Original Paper

Is nature conservation included in the training of teachers and educators?

The contribution of the SOFIA educational platform

Caterina Lorenzi, Franca Sangiorgio

Received: 28 August 2024 | **Accepted:** 6 November 2024 | **Published:** 29 November 2024

1. **Introduction**
2. **Materials and methods**
3. **Findings and discussion**
4. **Conclusions and future perspectives**

Keywords: ecology; environmental education; nature conservation; SOFIA platform; teachers and educators' training.

Abstract. *In the context of education for sustainable development, ecology can play a pivotal role in transforming human society. In this framework, the present paper addresses the training of Italian Teachers and Educators (T&Es) in ecological topics, with a special focus on nature conservation – a topic that has garnered increasing attention in recent years. The analysis centres on Italy's national training platform for schools, Sistema Operativo per la Formazione e le Iniziative di Aggiornamento del personale della scuola*

(SOFIA) – a unique platform in terms of relevance within the Italian education system. Our findings reveal a notable lack of attention to ecological topics, particularly nature conservation topics, within its training programs. We also observed that keywords such as "ecosystem", "ecology" and "climate change", used to identify courses on SOFIA, are often used in ways that diverge from their ecological roots. This issue is explored in the context of a rapidly evolving educational culture, where traditional ecological terms appear to be losing their effectiveness in identifying educational areas with a focus on ecology and nature, while acquiring different connotations altogether in other disciplines. The current polysemic usage of these keywords significantly complicates the identification of courses strictly focused on ecological topics for teachers and educators seeking their further training. This difficulty is even more significant in the context of ecological content with a special focus on nature conservation, where educational offerings are already limited. The paper concludes with a reflection on educational approaches that affect the availability of courses aimed at T&Es.

1. Introduction

In the current geological era, recognised by many as the Anthropocene (Crutzen & Stoemer, 2000), we face huge environmental challenges such as climate change, biodiversity decline and habitat loss (Cooke et al., 2021). In recent years, the integration of the 2030 Agenda for Sustainable Development (United Nations [UN], 2015)[1] into cultural, administrative, and educational spheres of civil society, has led to a broader perception of the environment as a complex system. This transformation calls for a comprehensive understanding of the trans-scalar and inter-sectoral relationships linking both humans and nature to the global scale of environmental problems (Intergovernmental Panel on Climate Change [IPCC], 2021). For example, regional climate change is seen as strongly interconnected with global climate change. Furthermore, understanding of environmental topics is no longer being addressed solely at the governmental and

[1] https://sdgs.un.org/2030agenda. Accessed 20 June 2024.

intergovernmental level, but is also being tackled locally through awareness-raising initiatives aimed at the general public. In fact, the general public's understanding of environmental issues is crucial not only for reducing negative human impact on the environment but also for promoting Nature Conservation (NC). NC is defined here on the basis of the World Conservation Strategy - WCS, prepared by International Union for Conservation of Nature and Natural Resources [IUCN], United Nations Environment Programme [UNEP], World Wildlife Fund [WWF] (1980), that defines *Conservation* as "the management of human use of the biosphere so that it may yield the greatest sustainable benefit to present generations while maintaining its potential to meet the needs and aspirations of future generations". This WCS definition revolves around the *living resource conservation*,[2] a key concept of the NC practices. NC topics represent a mainstream subject within Environmental Education (EE). A specific sector of EE literature that addresses the themes of NC is Conservation Education.[3] This field illustrates the many techniques available for creating effective education and outreach programs for conservation (Jacobson, McDuff & Monroe, 2015) included within the broader framework of practices aimed at sustainable development as outlined in the 2030 Agenda for Sustainable Development. Education plays a central role in this context, and all levels of governments, from local to global, are being asked to develop programs for sustainable development, including education campaigns (UN, 1992, 2015). These efforts involve investing in training, education, digital literacy, and capacity-building (United Nations Educational, Scientific and Cultural Organization [UNESCO], 2021a). UNESCO (2021b) stresses that "one of the areas that needs significant attention is building the capacity of educators to ensure that education for sustainable development and environmental education content is effectively introduced in the various subjects, courses, and grade levels". In the framework of education

[2] According to WCS living resource conservation has three specific objectives: "to maintain essential ecological processes and life-support systems (such as soil regeneration and protection, the recycling of nutrients, and the cleansing of waters), on which human survival and development depend; to preserve genetic diversity (the range of genetic material found in the world's organisms), on which depend the breeding programmes necessary for the protection and improvement of cultivated plants and domesticated animals, as well as much scientific advance, technical innovation, and the security of the many industries that use living resources; to ensure the sustainable utilisation of species and ecosystems (notably fish and other wildlife, forests and grazing lands), which support millions of rural communities as well as major industries". https://portals.iucn.org/library/efiles/documents/wcs-004.pdf. Accessed 20 June 2024.

