specific disciplinary domain but, as transversal, they bring together competences from different domains (Barth et al., 2007, p. 417) and this is an increasingly indispensable condition to implement because "simply increasing basic literacy on sustainability, as taught in most countries, will not advance sustainable societies. [...] What is needed is - knowledge, skills, values, and perspectives that encourage and support public participation" (UNESCO, 2005).

Through the definition of pathways that promote the competences, university education can become "enabling" (Arnold & Lermen, 2005), i.e., capable of guaranteeing both the training necessary for professional development and the development of the personality and the person, of the planetary citizen, allowing him to "develop what is best in him, namely his ability to be responsible and supportive" (Morin, 2020, p. 107).

The orientation towards inter-transdisciplinarity becomes a central challenge of education for sustainable development and is a *conditio sine qua non* for activating and enhancing key competencies, promoting experiences in the course of which reflection paths are launched on how each piece of knowledge affects the world, on a specific issue, and on how different pieces of knowledge allow us to better interpret the reality in which we live, to experiment with possible solutions, to understand the relationality that is characteristic of the hypercomplex society in which we live and of which we are part (Buckingham, 2014; Barnett 2012; Id, 2000). Universities should encourage inter-transdisciplinary learning processes, also through comparison and dialogue with the surrounding reality, businesses, and territorial institutions, by organising opportunities for reflection on contemporary problems. If we want to ensure that students can learn to connect what they learn in university classrooms with the contexts in which they live, a change in the way of understanding and implementing training and university programmes seems increasingly necessary: paths for the development of transversal skills, experiences of service learning, voluntary work, mentoring, co-construction of knowledge, workshops, debates and opportunities for discussion and community reflection are just some possible training opportunities that can be particularly effective if we want to promote education not only for sustainable development but education as sustainability (Sterling, 2006).

## Methodology

Data collection was carried by three different researchers from September 2021 to January 2022 embedding to separate round of submission and involving three different Italian universities: University of Bari; University of Verona; University of Bologna. Considering the pedagogical need for sustainable development the survey looks for how a common framework for teaching sustainable development can affects students from different disciplines, such as accounting, engineering and pedagogy. The framework for the survey was design considering the main studies on education for sustainable development and was divided in two separate section. A first section looks for the respondents personal data, rather the second one detect the level of students literacy on sustainable development issue through a 5-point Likert scale

where 1 is the lower lever rather 5 is the maximum rate of literacy or importance of a specific issue (e.g., 2030 Agenda, circular economy).

For determining the change in the level of sustainable development literacy of the attending students, the same survey was proposed both at the beginning and at the end of three different courses. Data collection has been developed looking for the level of student's literacy and their perception on sustainable development issues. These surveys collected data on three courses that propose a dedicated part on sustainable development. These three courses were carried out during the first academic semester of the Italian academic year 2021/2022, and are on accounting, engineering and pedagogy with an average of 100 student per class.

During the course a dedicated period presents 2030 Agenda issue and involve students in building their own project toward a more sustainable society. To the students also requested to presented their own case study on own SDG can influence the selected case (universities, companies, non profit organizations, etc).

### Results: A selection

This section presents the first attempt of data analysis of 614 valid answers coming from the two surveys. Data are presented comparing the results considering the answers at the begging of the three course and at the end of them. The first subsection proposes the sample description, rather second one presents the main results on students' perception and literacy on sustainable development.

Data are presented through a selection of the main results of the two survey. The soft-colour graphs present the ex ante data collection the stronger-colour graph the ex post facto data collection.

