



VII Encontro Internacional
de Formação na Docência
*7th International Conference
on Teacher Education*

ESCOLA SUPERIOR DE EDUCAÇÃO
IPB - Bragança - PORTUGAL

livro de atas conference proceedings

incte.ipb.pt



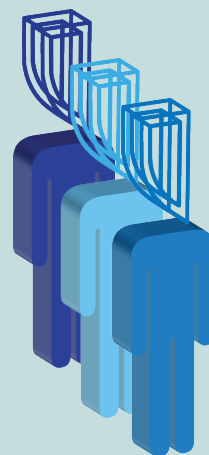
**Desafios na Formação
de Professores e nas
Escolas num Mundo
Interconectado**

*Challenges to
Teacher Education
and Schools in an
Interconnected World*



inct'e'23
international
conference on
teacher education

Bragança . 2023



23

Título | Title

VII Encontro International
de Formação na Docência: Livro de Atas

7th International Conference
on Teacher Education: Conference Proceedings

Editores | Editors

Cristina Mesquita, Elisabete Mendes Silva, Manuel Vara Pires, Rui Pedro Lopes, Paula Vaz
Instituto Politécnico de Bragança

Editores Gráficos | Graphic Editors

Jacinta Costa, Carlos Casimiro da Costa
Instituto Politécnico de Bragança

Apoio Técnico | Technical Support

Clarisse Pais

Publicação | Publisher

Instituto Politécnico de Bragança

Morada | Address

Escola Superior de Educação de Bragança
Campus de Santa Apolónia
5300-253 Bragança . Portugal
<http://incte.ipb.pt/>
incte@ipb.pt

ISBN

978-972-745-318-4

HANDLE

<http://hdl.handle.net/10198/28160>

DOI

<https://doi.org/10.34620/incte.2023>



Presidência da Comissão Organizadora | Conference Chairs

Cristina Mesquita | Instituto Politécnico de Bragança, Portugal
Manuel Vara Pires | Instituto Politécnico de Bragança, Portugal

Comissão Organizadora | Organising Committee

Ana Raquel Prada | Instituto Politécnico de Bragança, Portugal
Elisabete Mendes Silva | Instituto Politécnico de Bragança, Portugal
Jacinta Costa | Instituto Politécnico de Bragança, Portugal
Luís Castanheira | Instituto Politécnico de Bragança, Portugal
Maria da Conceição Martins | Instituto Politécnico de Bragança, Portugal
Paula Vaz | Instituto Politécnico de Bragança, Portugal
Rui Pedro Lopes | Instituto Politécnico de Bragança, Portugal

Secretariado | Secretariat

André Brasil | Instituto Politécnico de Bragança, Portugal
Cristiana Ribeiro | Instituto Politécnico de Bragança, Portugal
Maria Luísa Azevedo | Instituto Politécnico de Bragança, Portugal
Nelson Quina | Instituto Politécnico de Bragança, Portugal
Patrícia Teixeira | Instituto Politécnico de Bragança, Portugal
Ricardo Ramos | Instituto Politécnico de Bragança, Portugal
Rosilda Reichert | Instituto Politécnico de Bragança, Portugal
Samir Zedam | Instituto Politécnico de Bragança, Portugal
Sandra Gonçalves | Instituto Politécnico de Bragança, Portugal

Organizado por | Organised by



Apoios | Sponsors



Comissão Científica | Scientific Committee

Adorinda Gonçalves (IPB, Portugal)
Alexandra Soares Rodrigues (IPB, Portugal)
Alexia Dotras Bravo (IPB, Portugal)
Amélia Marchão (IPPortalegre, Portugal)
Ana Claudia Loureiro (IPB, Portugal)
Ana Garcia Valcárcel (USAL, Espanha)
Ana Lúcia Pinto (IPB, Portugal)
Ana Paula Florêncio Aires (UTAD, Portugal)
Ana Paula Laborinho (FEA, Portugal)
Ana Paula Martins (UMinho, Portugal)
Ana Raquel Prada (IPB, Portugal)
Angelina Sanches (IPB, Portugal)
António Domingos (ULisboa, Portugal)
António Guerreiro (UALgarve, Portugal)
António Nóvoa (ULisboa, Portugal)
António Vasconcelos (IPS, Portugal)
Ariana Cosme (UPorto, Portugal)
Assunção Folque (UEvora, Portugal)
Carla Araújo (IPB, Portugal)
Carla Guerreiro (IPB, Portugal)
Carlos Neto (ULisboa, Portugal)
Carlos Teixeira (IPB, Portugal)
Carlos Silva (UMinho, Portugal)
Catarina Vasques (IPB, Portugal)
Chee Hoo Lum (NIENTU, Singapura)
Christine Pascal (CREC, Reino Unido)
Cláudia Martins (IPB, Portugal)
Cristina Martins (IPB, Portugal)
Cristina Mesquita (IPB, Portugal)
Daniela Gonçalves (ESEPF, Portugal)
Delmina Pires (IPB, Portugal)
Domingos Fernandes (ULisboa, Portugal)
Eduardo Lopes (UEvora, Portugal)
Elisabete Mendes Silva (IPB, Portugal)
Elza Mesquita (IPB, Portugal)
Evangelina Bonifácio (IPB, Portugal)
Feliciano Henriques Veiga (ULisboa, Portugal)
Fernando Martins (IPC, Portugal)
Flávia Vieira (UMinho, Portugal)
Gabriela Portugal (UAveiro, Portugal)
Gianina Ana-Massari (UAICDlasi, Roménia)
Graça Santos (IPB, Portugal)
Helena Rocha (UNova, Portugal)
Henrique Teixeira-Gil (IPCB, Portugal)
Ilda Ribeiro (IPB, Portugal)
Isabel Cabrita (UAveiro, Portugal)
Isabel Mociño-González (UVigo, Portugal)
Isabel Chumbo (IPB, Portugal)
Isabel Vale (IPVC, Portugal)
Isolina Oliveira (UAberta, Portugal)
Jacinta Costa (IPB, Portugal)
João Carvalho Sousa (IPB, Portugal)
João Cristiano Cunha (IPB, Portugal)
João Formosinho (UMinho, Portugal)
Joaquim Machado (UCP, Portugal)
Jorge Ramos do Ó (ULisboa, Portugal)
José Manuel Cardoso Belo (UTAD, Portugal)
Juan Carlos Hernandez Beltran (USAL, Espanha)
Juan Gavilan (UConcèpcion, Chile)
Juan R. Coca (UVa, Espanha)
Juha Lahtinen (TAMK, Finlândia)
Júlia Oliveira-Formosinho (UCP, Portugal)
Leoncio Veja Gil (USAL, Espanha)
Leonor Santos (ULisboa, Portugal)
Letizia Cinganotto (INDIRE, Itália)
Lídia Machado dos Santos (IPB, Portugal)
Lídia Sanz Molina (UVa, Espanha)
Lina Fonseca (IPVC, Portugal)
Lourdes Montero (USC, Espanha)
Luís Barbeiro (IPLeiria, Portugal)
Luciana Cabral Pereira (UTAD, Portugal)
Lucía Casal de la Fuente (UVigo, Espanha)
Luís Castanheira (IPB, Portugal)
Luís Menezes (IPV, Portugal)
Luís Sebastião (UEvora, Portugal)
Luisa Panichi (UPisa, Itália)
Manuel Meirinhos (IPB, Portugal)
Manuel Vara Pires (IPB, Portugal)
Maria Mezquita-Fernández (UVa, Espanha)
Maria Assunção Flores (UMinho, Portugal)
Maria da Conceição Martins (IPB, Portugal)
Maria do Céu Ribeiro (IPB, Portugal)
Maria do Céu Roldão (UCP, Portugal)
María Alonso-Cortés (ULEón, Espanha)
Maria Figueiredo (IPV, Portugal)
Maria Isabel Castro (IPB, Portugal)
Maria José Rodrigues (IPB, Portugal)
Maria Raquel Patrício (IPB, Portugal)
Marília Castro Cid (UEvora, Portugal)
Maja Ljubetic (USplit, Croácia)
Mário Cardoso (IPB, Portugal)
Mark Daubney (IPLeiria, Portugal)
Marta Saracho Aranaíz (IPPorto, Portugal)
Mercedes López-Aguado (ULEón, Espanha)
Michiel Heijnen (MAcademy, Netherlands)
Miguel Guerra (UMálaga, Espanha)
Miguel Ribeiro (UCampinas, Brasil)
Nélia Amado (UALgarve, Portugal)
Neusa Branco (IPSantarém, Portugal)
Nuno Paulo Santos (IPB, Portugal)
Olga Santos (IPLeiria, Portugal)
Paula Maria Barros (IPB, Portugal)
Paula Vaz (IPB, Portugal)
Paula Quadro Flores (IPPorto, Portugal)
Paulo Afonso (IPCB, Portugal)
Pedro Mucharreira (ULisboa, Portugal)
Pedro Tadeu (IPG, Portugal)
Pilar Gútiéz Cuevas (UCMadrid, Espanha)
Rosa Novo (IPB, Portugal)
Rui Pedro Lopes (IPB, Portugal)
Rui Trindade (UPorto, Portugal)
Rui Vieira (UAveiro, Portugal)
Sandie Mourão (UNova, Portugal)
Sandra Regina Soares (UNEB, Brasil)
Sani Rutz da Silva (UTFPR, Brasil)
Sara Barros Araújo (IPPorto, Portugal)
Sofia Bergano (IPB, Portugal)
Sónia Galinha (IPSantarém, Portugal)
Sonia Rodríguez Cano (UBU, Espanha)
Susana Carreira (UALg, Portugal)
Susana Colaço (IPSantarém, Portugal)
Susana Gómez Redondo (UVa, Espanha)
Tony Bertram (CREC, Reino Unido)
Vanessa Delgado Benito (UBU, Espanha)
Vítor Gonçalves (IPB, Portugal)