[3] According to its traditional definition, Conservation Education is "the study of man's intelligent use of his natural environment through the development, management, preservation, and renewal of natural resources for his material, cultural, and aesthetic needs to benefit present and future generations" (Warren, 1970).

for sustainable development, ecology plays an important role in the transformation of human society (UNESCO, 2018).

This conceptual framework also draws attention to the complexity of the interdisciplinary knowledge system involved in EE practices, specifically concerning Conservation Education. Now, this conceptual and procedural complexity could disorient teachers and educators,[4] particularly those interested in NC. In this framework, a focal key question is: what is the current situation of educational processes in schools regarding ecological topics and NC? To answer this question several factors should be considered, starting with the school curriculum.[5] UNESCO (2021b), relating to a global review of national curricula and policy documents, points out that in 2021 47% of national curricula in 100 countries had no references to climate change and only 53% included climate change at least once. According to a similar survey by UNESCO (2021a), 45% of national primary and secondary education policies and curricula, surveyed across 46 UNESCO Member States, made little-to-no reference to environmental themes such as biodiversity. Mulvik et al., (2021), in a survey targeting primary and secondary teachers, report that half of EU Member States are working on competencies for the general theme of "environmental sustainability"; however, the latter is not yet considered a systemic feature of education and training policy in the EU (European Commission [EC], 2022). In the United Kingdom, in 2020, the Climate Assembly recommended making climate change a compulsory subject in all schools.[6] In Italy, the education system has recently increased its commitment to environmental themes in formal education: in 2019 a law was passed making environmentally sustainable development compulsory for all students in primary and secondary education.[7]

Another element to consider is the focus on T&E training on NC topics. Concerning the presence of environmental issues in teacher education, UNESCO underlines a considerable variation across countries, ranging from 16% in Croatia to 82% in Colombia, and 27% in Malta and Italy (Wheeler, 2019, as cited in UNESCO, 2021a, p. 19). On top of that, training activities aimed at

[4] Hereafter, we will refer to Teachers and Educators using the acronym T&Es.

[5] There are many definitions of "school curriculum" in the literature. For further information on this topic see Aliyeva (2016) who proposes, among others, Tyler's definition: "[The curriculum is] all the learning experiences planned and directed by the school to attain its educational goals".

[6] https://lordslibrary.parliament.uk/. Accessed 23 May 2023.

[7] *LEGGE 20 agosto 2019, n. 92, Introduzione dell'insegnamento scolastico dell'educazione civica. (19G00105) (GU n. 195 del 21-8-2019)* tr. LAW 20 August 2019, n. 92, Introduction of the teaching of civic education in schools. (19G00105) (GU n. 195 del 21-8-2019)

T&Es on environmental issues present gaps in many countries. According to a recent UNESCO survey, which conducted 1600 interviews in 93 countries, environment-related issues are debated little in teacher training programs: only 30% of pre-service and in-service training included environmental issues. Concerning climate change, nearly 95% of teachers believed that "it is important or very important to teach about the severity of climate change and its effects". However, only about 40% of teachers were confident in teaching the cognitive dimensions of climate change, and only about one-fifth of them could explain well how to reduce one's carbon footprint (UNESCO, 2021a). Considering this point, it is clearly essential to promote training initiatives for T&Es on ecological topics, in order to meet the educational needs of future generations and enable them to acquire the knowledge, skills, values and attitudes that will make them conscious contributors to sustainable development (Prisco, 2022) and NC. In various countries, several actions are thus being carried out to reinforce the training of teachers on environmental issues, so as to enable them to be agents of change.