#### 5.1 Sample Description

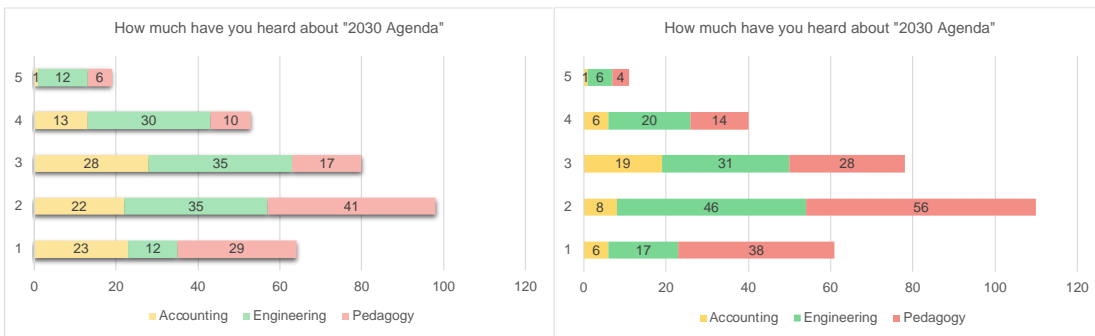
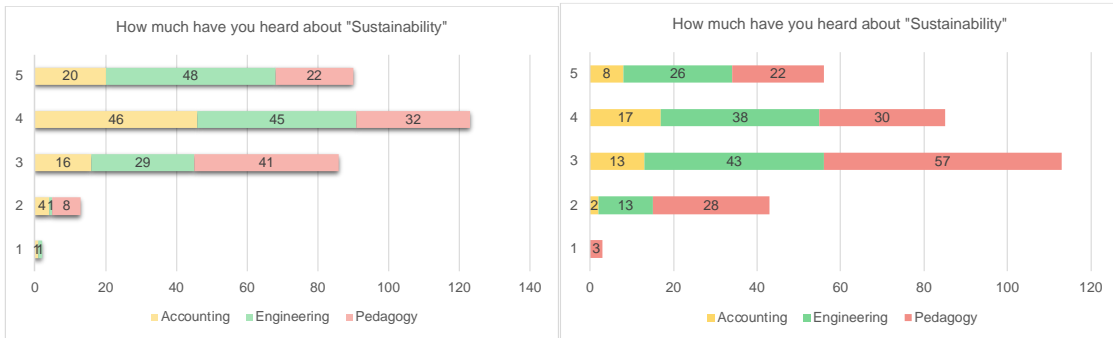
The data collection ensures 614 valid answers: 314 from the survey ex ante and 300 from the survey ex post facto.

	<i>Ex Ante</i>	<i>Ex post facto</i>
<b>Gender</b>	222 Female; 91 Male; 1 I prefer not to answer	193 Female; 106 Male; 1 I prefer not to answer
<b>Age</b>	Mean 22.73; Min 20; Max 31	Mean 22.66; Min 20; Max 31
<b>Courses</b>	Accounting 87; Engineering 124; Pedagogy 103	Accounting 40; Engineering 120; Pedagogy 140
<b>Level of degree</b>	bachelor's degree 131; master's degree 183	bachelor's degree 147; master's degree 153

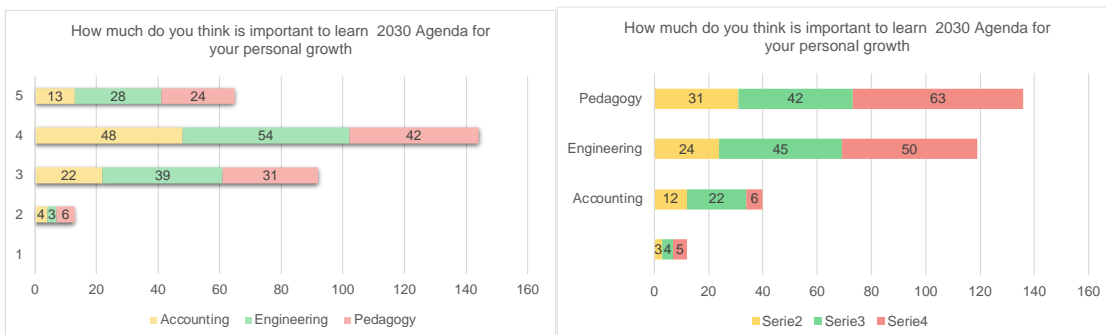
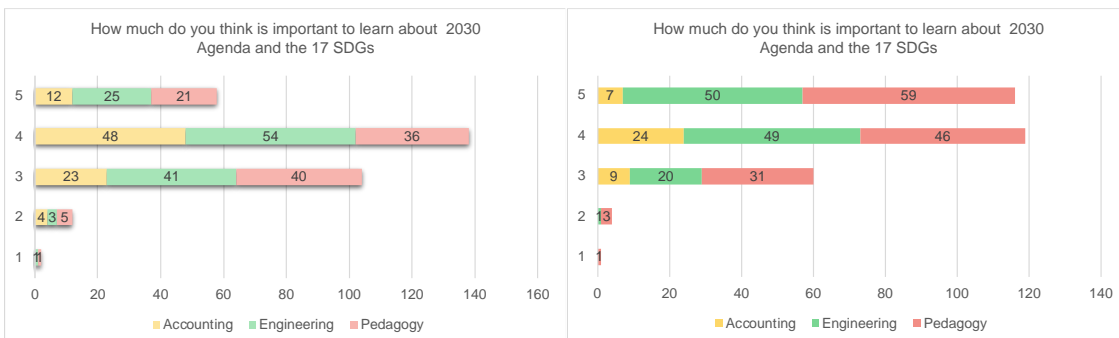
Table 1 – Sample description