INCTE'23

Vivemos num mundo interconectado confrontado com diversos desafios, para os quais se têm de preparar todos os cidadãos, os mais adultos, os mais jovens e as crianças.

Enfrentamos o constante aumento da população mundial, com todas as consequências que ele tem trazido: a ocupação de espaços geográficos menos favoráveis, a concentração de grandes massas populacionais nas cidades, bem como o esgotamento de recursos naturais e as alterações climáticas. Acresce a estes fenómenos, que atingem o mundo em diferentes escalas e dimensões, as assimetrias entre povos, que intensificam os olhares sobre a diversidade cultural, social e económica, mas também, fruto dos fluxos migratórios, conduzem à miscigenação. As questões políticas, económicas e sociais, cada vez mais interdependentes, fazem com que uma variação numa delas tenha vibrações nas restantes.

O desenvolvimento tecnológico constitui outra das áreas que tem despoletado alguns desafios na vivência societal mas, ao mesmo tempo, se tem constituído como uma oportunidade de interação científica, cultural, social e de abertura à criatividade e à inovação.

Testemunhamos cenários de volatilidade, de complexidade e de incerteza, onde as pandemias, as guerras, as ameaças climáticas, entre outros fenómenos, interligam as comunidades e criam a necessidade de definir estratégias mundiais concertadas. As palavras equidade, sustentabilidade, transformação e inclusão, assumidas nos discursos políticos, económicos e sociais, deverão ser realizações efetivas na construção da cidadania global. Todo este cenário requer esforços deliberados e contínuos de partilha de experiências, de ideias e de criatividade, no sentido de criar um entendimento que permita aumentar a confiança das pessoas e das comunidades.

O INCTE'23, já na sua 7.^a edição, como Encontro com afirmação nacional e internacional, está empenhado, mais uma vez, na reflexão sobre esta realidade e os seus impactos em contexto educativo, bem como na prossecução dos seus principais objetivos:

- Problematizar as estruturas curriculares da formação de educadores e professores;
- Debater propostas didáticas inovadoras no âmbito da formação para a docência;
- Refletir sobre as práticas formativas nos diversos contextos;
- Analisar o contributo da formação na dinamização das instituições;
- Promover o diálogo entre os diferentes intervenientes na formação numa perspetiva de educação para o desenvolvimento;
- Debater práticas de formação no ensino superior.

Além disso, a temática “Desafios na Formação de Professores e nas Escolas num Mundo Interconectado” constitui-se como um meio de estimular a partilha entre professores e educadores, formadores de formadores e investigadores sobre outras formas de educar, no respeito pela pluralidade, pela natureza, o desenvolvimento do pensamento crítico e informado, a flexibilidade e adequação a novas realidades, em situações incertas e cenários instáveis.

Por todos estes desafios lançados, endereçamos o convite a todos os interessados em contribuir para a discussão destas temáticas, que continuam a revelar-se tão oportunas e pertinentes no mundo em que vivemos.

Sintam-se muito bem-vindos em Bragança, presencial ou virtualmente.

A Comissão Organizadora do INCTE'23.

INCTE'23

We live in an interconnected world faced with various challenges, for which all citizens, adults, young people and children, must be prepared.

We are dealing with a constant increase in world population, with all the consequences that this has brought: the occupation of less favourable geographical spaces, the concentration of large masses of people in cities, as well as the depletion of natural resources and climate change. Added to these phenomena, which affect the world on different scales and dimensions, the asymmetries between peoples are also a worrying issue, which intensify the view of cultural, social and economic diversity, but also, as a result of migration flows, lead to miscegenation. Political, economic and social issues, increasingly interdependent, mean that a variation in one of them will certainly affect the others.

Technological development is another area that has triggered some challenges in societal life but, at the same time, it has been an opportunity for scientific, cultural and social interaction and for creativity and innovation.

We are witnessing scenarios of volatility, complexity and uncertainty, where pandemics, wars, climate threats, among other phenomena, interconnect communities and create the need to define concerted global strategies. The words equity, sustainability, transformation and inclusion, included in political, economic and social discourses, should be effective achievements in the construction of global citizenship. This whole scenario requires deliberate and continuous efforts to share experiences, ideas and creativity in order to create an understanding that will increase the trust of people and communities.

INCTE'23, already in its 7th edition, as a national and international renowned Conference, is committed, once again, to reflect on this reality and its impacts on the educational context, as well as on the pursuit of its main objectives:

- To problematise the curricular structures of the training of educators and teachers;
- To debate innovative didactic proposals in the scope of teacher training;
- To reflect on the training practices in different contexts;
- To analyse the contribution of training in making institutions more dynamic;
- To promote the dialogue between the different actors in training in a perspective of development education;
- To debate training practices in higher education.