Another aspect to be taken into account in the training of T&Es is the role of digital technologies. Information and Communication Technology (ICT), in fact, is increasingly used in scientific dissemination as well as formal and non-formal education processes (Artacho et al., 2020). For this reason, in 2016 the Italian Ministry of Education, published a National Plan for Digital Education (PNSD) to promote the use of ICT, stimulate innovation and improve teachers' digital competences (Bocconi, Panesi & Kampylis, 2020). Among ICT tools, digital platforms have become an unavoidable part of modern education (Nichols & Garcia, 2022), being increasingly used to support teaching, and learning in several disciplines, including ecology (Sangiorgio et al., 2014a, 2014b). In the school context, education platforms serve as a meeting point for the school communities involved in early childhood, primary, secondary, and initial vocational education. These platforms provide certificates of attendance that can be valuable for the careers of T&Es. One notable example on a transnational scale is the European School Education Platform, which benefits all stakeholders in the school sector by providing access to new content and teaching materials, especially related to European projects.[8]

In Italy, there is an educational platform called "Sistema Operativo per la Formazione e le Iniziative di Aggiornamento del personale della scuola

[8] https://school-education.ec.europa.eu/en. Accessed 23 July 2024.

(SOFIA)",[9] which is recognised and certified by the Ministry of Education and Merit. This platform has been the focus of our research. SOFIA was introduced by the law 107/2015 as compulsory for all Italian schools. It hosts courses and initiatives provided by accredited bodies such as universities, research centres, as well as professional and disciplinary associations linked to scientific communities. SOFIA is considered unique in terms of relevance within the Italian education system (Olivanti, Meschiari & Gastaldi, 2022) and is particularly useful for offering a comprehensive catalogue of the Continuing Teacher Education (Gentile, 2023). The importance of the SOFIA platform in Italian T&E training is testified by the fact that participants in its programs are entitled to exemptions from duty. This reflects the fact that in-service training is considered a mandatory, permanent, and integral part of the teaching profession.[10]

Procedurally, the platform is designed for in-service T&Es from schools at all levels, as well as other school system personnel. It provides a range of thematic macro-categories through which users can explore various training offerings. These courses, delivered both in-person and online, are created and managed by public and private providers across Italy that are subject to evaluation, following a ministerial directive that regulates the accreditation, qualification, and recognition of training providers.[11] SOFIA thus certifies and guarantees the quality of the training programs offered.

To ensure user satisfaction, the platform allows participants to provide feedback on individual courses via a questionnaire. Completing this evaluation is required to obtain a certificate of participation.

Given these features, we decided to explore the training opportunities available to T&Es by observing SOFIA, specifically addressing the following research question: does the SOFIA platform offer training programs for Italian in-service T&Es specifically focused on ecological topics related to NC? Additionally, we offer reflections on the future perspectives of T&E training in this area.

---

[9] *Sistema Operativo per la Formazione e le Iniziative di Aggiornamento del personale della scuola* tr. Operating System for the Training of school staff; available at: https://sofia.istruzione.it/. Last accessed 30 April 2024.

[10] Directive 107/2015 art 1, comma 124.

[11] Directive 170/ 2016; https://www.miur.gov.it/web/guest/enti-accreditati/qualificati. Accessed 20 June 2024.

2. Materials and methods

To answer the research question, we have chosen to look into the SOFIA educational platform in detail.[12] On it, T&Es interested in NC or, more generally, in ecological topics can find a course catalogue organised in stable macro-categories representing specific areas of knowledge; these macro-categories are clearly labelled with titles and logos explaining the covered topics (Figures 1, 2). T&Es can access the courses of interest in two ways: by directly browsing the macro-categories or by typing keywords in the "search" field. Among the 13 macro-categories, the one titled "Conoscenza e rispetto della realtà naturale e ambientale"[13] is the most relevant for our purposes.

To address our research question, we searched for courses by keyword; then we analysed the presentation text of each course. Keywords such as *biodiversity*, *climate change*, *ecology*, and *ecosystem/s* were chosen according to UNESCO (2021a), with the addition of *nature conservation*.[14]

3. Findings and discussion

SOFIA's catalogue includes 13 macro-categories (see Figures 1 and 2). These macro-categories have a high degree of heterogeneity in terms of the number of courses per category, ranging from 1.2% (89 out of 7459 courses) for "Education in economic culture" and 20.0% (1491 out of 7459 courses) for "Teaching of individual disciplines as per regulations" (Figure 3).