#### 5.2 Level of sustainable development literacy

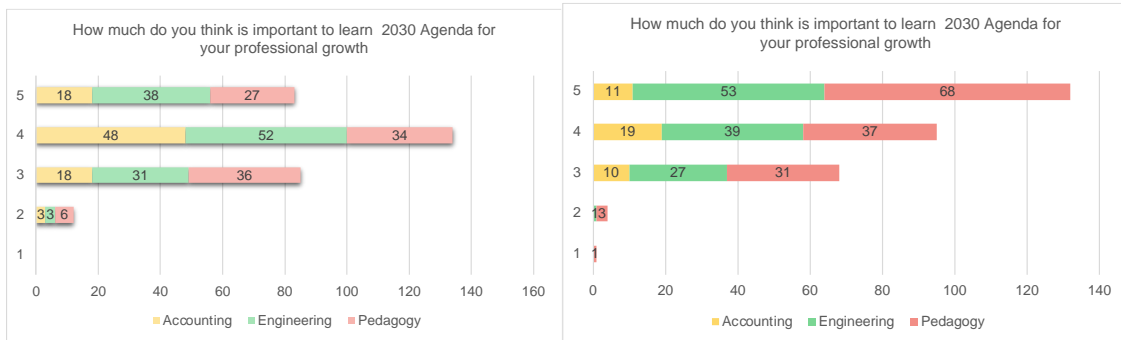
Considering the main results from the second part of the survey, the level of literacy seems increased at different level in the three type of courses.



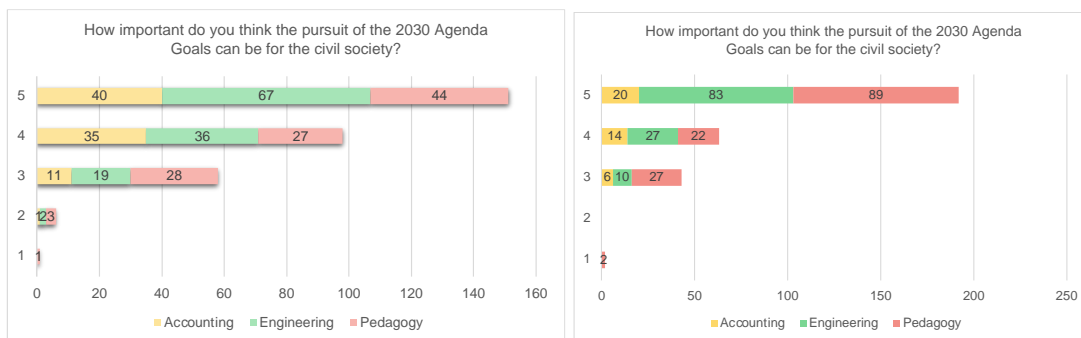
Similar results have been researched asking about their awareness on “sustainable development” and “circular economy” and “inclusion and equal opportunities”.







The survey also requests the opinion on the importance of 2030 Agenda for different entities, such as businesses, universities, non-profit organizations, and civil society as follow.



Finally, the students were asked how to improve their learning during the related course and a number of them requested for more practice and a concrete project to apply for really steer the change toward a more sustainable development.