Furthermore, the theme "Challenges in Teacher Training and Schools in an Interconnected World" is a means to stimulate involvement between teachers and educators, trainers of trainers and researchers on other ways of educating, respecting plurality, nature, the development of critical and informed thinking, flexibility and adaptation to new realities, in uncertain situations and unstable scenarios.

For all these challenges, we invite all those interested in contributing to the discussion of these themes, which continue to be so relevant in the world in which we live.

You are very welcome in Bragança, in person or virtually.

The Organising Committee of INCTE'23.

Eixos temáticos

O Encontro está estruturado em cinco grandes eixos temáticos:

Eixo temático 1:

Currículo e formação de educadores e professores

Este eixo temático integra as questões do currículo, da inovação curricular e as novas perspectivas curriculares no âmbito da formação inicial ou continuada de educadores e professores, incluindo a discussão de modelos e processos curriculares de diferente natureza e de trabalhos ou propostas de formação de educadores e professores, nos diversos contextos.

Eixo temático 2:

Didática e formação de educadores e professores

Este eixo temático integra aspetos dos diferentes saberes disciplinares em contexto escolar, abarcando a reflexão sobre os contributos da didática na formação de educadores e professores para uma construção progressiva de formas de compreender e agir conscientemente em situações educativas.

Eixo temático 3:

Práticas educativas e supervisão pedagógica

Este eixo temático integra o desenvolvimento de práticas de formação de educadores e professores nas escolas, compreendendo a problematização dos papéis a desempenhar pelos diversos intervenientes, numa perspectiva de trabalho colaborativo e da construção de uma identidade profissional consciente, empenhada e responsável.

Eixo temático 4:

Formação docente e educação para o desenvolvimento

Este eixo temático integra aspetos formativos do ensino e da aprendizagem relacionados com a promoção de uma cidadania global responsável, abrangendo a discussão de projetos e práticas educativas potenciadoras de uma educação para o desenvolvimento.

Eixo temático 5:

Práticas pedagógicas no ensino superior

Este eixo temático integra as questões relacionadas com os desafios pedagógicos que enfrenta o ensino superior na atualidade, abrangendo a discussão, partilha e disseminação de experiências pedagógicas vividas neste nível de ensino.



Thematic axes

The Conference is structured around five main thematic axes:

Thematic axis 1:

Curriculum and training of educators and teachers

This research topic integrates issues of curriculum, curricular innovation and new curricular perspective, in the context of the initial or continuous training of educators and teachers, including the discussion of curriculum models and processes of different nature and of works or proposals for the training of educators and teachers, in different contexts.

Thematic axis 2:

Teaching and training of educators and teachers

This research topic integrates aspects of different disciplinary knowledge in school context, covering the reflection on the contributions of teaching in the training of educators and teachers for a gradual construction of ways to understand and act consciously in educational situations.

Thematic axis 3:

Educational practices and pedagogical supervision

This research topic integrates the development of training practices of educators and teachers in schools, embracing the problematization of the roles to be played by the various actors, in a perspective of collaborative work and the construction of a mindful, committed and responsible professional identity.

Thematic axis 4:

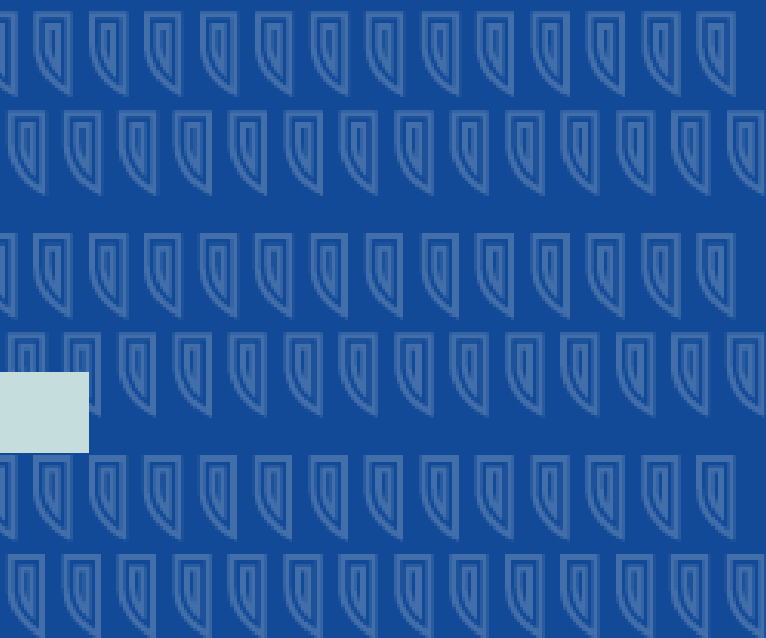
Teacher education and development education

This research topic integrates formative aspects of teaching and learning related to the promotion of a responsible global citizenship, including the discussion of possible projects and educational practices of development education (DELE).

Thematic axis 5:

Pedagogical practices in higher education

This research topic integrates issues pertaining to the pedagogical challenges that higher education currently faces, comprising discussion, sharing and dissemination of pedagogical experiences undertaken at this level of education.



Índice

INCTE 2023 – VI Encontro Internacional de Formação na Docência

Nota de abertura	1
Formação de professores e escolas: que desafios num mundo interconectado?	3
<i>Cristina Mesquita, Elisabete Mendes Silva, Manuel Vara Pires, Rui Pedro Lopes, Paula Vaz</i>	
Mesa Redonda	7
Desafios na formação de professores e nas escolas num mundo interconectado: uma conversa com e entre A. C. Cortez, N. Zagalo e S. Peralta	9
<i>Isabel Chumbo (moderador)</i> <i>Susana Peralta, Nelson Zagalo, António Cortez (intervenientes)</i>	
Currículo e Formação de Educadores e Professores	21
Education for sustainable development and teacher training in Italy: the “Rigenerazione Scuola” plan	23
<i>Giambattista Bufalino, Gabriella D’Aprile, Cristina Trovato</i>	
Fluência representacional numa abordagem tecnológica em matemática e física	33
<i>Tânia Coelho, Maria do Carmo Botelho, Helena Rocha</i>	
Formação de professores para o uso das tecnologias digitais da informação e da comunicação ...	45
<i>Solange Ciqueira Haetinger, Odilon Luiz Poli</i>	
Importância do currículo na formação inicial de professor primário na aprendizagem dos alunos em Angola	57
<i>Lúcia Chipuca, Carlos Silva, Fernando Ilídio Ferreira</i>	
Literacia financeira no 1.º CEB: o papel do jogo na natureza no desenvolvimento da aprendizagem	70
<i>Ana Oliveira, Fernando Martins, Rui Mendes</i>	
Mudanças curriculares para a formação inicial de professores brasileiros: avanços e retrocessos .	82
<i>Rosa Vasconcelos, Elton Fireman</i>	
O processo de formação de professores na licenciatura em matemática: currículo e a profissionalização docente	91
<i>Francisco Jucivânio Félix de Sousa, José Claudio Del Pino</i>	
Políticas de formação de professores no Brasil: a influência da agenda neoliberal	101
<i>Marilândi Maria Mascarello Vieira, Fernando Ilídio Ferreira</i>	
Professores, formação, comunidade e tarefas de aprendizagem profissional: uma tessitura à construção de conhecimentos profissionais	113
<i>Vera Cristina de Quadros, Susana Carreira</i>	