The first aspect to highlight concerns the macro-category that, as suggested by the title "Knowledge and respect for nature and the environment", is dedicated to environmental knowledge and education. The presence of this macro-category suggests a general interest within the Italian training system in topics concerning "nature" and more broadly "the environment". Looking inside the "Knowledge and respect for nature and the environment" macro-category, however, it becomes clear that this interest is not reflected in the actual educational offer. In fact, the courses in this macro-category are only 3.7% (275 out of 7459) – a relatively low percentage compared to other macro-categories such as 16.9%

[12] Our research on SOFIA was conducted in April 2024.

[13] Knowledge and respect for nature and the environment (translation by the authors).

[14] The term 'Nature Conservation' is widely recognised and likely familiar to T&Es. A quick search online reveals numerous sites that extensively use this term, including universities and governmental organisations focused on environmental issues.

(1259 out of 7459) for "School and social inclusion" and 15.7% (1172 out of 7459) for "Individual and social needs of students", both addressing social issues (Figure 3).

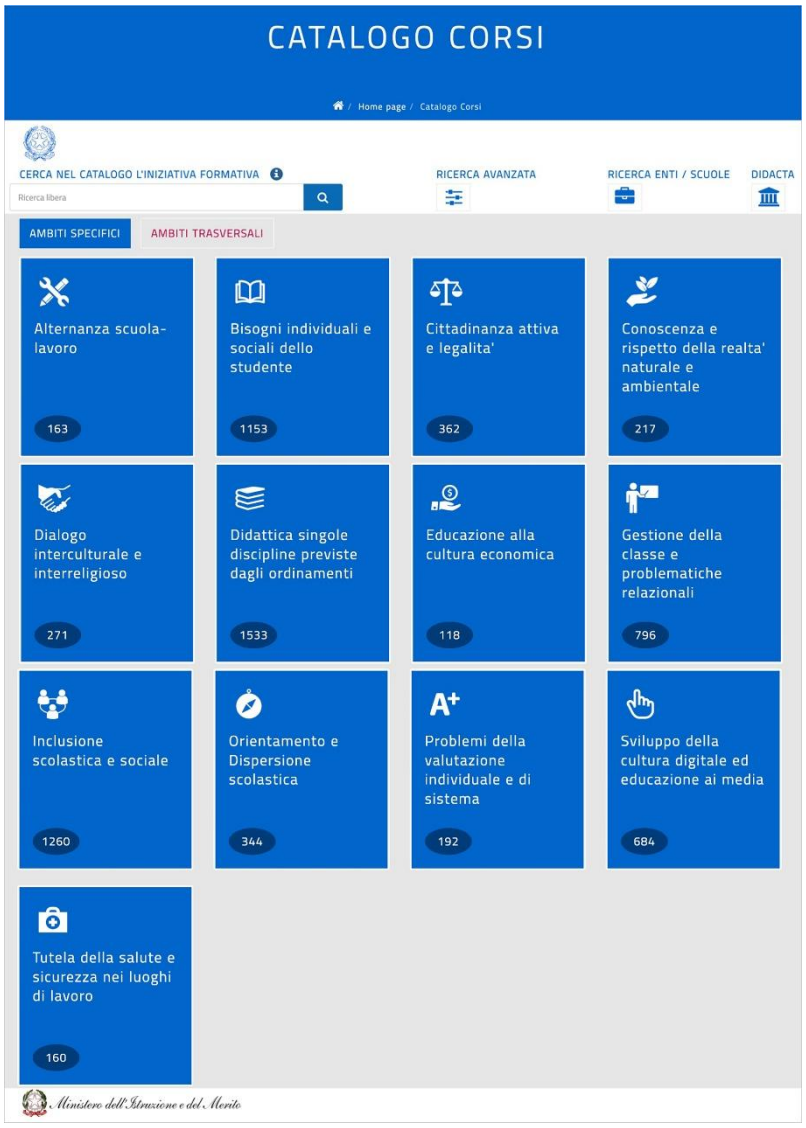

Figure 1. The SOFIA webpage indicating the courses' macro-categories (https://sofia.istruzione.it/).

Macro-categories
Work-school
Individual and social needs of students
Active citizenship and legality
Knowledge and respect for nature and the environment
Inter-cultural and inter-religious debate
Teaching of individual disciplines as per regulations
Education in economic culture
Classroom management and relational problems
School and social inclusion
Orientation and school dropout
Problems of individual and systemic evaluation
Development of digital culture and media education

Figure 2. English titles of the SOFIA macro-categories (https://sofia.istruzione.it/).