## Discussion and Conclusions

The present study proposes a first overview on a study that involved the Universities of Bari, Verona and Bologna in Italy. The main purpose is to explore how the same teaching approach toward 2030 Agenda and SDGs can differently affect the level of literacy of students coming from different courses (accounting, engineering, pedagogy). The first overview of the collected data, present interesting suggestions, as the reactions from students a quite different in accordance with their studies. This suggest that, despite a common approach can be applied, it should be better considered a tailored-made approach adequate to the different kind of subjects thought.

## References

- Arnold, R., Lermen, M. (2005). Didaktik des E-Learning. Baltmannsweiler: SchneiderVerlag Hohengehren.
- Baldacci, M. (2019). La scuola al bivio. Mercato o democrazia. Milano: Franco Angeli
- Barnett, R. (2000). University knowledge in an age of supercomplexity. Higher education, 40(4), 409-422.
- Barnett, R. (2012). Learning for an unknown future, Higher Education Research & Development, 31(1), 65-77.

Barth, M., Godemann, J., Rieckmann, M., Stoltenberg, U. (2007). Developing key competences for sustainable development in higher education. *International Journal of Sustainability in Higher Education*, 8, 416-430.

Baumann, Z. (2011). *Modernità liquida*. Roma-Bari: Laterza.

Bergan, S., Harkavy, I., Munck, R. (Eds) (2019). *The local mission of Higher Education. Principles and Practice*. Dublin: Glasnevin Publishing.

Bologna, G. (2018). È possibile lo sviluppo sostenibile nell'Antropocene? In Von Weizsacker, E.U., Wijkman, A., *Come On! Come fermare la distruzione del pianeta*. Firenze: Giunti, 19-48.

Buckingham, W. (2014). Communicating Not-Knowing: Education, Daoism and Epistemological Chaos, *China Media Research*, 10(4), 10-19.

Calvano, G. (2021). The third mission that looks to the future: for a sustainable, transformative, civic university. *Formazione Lavoro Persona*, 33, 75-89.

Calvano, G. (2017). *Educare per lo sviluppo sostenibile. L'impegno degli Atenei italiani: esperienze in corso e buone pratiche*. Roma: Aracne.

Calvano, G., Paletta, A., Bonoli, A. (2019). How the structures of a Green Campus promote the development of sustainability competences. The experience of the University of Bologna. In Leal Filho, W., Bardi, U. (Eds). *Sustainability on University Campuses: Learning, Skills Building and Best Practices*. Cham: Springer, 31-44.

Colonna, A. (2020). Creating communities of knowledge and connecting to landscape. In: UNESCO, *Humanistic futures of learning - Perspectives from UNESCO Chairs and UNITWIN Networks*. UNESCO, France, 16-20.

Derrida, J., Rovatti P.A. (2002), *L'Università senza condizione*. Milano: Raffaello Cortina

Fedeeva, Z., Mochizuki, Y. (2010). Higher education for today and tomorrow: university appraisal for diversity, innovation and change towards sustainable development. *Sustainability Science*, 5, 249-256.

Giovannini, E. (2018). *L'utopia sostenibile*, Roma-Bari: Laterza.

Guzman-Valenzuela, C. (2016). Unfolding the meaning of public(s) in universities: toward the transformative university. *Higher Education*, 71, 667-679.

Hopkins, C. A., Michelsen, G., Salite, I., Siegmund, A., Wagner, D. A., Yokoi, A., Fischer, D., Kohl, K., Razak, D. A., & Tilleczek, K. (2020). Sustainability as a purpose on the new path of learning for the future. In: UNESCO, *Humanistic futures of learning - Perspectives from UNESCO Chairs and UNITWIN Networks*. UNESCO, France, 58-62.

Lambrechts, W., & Van Petegem, P. (2016). The interrelations between competences for sustainable development and research competences. *International Journal of Sustainability in Higher Education*, 17(6), 776–795.

Leal Filho, W., Muthu, N., Edwin, G., Sima, M. (2015). *Implementing Campus Greening Initiatives: Approaches, Methods and Perspectives*. Cham: Springer International Publishing.

Leicht, A., Heiss J., Byun, W.J. (eds.) (2018). *Issues and trends in Education for Sustainable Development*. Unesco Publishing: Paris.