Projetos educacionais neoconservadores e as avaliações em larga escala: a negação da diversidade educacional brasileira	125
<i>Letícia M. Rebelatto, Genilse S. Costa, Marilandi M. M. Vieira</i>	
Tecnologias digitais na área das ciências exatas: uma experiência com estudos de aula	138
<i>Maria Madalena Dullius, Marli Teresinha Quartieri, Italo Gabriel Neide, Maria Claudete Schorr</i>	
The impact of digital skills on teachers' self-efficacy: results of an exploratory survey	149
<i>Natalia Altomari, Alessandra M. Straniero, Antonella Valenti</i>	
Didática e Formação de Educadores e Professores	161
A ópera infantil A Floresta, de Eurico Carrapatoso: um recurso didático	163
<i>Maria do Rosário da Silva Santana, Helena Maria da Silva Santana</i>	
Afetividade no ensino de matemática: uma revisão sistemática das pesquisas publicadas em âmbito internacional	175
<i>Thales Silva, Katia Maria de Medeiros</i>	
Avaliação das aprendizagens em estatística: concepções e crenças de professoras polivalentes ...	187
<i>Cristiane de Fatima Budek Dias, Cristina Mesquita, Guataçara dos Santos Junior, Mary Ângela Teixeira Brandalise</i>	
Educação ambiental: produção de recursos didáticos sobre o tema “insetos polinizadores”	199
<i>Ângela Cordeiro, Adorinda Gonçalves</i>	
Educação ambiental em contexto educativo: concepções das crianças sobre a água e a sua importância	211
<i>Helena Cardoso, Ilda Freire-Ribeiro, Delmina Pires</i>	
Formação inicial de professores e o conhecimento matemático necessário para ensinar matemática	224
<i>André Joaquim, Ana Gonçalves, Armando Soares, Manuel Cabral, Paula Catarino</i>	
Importância da inclusão de atividades práticas para o enriquecimento da literacia climática ...	236
<i>Ricardo Ramos, Maria José Rodrigues, Isilda Rodrigues</i>	
Potenciar o pensamento crítico em contexto educativo	246
<i>Ana Luís, Ilda Freire-Ribeiro, Delmina Pires</i>	
Promover a interdisciplinaridade no 1.º CEB: potencialidades da visita de estudo no desenvolvimento de aprendizagens	259
<i>Catarina Pinto, Catarina Pena, Mariana Silva, Mariana Reis, Cristina Maia, Sara Aboim</i>	
Práticas Educativas e Supervisão Pedagógica	269
A aplicação digital WheelDecide e suas potencialidades educativas e resultados de uma investigação no 1.º CEB	271
<i>Henrique Gil, Rute Mateus</i>	
Collaborative Online International Learning em tecnologias educativas: uma proposta de internacionalização entre IPB e UTFPR-PG	283
<i>Eliana C. M. Ishikawa, Vítor Gonçalves, Cristina Mesquita</i>	

Contributos e potencialidades da aplicação digital Plickers na avaliação formativa: uma investigação na PES 1.º CEB	295
<i>Henrique Gil, Cátia Freitas</i>	
Desenvolvimento da linguagem oral: contributos da literatura para a infância na educação na educação básica	307
<i>Ana Sofia Ferreira Mendes, Carlos Silva</i>	
Escolas Irmãs: colaboración entre escuelas de Soria (España) y Bigene (Guinea-Bisáu)	319
<i>Raúl Maján Navalón, Lidia Sanz Molina, Susana Gómez Redondo</i>	
Potencialidades e os contributos da robótica em contexto da educação pré-escolar: resultados de uma investigação	331
<i>Henrique Gil, Soraia Dias</i>	
Teaching writing to children using artificial intelligence with GPT-3	343
<i>Alessio Castiglione, Gioacchino Lavanco, Vítor Gonçalves, Luís Castanheira</i>	
Tecnologia educativa na educação básica: visão integrada e motivadora do processo de ensino e aprendizagem	355
<i>Ana Margarida Alves Fernandes, Carlos Silva</i>	
Formação Docente e Educação para o Desenvolvimento	367
App Ecomangueando: um novo recurso didático para educação ambiental sobre os manguezais .	369
<i>Rafaela Camargo Maia, Lídia Nogueira de Queiroz</i>	
Diferentes somos todos... Especiais também!	379
<i>Carla Guerreiro, Eugénia Mendes, Paula Vaz</i>	
Dificuldades e desafios para educação ambiental sobre manguezais no ensino formal brasileiro ..	386
<i>Rafaela Camargo Maia, Francisco Glauco Gomes Bastos</i>	
Escola, comunidade e família: visão dos professores das escolas rurais de gestão comunitária na Guiné-Bissau	398
<i>Filipe Dias, Maria José Rodrigues</i>	
Formação contínua de professores e educação inclusiva para o desenvolvimento: uma compreensão crítica	410
<i>Henrique Ramalho, Fernanda Araújo</i>	
Formação de professores para o uso de tecnologias na perspectiva inclusiva: uma revisão sistemática	422
<i>Adriela Maria Noronha, Renato Marcondes, Sani de Carvalho Rutz da Silva, Silvio Luiz Rutz da Silva, Manuel Meirinhos</i>	
Livros sobre a guerra para promover a paz	435
<i>Carla Guerreiro</i>	
O livro cartonero como ferramenta de educação para o desenvolvimento e cidadania global	442
<i>Ana Raquel Aguiar, Albertina Raposo, Joana Costa, Joana Padrão, Sílvia Franco</i>	
Passeio escolar ao campo: Frutos, de Eugénio de Andrade, em sala de aula	455
<i>Ana Boura</i>	

Resíduos ou lixo? Ameaça ao desenvolvimento sustentável e desafio à educação ambiental	469
<i>Sara Sofia Martins Reis, Maria da Conceição Martins</i>	
Vozes de comunidades educativas para a formação inicial e contínua de professores/as em ED . .	481
<i>Cecília Fonseca, Sílvia Franco, Sandra Fernandes</i>	
Práticas Pedagógicas no Ensino Superior	493
A influência das experiências no internato médico na escolha da especialidade médica	495
<i>Vinicius Lopes Marinho, Nélia Amado</i>	
Apreensão de competências no ensino superior nos domínios artísticos: relato de prática	507
<i>Maria do Rosário da Silva Santana, Helena Maria da Silva Santana</i>	
Conquistas e limites da experiência de mobilidade académica internacional	518
<i>Marizete Righi Cechin, Miguel Archanjo de Freitas Junior</i>	
Contribuições do Geogebra para a apreensão de conceitos relativos aos espaços vetoriais	530
<i>Edite Cordeiro, Paula Maria Barros</i>	
Da universidade à escola: desafios na formação inicial de professores	542
<i>Isabel Barbosa</i>	
Desenvolver o pensamento computacional através do jogo de mesa Tichu	554
<i>Ana Gonçalves, Hélder Sousa, André Joaquim, Ana Paula Aires, Paula Catarino</i>	
Developing ecological thinking in university students	566
<i>Giambattista Bufalino, Gabriella D'Aprile</i>	
Digitalização e impressão 3D de uma locomotiva num contexto baseado na metodologia STEAM	577
<i>Kauam Piacentini, Hellen Carvalho, Jorge Santos, João Rocha</i>	
Diseño y valoración de una actividad sobre energía: emociones generadas en futuros maestros de primaria	587
<i>Óscar González Iglesias, Juan Carlos Rivadulla López, Yolanda Golías Pérez, Marisol Rodríguez Correa</i>	
Escenarios bélicos en LIJ: estudio comparado para la sensibilización cívica en el aula de ELE . .	598
<i>Alexia Dotras Bravo, Filipa Raquel Veleda Santos</i>	
Metodologia STEAM aplicada à digitalização de edifícios históricos em Bragança: uma nova abordagem	610
<i>Hellen Carvalho, Kauam Piacentini, Jorge Santos, João Rocha</i>	
Os ODS em unidades didáticas de língua inglesa: revisitando a proposta	622
<i>Ana E.L. Gebara, Sandra Moreira</i>	
Perceções dos estudantes do ensino superior sobre uma abordagem pedagógica na unidade curricular de álgebra linear	633
<i>Gabriela Gonçalves, Luís M. Afonso</i>	
Poemas para crianças e adolescentes em programas escolares e universitários?	643
<i>Ana Boura</i>	
Reflexão sobre as formas de acesso à profissão docente no ensino superior no contexto moçambicano	657
<i>Nharongue David Araujo, Evangelina Bonifácio</i>	