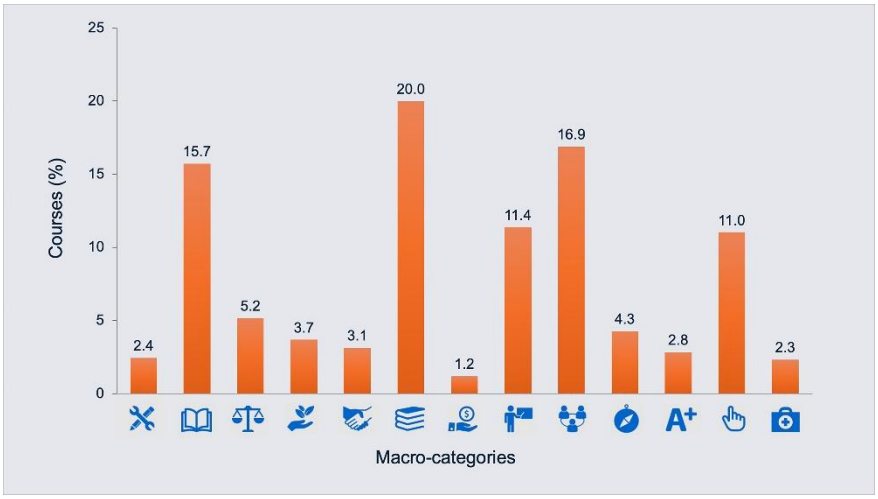

Figure 3. Percentage of courses per macro-category available on the SOFIA platform (for the full list of macro-categories, see Figure 1b).

Investigating the courses on "Knowledge and respect for nature and the environment" through the selected keywords (*biodiversity, climate change, ecology, ecosystem/s,* and *nature conservation*), one can see that little attention was given to ecological and NC topics. Specifically, the search by the keyword *nature conservation*, which is closely linked to NC issues, returned only one course within the "Knowledge and respect for nature and the environment" macro-category, corresponding to 0.4% (1 out of 275) of the available ones. Moreover, using all five keywords resulted in only 47 courses, representing 17% (47 out of 275) of the courses in this macro-category. When extending this figure to the entire SOFIA catalogue, one observes that only 0.6% (47 out of 7459) of the courses available on the platform cover these keywords. More specifically, the keywords identified 14 courses on *biodiversity*, 8 on *climate change*, 16 on *ecology*, 8 on *ecosystem/s*, and 1 on *nature conservation* (Table 1). This emerging lack of material on environmental issues in Italian T&E education aligns with UNESCO's findings (2021a), underlining a critical need worldwide to enhance teacher training in order to address urgent environmental challenges.

Observing the descriptions (*e.g.*, title, abstract, objectives) of the 47 courses, we noted that only part of them (35 out of 47) were properly concerned with ecological and NC topics, corresponding to 0.5% of all available courses (35 out of 7459). More specifically, the courses related to the keywords *biodiversity*, *nature conservation* and *climate change* (7 out of 8 for *climate change*) actually cover ecological topics. Instead, the courses found with the remaining keywords (*ecology* and *ecosystem*) turned out to address topics not relevant to ecology and applied to other disciplinary contexts. This occurred 5 times out of 16 with the keyword *ecology* and 6 times out of 8 with the keyword *ecosystem* (Table 1).

Regarding the fact that the keywords *ecology* and *ecosystem* identify courses not always aligned with ecological topics, we wish to underline a striking heterogeneity in how these terms are understood from a cultural perspective. Notably, in recent decades, both "ecology", a specific disciplinary field, and "ecosystem", a fundamental functional unit within that discipline (Odum, 1971, p. 8), have been employed in various disciplinary contexts, sometimes distant from their strict ecological meaning, exhibiting a well-known problem of lexical promiscuity in the literature (Lorenzi, 2020, pp. 161-182). For instance, the concepts "ecology of language" and "digital ecosystem" are used in linguistics; Bronfenbrenner's "ecological model of child development" (Bronfenbrenner, 1979, p. 4) is well-known in pedagogy and the term "school ecosystem" is often used in educational projects.