Magatti, M., Giaccardi, C. (2014). *Generativi di tutto il mondo unitevi!*. Feltrinelli: Milano.

Makrakis, V. (2017). Developing and validating a sustainability justice instrument to transform curriculum, learning and teaching. 9th International Conference in Open & Distance Learning, November, Athens.

- Mannese, E. (2021). La pedagogia, scienza di confine, tra innovazione, sostenibilità e orientamento efficace. *Formazione & Insegnamento*, XIX, n.1, 24-30.
- Morin, E. (2020). *Cambiamo strada. Le 15 lezioni del coronavirus*. Milano: Raffaello Cortina.
- Mulà, I., Tilbury, D., Ryan, A., Mader, M., Dlouha, J., Mader, C., Benayas, J., Dlouhy, J., Alba, D. (2017). Catalysing Change in Higher Education for Sustainable Development. A review of professional development initiatives for university educators. *International Journal of Sustainability in Higher Education*, 18(5), 798-820.
- OECD (2005). Definition and selection of key competences. In <https://www.oecd.org/pisa/35070367.pdf>
- Piza, V., Aparicio, J., Rodriguez, C., Marin, R., Beltran, J., Bedolla, R. (2018). Sustainability in Higher Education: A Didactic Strategy for Environmental Mainstream. *Sustainability*, 10, 4556.
- Rychen, D. (2003). Key competencies: Meeting important challenges in life. In Rychen, D., Salganik, L. (Eds.). *Key competencies for a successful life and well-functioning society*. Cambridge/MA., Toronto, Bern, Göttingen: Hogrefe & Huber, 63-107.
- Rieckmann, M. (2012). Future-oriented higher education: Which key competencies should be fostered through university teaching and learning? *Futures*, 44, 127-135.
- Sterling S. (2006). *Educazione sostenibile*. Cesena: Anima Mundi.
- Schwab, K., (2013). *The Global Competitiveness Report 2013-2014*. Switzerland: World Economic Forum.
- Stephens, J.C., Romàn, M., Graham, A.C., Scholz, R.W. (2008). Higher education as a change agent for sustainability in different cultures and contexts. *International Journal of Sustainability in Higher Education*, 9, 317-338.
- Tilbury, D. (2011). *Education for Sustainable Development: an Expert Review of Processes and Learning*. Paris: Unesco.
- Trencher, G., Rosenberg Daneri, D., McCormick, K., Terada, T., Peterson, J., Yarime, M., Kiss, B. (2016). The role of students in the co-creation of transformational knowledge and sustainability experiments: experiences from Sweden, Japan and the USA. In Leal Filho, W., Brandli, L. (Eds.), *Engaging Stakeholders in Education for Sustainable Development at University Level*. Berlin: Springer.
- Trencher, G., Yarime, M., McCormick, K.B., Doll, C.N., Kraines, S.B. (2014). Beyond the third mission: exploring the emerging university function of co-creation for sustainability. *Science and Public Policy*, 41, 151-179.
- Unesco (2017). *Education for Sustainable Development Goals. Learning objectives*, Paris: Unesco.
- Unesco (2009). *Unesco World Conference on Education for Sustainable Development: Bonn Declaration*. Paris: Unesco.
- Unesco (2005). *United Nations Decade of Education for Sustainable Development 2005-2014. International Implementation Scheme*. Paris: Unesco.
- United Nations (2015), *Transforming our World. The 2030 Agenda for sustainable development*. In <https://sdgs.un.org/2030agenda>.
- Wals, A.E.J. (2015). *Beyond Unreasonable Doubt. Education and Learning for Socio-ecological Sustainability in the Anthropocene*. Wageningen University: Wageningen.

Wals, A.E.J., Jickling, B. (2002). "Sustainability" in higher education: from doublethink and newspeak to critical thinking and meaningful learning. *International Journal of Sustainability in Higher Education*, 3, 221-232.

Wals, A.E.J. (2010). Mirroring, Gestaltswitching and transformative social learning: steppingstones for developing sustainability competence. *International Journal of Sustainability in Higher Education*, 11, 380-390.

Wiek, A., Withycombe, L., Redman, C.L. (2011). Key competencies in sustainability: A reference framework for academic program development. *Sustainability Science*, 6, 203-213.