Tarefas investigativas e processos metacognitivos no estudo de derivadas	668
<i>Marli Teresinha Quartieri, Carlos José Ferreira Soares, Ieda Maria Giongo, Maria Madalena Dullius</i>	
¿Qué habilidades consideran importantes los futuros maestros para desarrollarse en aulas de educación infantil?	680
<i>Yolanda Golías Pérez, Juan Carlos Rivadulla López, Óscar González Iglesias</i>	
À luz das estrelas: um projeto interdisciplinar e artístico no ensino superior	691
<i>Maria do Rosário da Silva Santana, Helena Maria da Silva Santana</i>	
Índice de Autores	703

Developing ecological thinking in university students

Desarrollar la consciencia ecológica en los estudiantes universitarios

Giambattista Bufalino¹, Gabriella D'Aprile¹,
<https://orcid.org/0000-0002-7776-5592>, <https://orcid.org/0000-0003-1000-9343>
gbufalino@unict.it, gabrielladaprile@unict.it

¹ *Department of Educational Sciences, University of Catania*

Abstract

Universities play a critical role in promoting environmental awareness and a widespread culture of sustainability. They are especially important in the design of training courses aimed at educating future professionals involved in the social planning of sustainable and green environments. The contribution describes a university pedagogical practice in environmental sustainability education that was launched as part of the training activities of the “Green Education Lab” research laboratory at the Department of Educational Science (University of Catania). Future educator students were involved in the educational didactic experience, which adopted recent research and training models that emphasize the role of the student as researcher. They were committed to exploring different dimensions and declinations of education for sustainability, which they socialized and disseminated through the creation of podcasts with the collaboration of the University of Catania’s radio station (Radio Zammù). The critical-reflective considerations that emerged from this experience suggest innovative pedagogical models and approaches for future educational professionals' university training, which can orient sustainability education practices for the promotion of green skills.

Keywords: green skills, ecology, sustainability education, university.

Resumen

Las universidades desempeñan un papel fundamental en la promoción de la conciencia medioambiental y de una cultura generalizada de la sostenibilidad. Son especialmente importantes en el diseño de cursos de formación destinados a educar a los futuros profesionales implicados en la planificación social de entornos sostenibles y verdes. La contribución describe una práctica pedagógica universitaria en educación para la sostenibilidad medioambiental que se puso en marcha como parte de las actividades de formación del laboratorio de investigación “Green Education Lab” del Departamento de Ciencias de la Educación (Universidad de Catania). Los futuros estudiantes de pedagogía participaron en la experiencia didáctica, que adoptó modelos recientes de investigación y formación que hacen hincapié en el papel del estudiante como investigador. Se comprometieron en la exploración de diferentes dimensiones y declinaciones de la educación para la sostenibilidad, que socializaron y difundieron a través de la creación de podcasts con la colaboración de la emisora de radio de la Universidad de Catania (Radio Zammù). Las consideraciones crítico-reflexivas surgidas de esta experiencia sugieren

modelos y enfoques pedagógicos innovadores para la formación universitaria de los futuros profesionales de la educación, que pueden orientar las prácticas educativas de sostenibilidad para la promoción de competencias verdes.

Palabras clave: competencias verdes, ecología, educación para la sostenibilidad, universidad.

1 Introduction

In recent years, there has been an increase in the number of programs, policy measures, and civic-business initiatives designed and implemented to promote the theme of environmental sustainability. Environmental education aims to create a cultural shift in educational institutions at all levels. It aims to educate citizens and enable them to understand the complexities of the relationships between nature and human activities; it teaches respect for inherited resources and the importance of protecting them for future generations. University institutions, in particular, play an important role in promoting environmental awareness and a widespread culture of sustainability by creating educational pathways aimed at training future professionals involved in the social design of sustainable and green environments. To achieve this, interdisciplinary and cross-curricular educational processes must be ensured (UNESCO 2017), which includes the adoption of innovative and interdisciplinary pedagogical practices to promote skills for living in an increasingly complex world.

Given these premises, the Green Education Lab (D'Aprile & Bufalino, 2022) was established at the Department of Educational Sciences (University of Catania) as part of the PON Research and Innovation – REACT EU – (GREEN) project “Environmental leadership in education. Educational design, sustainability culture, and ethical-social responsibility”. The Green Education Lab focuses on educational design, teacher and educator training, and the experimentation of innovative teaching practices in the field of environmental education.

The purpose of this paper is to present a teaching practice in higher education in the context of environmental sustainability education. In doing so, the paper is structured as follows. In the following section we will discuss sustainability education and ecological thinking training, which are central to the university's educational, training, and research missions. Then, in section 3, environmental leadership is introduced as an effective model in higher education, and the case of the Green Education Lab of the University of Catania's Department of Education will be presented (section 4) as an effective example to promote environmental sustainability culture. In subsection 4.1, a pedagogical experience involving an innovative practice to learn about sustainability will be presented as part of the Green Lab activities. Finally, concluding remarks on this experience and its potential impact are briefly discussed.

2 Education for sustainability and ecological thinking

Environmental concerns necessitate significant decisions by public and private organizations that favor a less risky, less impactful coexistence with the environment. Recent environmental studies clearly show that signs of degradation and violence against various aspects of nature are, in some ways, irreversible. Many recent reports have urged

us to consider glacier melting and rising sea levels, which could submerge millions of square kilometers of coastline, rising temperatures, and atmospheric pollution (Newell, Daley, & Twena, 2022). Furthermore, because of social changes and the reorientation of economic processes toward a broader responsibility for ecological and environmental issues, modern organizations face increasing challenges.

Modern organizations are confronted with the reconversion of economic processes towards a more widespread responsibility for ecological and environmental issues. The reference to ecology should not only be understood in its environmentalist declination, but also as a vision aimed at grasping the multiple interactions that involve subjects, spaces, territories, tangible and intangible assets, technologies, rights, equity, health and human and economic development.

Accepting a deliberate, rather than a rhetorical, call for a new human development culture that emphasizes ontological boundaries and environmental care as indicators of human and social resilience is now required (Moore, 2005). Individuals, future citizens and workers, must be prepared to plan for and access the future by embracing new behaviors, ideas, and sensibilities while remaining responsible, ethical, and critical-reflective (Hayward, 2012).