Table 1. Courses found on the SOFIA platform by keyword. Pertinence to ecological topics is also reported.

Keywords	Identified courses	Courses with pertinence to ecological topics
Biodiversity	14	14
Climate change	8	7
Ecology	16	11
Ecosystem/s	8	2
Nature conservation	1	1
Total	**47**	**35**

When viewed societally, the proliferation of terms rooted in various ontologies and epistemologies may still contribute to spread the ecological culture. However, in the context of this paper, their polysemic nature complicates the process of identifying courses relevant to ecological topics both within SOFIA's training offerings and more broadly on the internet.

4. Conclusions and future perspectives

As the title suggests, this paper shows what opportunities are available for Italian T&Es to receive training and updates on ecological issues specifically related to NC, as well as to learn effective teaching practices in these fields. We investigated this aspect by analysing SOFIA, the main institutional training platform in Italy. This matters because T&Es, who play an active role in educating citizens, are crucial for promoting sustainable development, ensuring that society, economy, and the natural world can thrive together. Based on what we observed, at the time of writing, T&Es interested in ecological topics, particularly those focused on NC, have very limited training opportunities in Italy provided by accredited institutions.

As a final reflection, we wish to highlight a structural aspect of this research, specifically the limited training material provided by the SOFIA platform. Its courses, in fact, do not always clearly outline their philosophical and methodological approaches, which is why these aspects were not investigated in our study.

In addition, the findings we presented reflect a snapshot in time – a limitation we acknowledge, and one that could be addressed by future research with a diachronic approach.

That being said, we believe it is desirable for SOFIA to align with international recommendations calling for increased investment in formal training programs on environmental themes. Furthermore, given that EE has been mandatory in Italian schools since 2019 (see note 7), we believe it is essential to monitor the training offerings on these topics.

In light of our findings, we think it would be beneficial for T&Es to look at the wide range of opportunities available online in the sphere of non-formal education.[15] In fact, many entities, such as scientific and environmental organisations, offer their specialised knowledge on their websites. These organisations play a crucial role in developing and disseminating scholarly knowledge and educational tools based on cutting-edge science. Therefore, they could offer significant contributions to the ecological knowledge of T&Es.

As for future research, we recommend conducting continuous assessments of the SOFIA platform to monitor the evolution of training for T&Es on NC topics, especially as academic approaches to knowledge construction continue to change. In this context, a few preliminary considerations are worth noting. SOFIA, as previously discussed, serves as a showcase for training programs offered by numerous organisations across the country, many of which are active in both scientific and humanistic research. Given that NC topics are studied and applied not only within scientific disciplines but also in the humanities – and, in some virtuous cases, through interdisciplinary collaborations – it would be valuable to track the disciplinary orientation of emerging training programs on NC topics, as well as their theoretical and methodological frameworks.

On a philosophical level, recent years have seen a flourishing of reflections on the ontological and epistemological aspects related to NC. Bianchi, Pisiotis & Cabrera (2022) highlight the emergence of new interpretations of the human-nature relationship, challenging the anthropocentric views that currently shape pivotal concepts like sustainable development. From a methodological perspective, it would be valuable to explore how educational offerings address the development of critical, problematising (Dodman, 2016), and interdisciplinary approaches (Dodman, 2016; Annan-Diab & Molinari 2017), which can be introduced in schools to equip future generations to navigate the

[15] On the meaning of the term see: European Commission/EACEA/Eurydice (2024).

complex human-nature relationship. This becomes even more significant in the context of NC, a field that is informed by diverse disciplines, ranging from natural resource management to the history of biological thought.

Continuing on the topic of disciplinary perspectives, we wish to make a few further remarks based on the observation of the increasing prominence of environmental issues across various branches of humanistic knowledge – ranging from legal to historical, philosophical, and pedagogical fields. This trend could lead to a rapid and significant ontological and epistemological transformation in the body of scholarly knowledge focused on the human-nature relationship, and more specifically, on NC. For decades now, there has been an international expansion of humanistic disciplines towards environmental topics traditionally viewed as belonging to the scientific and naturalistic realms, commonly associated with ecology. Conversely, ecology itself has increasingly incorporated elements from disciplines historically outside its scope (Costanza, 1991). In our view, this reciprocal expansion is fostering the consolidation of new interdisciplinary paradigms in environmental knowledge, which influence both theoretical and practical approaches to NC education. The interdisciplinary development of teachable knowledge is evident in many emerging teaching practices. One such example is outdoor education, which is grounded in theoretical constructs like biophilia, blending naturalistic elements with insights from environmental psychology (Barbiero, 2021).