The global challenges that modern society faces demand creative approaches and immediate action to support the United Nations-adopted sustainable development goals (SDGs) to be accomplished by 2030. There is nearly a decade left to support educational frameworks for civic involvement and awareness, as well as to establish new ways of knowledge creation and decision-making for sustainability.

On this basis, the theme of sustainability has been addressed in education through a variety of terms and concepts, including environmental education, education for sustainable development, and sustainability education (Acosta Castellanos & Queiruga-Dios, 2022).

Environmental sustainability necessitates a behavior that values the common good (Lo Iodice, 2017), that is, a daily action that strives to respect and protect the environment in which we live and work. In this regard, the theme of sustainability allows us to reconsider the existing interconnections between the natural, social, cultural, and economic environments, and it calls for the development of an ecological mindset that includes knowledge, understanding, and the capacity to imagine ecological ways of inhabiting the Earth, as well as an ethic of care and respect (Dozza, 2018). Ecological thinking is the ability to relate to what is happening deliberately without causing harm to oneself or the environment, to accept responsibility for actions, and to enjoy the results. This form of thinking can be fostered using specialized pedagogical tools and a unique university ecosystem. The university of the ecosystem is a flexible system with multiple connections that can respond rapidly and appropriately to external and internal societal changes. It contrasts with hierarchical systems and is based on multiple horizontal interactive communications. Successful socioecological systems develop resilience over time by adapting to change and uncertainty and by combining and assimilating diverse types of knowledge and perspectives from their many stakeholders through transformative learning (Dozza, 2018).

A key question concerns 'relationship' as a value of choice or thinking of oneself as part of an evolutionary network of planetary relationships, where responsibility is motivated by a desire to create a culture of well-being. As a result, environmental education

investigates and reflects on the historical and cultural manifestations of the relationship between subject formation and the environment. Environmental education is distinguished by a deliberate and rigorous examination of goals and values, procedures and methodologies. Environmental education must contribute to the unity and epistemic articulation of the educational discourse by focusing on a specific set of educational theories and practices (Tomarchio, D'Aprile, & La Rosa, 2019).

Given these assumptions, education for sustainability is proposed as a theoretical-methodological approach that shapes the conception of educational contexts and subjects, curriculum choices, and teaching practices. It is a natural and social process that begins in childhood and continues throughout life (lifelong learning), and it is built in a variety of learning and experience contexts (lifewide learning). In this way, education should contribute to the development of an ecological, environmental mindset, i.e., a respect for life in all of its forms, both vegetable and animal, human, but also for aspects of a constantly changing non-living nature.

Given the current scenario, there is an increasing need for educational action aimed at future generations in order to generate actions and behavioral models that benefit the environment and thus the community. Environmental education should aim to achieve goals that are independent of the various national and international policies and economic interests of multinational corporations, trusts, and cartels that bring together only and exclusively partisan interests (Malavasi, 2020). Environmental education must be capable of grasping not only emerging problems, but also of interpreting cultural, psychological, ethical, and political issues, as well as determining the relationship between these dimensions. Clearly, environmental education must not ignore the fundamental nodes of the “green” problem: environmental sustainability, climatic emergencies, pollution, the responsibility of all manufacturing companies, individual and collective responsibility, i.e., the ecological behaviors of single individuals, families, and communities. Environmental education can motivate future generations to participate in international cooperation, fight for peace, care for the environment, and safeguard human health. Green jobs, food education and management, consumption and green marketing, mobility and sustainable tourism, smart cities, the green economy, and lifestyles are all issues that must be addressed.

The current situation is clearly one of an environmental emergency that spares no nation or region of the globe, and thus educating and environmental educations require a long-term view of lifelong learning. Training designed within educational institutions, primarily schools, but also other educational agencies, must move toward a perspective that connects the past, present, and future in a significant and vital way. Training is thus a ‘education for the future,’ education as ‘building the future’ with the acquisition of green skills, even if these can be accompanied by technology and digital, which cannot be ignored (Vischi, 2021). Environmental education is clearly concerned with more than just sustainability; it is also concerned with relationships and responsibility. Sustainability must assist us in rethinking the interconnectedness of the natural and social environments, and thus the need for an ecological significance; thinking and acting as a permanent education perspective in which information, knowledge, and understanding of environmental problems are linked to an ethics and morality of respect and care for the environment itself. Only when we hold others accountable for their actions can we truly care for the environment around us. This is an assumption of responsibility that does not have and does not act as a *do ut des*, it is a responsibility that does not expect retaliation

because the direction of the choices must not follow economic interests and profits, but rather the interest in a significant experience in the environment we inherited and that we will leave as a legacy (Dozza, 2020).

3 Environmental leadership development in higher education

Because of the magnitude and complexity of these challenges, significant transformations are required, including the training of qualified professionals capable of supporting and managing ecological transition processes. This process is also seen as a transition to a new circular economic and social model that has a low environmental impact.

Effective leadership becomes a vector and a transformative practice in order to activate processes of innovation and change within organizations in an ecological and green direction (Gallagher, 2012). Environmental leadership, in particular, is envisioned as a strategic model to guide the qualification of green professionals and the training of competent leaders capable and willing to contribute to a genuine and widespread cultural transformation. These are professionals who are driven by an ecological vision and are committed to promoting organizational change and mobilizing employees toward pro-environmental behaviors. The ability to influence individuals and mobilize organizations to realize a vision of long-term ecological sustainability is thus defined as environmental leadership (Case et al., 2015). Environmental leaders, guided by eco-centric values, strive to change economic and social systems that threaten the environment (Egri & Herman, 2000).

Some clarifications are required to critically interrogate the ways in which leadership phenomena are understood in the field of environmental studies from a pedagogical standpoint. In effect, a simple definition of 'leadership' is complicated and open to multiple interpretations, leading to conceptual ambiguity. Because leadership occurs and is exercised within a larger historical, cultural, economic, and political context, any attempt at definition is influenced and highly contextual (Bufalino, 2020).

A relational perspective encourages us to shift our focus away from 'leaders' and toward 'leadership,' defined as processuality, and thus away from leader-centric and ideological perspectives. Individual traits, characteristics, and roles have frequently been presented and summarized in this field of research in frameworks, models, or reference standards (Heizmann & Liu, 2018). Individuals and their abilities are overemphasized in traditional leadership theories, which pertain to managerial culture or the hero-leader image that has existed in our western culture. These are theories that reify competences by elevating them to normative or ideal levels. Indeed, charisma, vision, determination, and decisiveness have long been associated with organizational and environmental leaders (Thoroughgood et al., 2016). Environmental leadership development, on the other hand, cannot be reduced to a predetermined and prescribed set of skills to be acquired, nor to the development of training courses that conform to the aspirations and intentions of a small group of experts or a group of interest. Thinking about the 'non-territorialized' ecological transition entails being able to recognize individual differences as well as the capacity for self-determination of individual citizens, professionals, organizations, and communities.

Authentic ecological education must be capable of facilitating transformation, educating to uncertainty, and creating conditions for professionals (all professionals, not just

specific categories) to establish themselves as true political subjects or activists concerned with environmental issues, capable of promoting participatory and widespread leadership processes. The term 'leadership' in this context refers to a broader vision that is not limited to those who formally hold positions of responsibility or power, but rather, from a broader perspective, concerns the potential ability to lead and promote green changes. Because leadership processes affect everyone, and everyone has the potential to lead and promote green changes, this enables the development of active networks for the promotion of sustainability. As a result, environmental leadership is envisioned as both a process of influence and a project for the development of human being, culture, and society (Bufalino, 2022).

Universities and other higher education institutions play an important role in assisting society in achieving the Sustainable Development Goals (SDGs) through their research, learning and teaching, campus operations, and leadership. Education for SDGs is an important mission for universities, both because universities are in a unique position to provide this service to society and because ESDG implementation can benefit universities (Ruiz-Mallén & Heras, 2020). Because the ESDGs are relevant to everyone, universities should strive to reach as many learners as possible within their sphere of influence, while prioritizing traditional students and staff. Given the breadth and cross-cutting nature of the SDGs, university courses should incorporate these elements and add value to most of the existing formal and informal learning and teaching activities in universities (Franco et al., 2019). Furthermore, universities should assist students in developing cross-cutting ESDGs skills, competencies, and mindsets. Universities also need to develop new transformative learning activities that employ interdisciplinarity, action-based learning, and multi-actor involvement, which are currently not standard practice within universities (Misiaszek & Rodrigues, 2023). Indeed, higher education is typically organized into highly specialized knowledge areas and traditional disciplines (Gallagher & Savage, 2020; Zamora-Polo & Sánchez-Martín, 2019). In this sense, a paradigm shift toward a systemic perspective emphasizing collaboration and cooperation is required to design a sustainable human future (Aung & Hallinger, 2023).

4 The Green Education Lab

The Green Education Lab was established in 2022 at the Department of Education Sciences of the University of Catania (D'Aprile & Bufalino, 2022) as part of the research project PON Research and Innovation – REACT EU – (GREEN) “Environmental leadership in education. Educational planning, culture of sustainability, and ethical-social responsibility”. The research objectives of the laboratory are in line with the principles of the Agenda 2030 and the most recent programmatic indications of the National Recovery and Resilience Plan (PNRR), with a focus on promoting a culture of sustainability, enhancing biodiversity, and the ecological and cultural transition. The laboratory is a space for theoretical-application research on ecological education and green professional training, and it fosters collaborations between institutions, local governments, and businesses to spread an environmental sustainability culture and build a green community (D'Aprile & Bufalino, 2022). The laboratory lecturers deliver courses and provide training to students and professionals in accordance with the recent ‘student as researcher’ model (Haggis, 2009), which promotes partnerships in which students work with lecturers to mobilize their knowledge in order to become ‘change agents’ and leaders in their work.

This should be a central and structured component of their formal and informal co-curricular activities. While other goals of the curriculum should be supported (for example, student employability and civic engagement), students learning in ‘research mode’ should be central to the curriculum. We need to transform undergraduate research from a privileged role for a few students to a significant structured curriculum experience for all students (Matthews et al., 2018). This approach aims to foster a sense of shared responsibility for the quality and conditions of teaching and learning among students and lecturers (Jenkins & Healey 2009). It requires the student to take an active role in researching, analyzing data, documenting, and presenting it. The following section provides an example of pedagogical practice that can be used to teach sustainability Learning about sustainability through podcasts.

4.1 Learning about sustainability through podcasts

A podcast is defined as any digital media file, or series of files, distributed over the internet for playback on portable media players and personal computers (Lonn & Teasley 2009). Podcasts cover a wide range of topics and genres, including film, music, and comedy. On-demand voice media, whether music, podcasts, or radio, has broken down the barriers between scheduled and live voice entertainment. People can now listen to whatever they want, whenever they want, and as often as they want. Modern voice media has reshaped how people consume entertainment in the twenty-first century.

Students who can use podcasts as a learning resource benefit from audio learning, learn about podcasting technology, and encourage learning outside of the classroom. Podcasts enable lecturers to increase podcast usage and develop new classroom activities to improve students’ learning experiences.

Podcasts are popular because they can be consumed a la carte by connecting listeners with specific topics. Furthermore, almost anyone can create content and share their thoughts and perspectives with an audience.

It has been found that the majority of people who listen to podcasts do so in order to learn new things (Watson 2020). As a result, assigning podcasts is a potential addition to any course in sustainability education. According to the literature, instructors believe that students perceive podcasts as a useful educational tool, and that the primary way students use podcasts is for reviewing and clarifying concepts. In 2022, a group activity was organized at the Department of Educational Sciences with 300 students from the course of ‘General education’ of the Bachelor’s degree in science and psychological techniques (University of Catania). Thirty working groups were formed as part of the training activity and a basic lesson on “how to create a podcast” was delivered. Students were tasked with managing the project, choosing the topic, writing the script, producing the podcast, presenting it to the class, and uploading it to media space (an audio-video collection space). The production activity has provided them with opportunities to develop teamwork, communication skills, organizational skills, planning skills, and technological literacy. In particular, each group was required to create a podcast lasting approximately 20 minutes on the themes of “sustainability” for the development of environmental education. Each group member acts as a researcher because he or she is required to conduct research in academic articles, journals, or books that were provided as suggestions, while others were free to use other sources. A jury of students and lecturers selected the most innovative products with the greatest communicative and scientific impact. This multimedia product was recorded and published as a result of collaboration

with Radio Zammù, the radio station of the University of Catania, and the UNICT Communication area. The activities were designed to strengthen the student's role as a researcher by utilizing cooperative learning methodology. This enabled us to conduct an in-depth investigation of the various dimensions that characterize the themes of education for sustainability, which were socialized and disseminated through the development of a multimedia product in the form of a podcast. Here are some examples of student-created podcasts that address this question: What exactly does the term 'sustainability' mean?

One group referred to sustainability as inner ecology, and they created a podcast called Carpegreen. Carpegreen is a neologism formed by combining the well-known Latin phrase *carpe diem* (*carpe*) and green, an English noun commonly used in ecology. The meaning can be found in the etymology of the first word, *carpe*, which means seize the day in Latin. In this case, it is interpreted as an admonition to make every day a chance to express one's uniqueness, as the ultimate goal of the permanent and essence of man, as opposed to the waning of humanity in danger. Throughout the podcast, the students examined the interconnections between mind, education, and environment by following a timeline from the past to the present.

Figure 1

CarpeGreen



Another group of students wanted to emphasize sustainability and show that it is possible to promote sustainable education that starts with children and continues to educate future generations through innovative and creative means (art, film, music, and comics).

Figure 2

Lifeguards of the Planet: creativity and sustainability



Other groups use metaphorical language to explain the theme of sustainability, such as poetry and classical literature; others emphasize the need for creative approaches to environmental solutions; and still others report on their experiences with outdoor education and the need to create educational opportunities to learn in open spaces and with nature.

5 Concluding remarks

A genuine education for sustainability engages students in fundamental questions about how humans and other species live on this planet, while also valuing approaches which allow individuals and communities to address these questions in a relatively autonomous and context-sensitive manner. This will help to increase citizen engagement with social and environmental issues through more active participation in decision-making processes. Education for environmental sustainability cannot be solely about social reproduction; it must also – and perhaps most importantly – include the capacity to critique and 'transcend' social norms, behavior patterns, and lifestyles by promoting alternative norms and practices that are not prescriptive or authoritarian. In this context, a critical examination of the concept of 'ecological transition' as a pedagogical category capable of reflecting on transformations in order to guide new generations and redesign daily routines is possible.