In the early twenty-first century, the environmental humanities emerged as an academic discipline, reflecting a growing conviction that environmental problems cannot be solved by science and technology alone (a useful bibliographic source is Emmett & Nye, 2017). This development represents a cultural shift that is influencing not only academia but also the field of education in general, helping bridge the traditional divide between the sciences and the humanities. That being said, we believe it is important to consider that while the humanities' increasing engagement with environmental issues in education introduces valuable cultural perspectives, it may inadvertently contribute to a further weakening of the educational offerings in terms of ecological knowledge in the strict sense.

References

Aliyeva, E. (2016). An overview of the national curriculum process for Azerbaijan. *The Online Journal of New Horizons in Education*, 6(1), 13-26.

Annan-Diab, F., & Molinari, C. (2017). Interdisciplinarity: Practical approach to advancing education for sustainability and for the Sustainable Development Goals. *The International Journal of Management Education*, 15(2), 73-83. https://doi.org/10.1016/j.ijme.2017.03.006

Artacho, E.G., Martínez, T.S., Ortega Martín, J.L., et al. (2020). Teacher Training in Lifelong Learning-The Importance of Digital Competence in the Encouragement of Teaching Innovation. *Sustainability*, 12(7), 2852. https://doi.org/10.3390/su12072852

Barbiero, G. (2021). Affective Ecology as development of biophilia hypothesis. *Visions for Sustainability*, 16(5575), 1-35. http://dx.doi.org/10.13135/2384-8677/5575

Bianchi, G., Pisiotis, U., & Cabrera, M. (2022). GreenComp - The European sustainability competence framework. Punie, Y. & Bacigalupo, M. (Eds), EUR 30955 EN, Publications Office of the European Union, Luxembourg; ISBN 978-92-76-46485-3, doi:10.2760/13286, JRC128040.

Bocconi, S., Panesi, S., & Kampylis, P. (2020). Fostering the Digital Competence of Schools: Piloting SELFIE in the Italian Education Context. *IEEE Revista Iberoamericana de Tecnologías Del Aprendizaje*, 15(4), 417-425. https://doi.org/10.1109/rita.2020.3033228

Bronfenbrenner, U. (1979). The Ecology of Human Development: Experiments by Nature and Design. Harvard University Press, Cambridge, Massachusetts. ISBN 0-674-22457-4.

Cooke, J., Araya, Y., Bacon, K.L., et al. (2021). Teaching and learning in ecology: a horizon scan of emerging challenges and solutions. *Oikos*, 130, 15-28. https://doi.org/10.1111/oik.07847

Costanza, R. (1991). Ecological economics: A research agenda. *Structural Change and Economic Dynamics*, 2, 335-357. https://doi.org/10.1016/S0954-349X(05)80007-4

Crutzen, P., & Stoermer, E. (2000). The 'Anthropocene.' *Global Change Newsletter*, 41, 17-18. https://doi.org/10.12987/9780300188479-041

Dodman, M. (2016). Knowledge and competence. Key concepts in an educational paradigm for a sustainable society. *Visions for Sustainability*, 5, 15-27. https://doi.org/10.13135/2384-8677/1660

Emmett, R.S., & E.D. Nye (2017). The Environmental Humanities: A Critical Introduction. MIT Press, Cambridge, MA. ISBN electronic: 9780262342292. https://doi.org/10.7551/mitpress/10629.001.0001

European Commission (2022). Council Recommendation on learning for environmental sustainability. Staff working document. Brussels.

European Commission/EACEA/Eurydice (2024). Validation of non-formal and informal learning in higher education in Europe. Eurydice report. Luxembourg, Publications Office of the European Union.

Gentile, M. (2023). Teacher education policies in Italy: in search of PL indicators. European Conference on Educational Research. Glasgow, 21-25 August 2023. https://doi:10.13140/RG.2.2.20297.11365

Intergovernmental Panel on Climate Change (2021). Climate Change 2021: the Physical Science Basis. *Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change.* Masson-Delmotte, V., P. Zhai, A. Pirani, S.L., et al. (Eds.). Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. https://doi.org/10.1017/9781009157896

International Union for Conservation of Nature and Natural Resources, United Nations Environment Programme, World Wildlife Fund, (1980). World Conservation Strategy: Living Resource Conservation for Sustainable Development. https://portals.iucn.org/library/efiles/documents/wcs-004.pdf. Accessed 1st June 2024.

Jacobson S.K., McDuff M.C., & Monroe M.C. (2015). Conservation Education on Outreach Techniques. Oxford University Press, United States 2nd edition. ISBN 978019871669.

Lorenzi C. (2020). Le risorse ecosistemiche in una visione culturale. In *Risorse naturali. Riflessioni multidisciplinari. C.* Lorenzi & A. Dani (Eds.). Universitalia, Roma: pp. 161-182.

Mulvik, I., Pribuišis, K., Siarova, H., et al. (2021). Education for environmental sustainability: policies and approaches in EU Member States. *Final Report, European Commission*. Luxembourg: Publications Office of the European Union. ISBN 978-92-76-41156-7.

Nichols, T.P., & Garcia, A. (2022). Platform Studies in Education. *Harvard Educational Review*, 92(2), 209-230. https://doi.org/10.17763/1943-5045-92.2.209

Odum, E.P. (1971). Principi di ecologia, Piccin Editore, Padova. Trad, Fundamentals of Ecology, W. B. Saunders Company, London.

Olivanti, F., Meschiari, F., & Gastaldi, L. (2022). Policy analytics and teachers' digital competencies in Italy: a multiple case study. *International Continuous Innovation Network (CINet) Conference*. ISBN 978-90-77360-25-5.

Prisco, G. (2022). La formazione alla sostenibilità: il ruolo degli insegnanti e le nuove generazioni. In *La formazione degli insegnanti: problemi, prospettive e proposte per una scuola di qualità e aperta a tutti e tutte.* A.L. Rizzo & V. Ricciardi (Eds.). Pensa Multimedia, Lecce. ISBN 978-88-6760-945-1.

Sangiorgio, F., Lorenzi, C., Fiore, N., et al. (2014a). EcoLogicaCup: an innovative tool to teach Ecology in the high schools. *Proceedings of EDULEARN14 Conferences*, Barcelona, Spain, 1573-1578. ISBN 978-84-617-0557-3.

Sangiorgio, F., Lorenzi, C., Fiore, N., et al. (2014b). Research game: an innovative tool for teachers and students. *SCIentific RESearch and Information Technology*, 4(2), 109-116. http://dx.doi.org/10.2423/i22394303v4n2p109

United Nations (1992). Agenda 21. *Conference on Environment & Development*. Rio de Janeiro, Brazil 3-4 June.

United Nations (2015). Transforming our world: the 2030 Agenda for Sustainable Development. Available at https://sdgs.un.org/2030agenda Accessed June 2024.

United Nations Educational, Scientific and Cultural Organization (2018). Issues and trends in Education for Sustainable Development. A. Leicht, J. Heiss & W.J. Byun (Eds.). Paris, France. ISBN 978-92-3-100244-1.

United Nations Educational, Scientific and Cultural Organization (2021a). Learn for our planet. A global review of how environmental issues are integrated in education. Printed by UNESCO, France. ISBN 978-92-3-100451-3.

United Nations Educational, Scientific and Cultural Organization (2021b). Getting every school climate-ready. How countries are integrating climate change issues in education. Printed by UNESCO, France.

Warren, G. Jr. (1970). *National Conservation Education Association Conference Report.* University of Southwestern Louisiana, Lafayette, Louisiana August 16-20.

Authors

Caterina Lorenzi *(corresponding author)* lorenzi@uniroma2.it
Department of History, Humanities and Society, University of Rome Tor Vergata, Roma, Italy.

Franca Sangiorgio franca.sangiorgio@unisalento.it
Department of Biological and Environmental Science and Technologies, University of Salento, Lecce, Italy.

Funds

This study did not receive external funding.

Competing Interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Citation

Lorenzi, C., & Sangiorgio, F. (2024). Is nature conservation included in the training of teachers and educators? The contribution of the SOFIA educational platform. *Visions for Sustainability*, 22, 10977, 159-175. http://dx.doi.org/10.13135/2384-8677/10977