According to the reported experience, the construction of the podcast increased students' motivation and curiosity by encouraging full participation in the learning process. Indeed, podcasting can be a highly effective tool for increasing class interaction, fostering collaboration, and developing the skills necessary to reach a common objective. It is an approach that encourages students to reflect on their own learning, enhance their performance while creating content, and reconsider and modify their own ideas. Consequently, the use of active methodologies promotes the continuous construction of new knowledge, the development of learner-centered learning environments, and the activation of skills that will be beneficial in the future (Fedeli et al., 2016; Tino, 2019).

The reported pedagogical experience contributes to the value and recognition of podcasting as a student-centered activity in higher education, enabling students to be active authors and producers as opposed to passive recipients. In contrast to the passive reception of information through traditional lectures, student-activating teaching methods are pedagogical approaches that require students to actively participate, think critically, and reflect. This way of learning about sustainability involves acquiring new ideas, but also modifying or abandoning old ones. It also requires students consider their perspectives on sustainability in order to develop them further, and that instructors or lecturers elicit these perspectives in order to incorporate them into their teaching (Seatter & Ceulemans, 2017).

Acknowledgments

The article is the result of the collaboration of the two authors. Paragraphs 1, 2 were written by Gabriella D'Aprile, while paragraphs 3, 4, and 5 were written by Giambattista Bufalino. The authors acknowledge that this study was conducted as part of the PON Research and Innovation project REACT EU - (GREEN) "Environmental leadership in

education." Educational design, sustainability culture, and ethical-social responsibility" CUP E65F21002540007.

6 References

- Acosta Castellanos, P. M., & Queiruga-Dios, A. (2022). From environmental education to education for sustainable development in higher education: a systematic review. *International Journal of Sustainability in Higher Education*, 23(3), 622–644.
- Aung, P. N., & Hallinger, P. (2023). Research on sustainability leadership in higher education: A scoping review. *International Journal of Sustainability in Higher Education*, 24(3), 517–534.
- Bufalino, G. (2020). *Pedagogia e leadership educativa*. Armando.
- Bufalino, G. (2022). (Ri) generare la scuola. Per una transizione green e culturale. *Studi sulla Formazione/Open Journal of Education*, 25(2), 7–11.
- Case, P., Evans, L. S., Fabinyi, M., Cohen, P. J., Hicks, C. C., Prideaux, M., & Mills, D. J. (2015). Rethinking environmental leadership: The social construction of leaders and leadership in discourses of ecological crisis, development, and conservation. *Leadership*, 11(4), 396–423.
- D'Aprile, G., & Bufalino, G. (2022). Cultura della sostenibilità e formazione ecologica: il Green Education Lab. *Annali della facoltà di Scienze della formazione Università degli studi di Catania*, 21, 73–85.
- Dozza, L. (Ed.) (2020). *Con-tatto. Fare Rete per la Vita: idee e pratiche di Sviluppo Sostenibile*. Zeroseiup.
- Dozza, L. (2018). Co-building an ecological mindset for living gently on planet Earth. *Pedagogia oggi*, 16(1), 193–212.
- Egri, C. P., & Herman, S. (2000). Leadership in the North American environmental sector: Values, leadership styles, and contexts of environmental leaders and their organizations. *Academy of Management journal*, 43(4), 571–604.
- Fedeli, M., Grion, V., & Frison, D. (Eds.) (2016). *Coinvolgere per apprendere. Metodi e tecniche partecipative per la formazione*. Pensa MultiMedia.
- Franco, I., Saito, O., Vaughter, P., Whereat, J., Kanie, N., & Takemoto, K. (2019). Higher education for sustainable development: Actioning the global goals in policy, curriculum and practice. *Sustainability Science*, 14, 1621–1642.
- Gallagher, D. R. (Ed.). (2012). *Environmental leadership: A reference handbook*. Sage.
- Gallagher, S. E., & Savage, T. (2020). Challenge-based learning in higher education: an exploratory literature review. *Teaching in Higher Education*, 1–23.
- Hadjichambis, A. C., & Paraskeva-Hadjichambi, D. (2020). Education for environmental citizenship: The pedagogical approach. *Conceptualizing environmental citizenship for 21st century education*, 4, 237–261.
- Haggis, T. (2009). What have we been thinking of? A critical overview of 40 years of student learning research in higher education. *Studies in Higher Education*, 34(4), 377–390.
- Hayward, B. (2012). *Children, citizenship and environment: Nurturing a democratic imagination in a changing world*. Routledge.
- Heizmann, H., & Liu, H. (2018). Becoming green, becoming leaders: Identity narratives in sustainability leadership development. *Management Learning*, 49(1), 40–58.
- Loiodice, I. (2017). La gravidanza educativa della locuzione “bene comune”. *MeTis*, 7(2), I-IV.

- Malavasi, P. (2020). Pedagogia ed economa civile per imparare l'umano. *MeTis-Mondi educativi. Temi indagini suggestioni*, 10(2), 73-91.
- Matthews, K. E., Dwyer, A., Hine, L., & Turner, J. (2018). Conceptions of students as partners. *Higher Education*, 76, 957–971.
- Misiaszek, G. W., & Rodrigues, C. (2023). Six critical questions for teaching justice-based environmental sustainability (JBES) in higher education. *Teaching in Higher Education*, 28(1), 211–219.
- Moore, J. (2005). Barriers and pathways to creating sustainability education programs: Moving from rhetoric to reality. *Environmental Education Research*, 11(5), 537–555.
- Newell, P., Daley, F., & Twena, M. (2022). *Changing our ways: Behaviour change and the climate crisis*. Cambridge University Press.
- Prince, B. F. (2020). Podcasts: The potential and possibilities. *Teaching sociology*, 48(4), 269–271.
- Ruiz-Mallén, I., & Heras, M. (2020). What sustainability? higher education institutions' pathways to reach the agenda 2030 goals. *Sustainability*, 12(4), 1290.
- Seatter, C. S., & Ceulemans, K. (2017). Teaching Sustainability in Higher Education: Pedagogical Styles that Make a Difference. *Canadian Journal of Higher Education*, 47(2), 47–70.
- Thoroughgood, C. N., Sawyer, K. B., Padilla, A., & Lunsford, L. (2016). Destructive leadership: A critique of leader-centric perspectives and toward a more holistic definition. *Journal of Business Ethics*, 151, 627–649.
- Tino, C. (2019). Active learning: resistenza di studenti e studentesse. Strategie per ridurla. *Educational Reflective Practices*, 9(1), 194–210.
- Tomarchio, M., D'Aprile, G., & La Rosa, V. (2019). *Natura Cultura: Paesaggi oltreconfine dell'innovazione educativo-didattica*. FrancoAngeli.
- UN General Assembly. Resolution adopted on 25 September 2015. *Transforming our World: The 2030 Agenda for Sustainable Development*. https://www.un.org/ga/search/view_doc.asp?
- Vischi, A. (2021). Sostenibilità e imprese per generare il bene comune. Progettualità, Post-Covid 19, Società benefit. *Formazione & insegnamento*, 19(2), 50–56.
- Zamora-Polo, F., & Sánchez-Martín, J. (2019). Teaching for a better world. Sustainability and sustainable development goals in the construction of a change-maker university. *Sustainability*, 11(15).