Alessia Scarinci
Anna Daniela Savino

Enhancing skills development for sustainability

A Pedagogical-didactic model for teachers in VET education

didattizzazione

FrancoAngeli

Didattizzazione

La collana accoglie e sviluppa temi e prospettive inerenti l'insegnamento assunto come "azione mediata", a diversi livelli di elaborazione e campi di espressione. A partire dalla definizione originaria di insegnamento, in-signo-pònere, la collana intende sviluppare tutte le possibili diramazioni oggi percorribili dalla ricerca didattica in ambito scolastico e della formazione e, nella fattispecie: i processi di mediazione, sul piano traspositivo, relazionale, comunicativo, semiotico; i processi di mediatizzazione, nella prospettiva socio-culturale, dell'embodiment, tecnologica e "mediale"; gli agenti della mediazione, siano essi docenti di scuola, educatori dell'area sociale e culturale, supervisori, mentori e tutor dei percorsi universitari e professionalizzanti; i mediatori didattici, sotto forma di esperienza diretta, simulazione, immagini, concetti; i prodotti della mediazione, sotto forma di prototipi e strumenti didattici di cui usufruire nelle pratiche. La collana, pertanto, accogliendo le intuizioni euristiche di autori come M. Develay, M. Altet, L. Shulman, C. Day, E. Damiano, C. Laneve, M. Pellerey, intende diventare una "piattaforma" di ricerca finalizzata anche a suscitare il dibattito tra gli operatori coinvolti a vario titolo nei processi di educazione e formazione in cui si realizza l'"azione mediata": ricercatori e studiosi, operatori della scuola, formatori delle professionalità educative e didattiche.

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1. Introduction

by *Anna Daniela Savino*

The green transition is emerging as a central theme in public policies, requiring a radical renewal of both economic and social development paradigms (UNIONCAMERE, 2021). In this context, the integration of sustainability in Vocational Education and Training (VET) emerges as a strategic imperative, which aligns with the ambitious United Nations Sustainable Development Goals (SDGs), established in the 2030 Agenda in 2015. To achieve these goals, the role played by education and training is crucial, as specifically highlighted by targets 4.4. and 4.7 of SDG 4, which emphasize the need to provide individuals with the tools, in terms of knowledge and skills, necessary to promote sustainable development (UNEVOC, 2021; Öhman, Sund, 2021).

European documents highlight how reskilling and upskilling initiatives, i.e. the requalification and updating of professional skills, are fundamental to achieving competitive sustainability (UNIONCAMERE, 2021). These skills are therefore relevant not only in terms of increasing individual employability, but also in order to improve overall business productivity and promote economic resilience (McGrath, Powell, 2016). The continuous adaptation of industries to new environmental standards and technologies therefore requires a workforce competent in green and soft skills, highlighting the need for VET curriculum to incorporate sustainable practices and programs aimed at improving creative, entrepreneurial and innovative skills among students, supported by critical reflections on attitudes

and values central to Education for Sustainable Development (ESD) (Kamis et al., 2017; UNEVOC, 2021).

There are several challenges highlighted by the UNEVOC document (2017, 2021) in the achievement of the SDGs by Vocational Education and Training (VET) systems, such as the lack of awareness on sustainability, outdated skills and the need for greater involvement of key actors (UNEVOC, 2021; UNEVOC, 2017). For an effective implementation of the SDGs, UNESCO proposes a holistic approach that integrates sustainable development in the curriculum, research, community and institutional culture (UNEVOC, 2017, p. 12). In particular, as regards to the curriculum, it can be made "green" if sustainability is integrated into the skills, knowledge, attitudes and values of individuals through a multidisciplinary and multidimensional approach to sustainability in order to ensure appropriate training which addresses the needs of the green economy, in line with future challenges and opportunities (UNEVOC, 2021).

It is essential to adapt curricula and standards to current green skills needs and reflect these changes in pedagogical strategies that, through learning experiences that integrate theoretical and practical studies, are aimed at achieving educational objectives in line with the SDGs (UNEVOC, 2021; Öhman, Sund, 2021). Vare and Scott, in fact, highlight the importance of considering sustainable development as a social learning process, focused on the ability to deal with dilemmas and contradictions (Öhman, Sund, 2021). Education based on sustainability skills can stimulate responsible actions and motivate students to undertake or request actions at local, national and global levels. Developing sustainability skills also helps students overcome cognitive dissonance that arises not only from awareness of a problem but also from the lack of action capacity to address it. In this context, the GreenComp framework plays a fundamental role, helping education and training systems to educate people capable of thinking systematically and critically, concerned about the present and future of our planet (Bianchi et al., 2022).

The acquisition of green skills becomes, therefore, a necessary condition to ensure the success of the transition towards a green and low-carbon economy and therefore able to offer new job opportunities by 2030 and greater stability not only environmental but

also financial (McGrath, Powell, 2016). The Action Plan of the EU Agency Cedefop (2015) also underlined the importance of developing such skills in all sectors, with a particular emphasis on strategic sectors such as construction that require specialization in areas such as energy efficiency, renewable energy, circularity and digitalization, recognizing the importance of such skills in promoting competitive sustainability and responding effectively to the environmental challenges of our time.

Despite the relevance that vocational education and training (VET) has regained at the international policy level since 2010, the problem highlighted by some studies (McGrath, Powell, 2016; UNEVOC, 2021; Kamis et al., 2017; Öhman, Sund, 2021) concerns the persistence of approaches rooted in old patterns of thought related to skills, work and development, which remain strongly focused on economic logics, formal wage employment and industrial modernization, which have remained almost unchanged since the 1960s. In order for VET to contribute effectively to sustainable development, a rethinking, a "reimagination" as Powell (2012) argues, of the vocational training system is necessary, capable of embracing not only the technical aspect of skills, but also a broader approach that includes social and environmental responsibility, fully integrating the principles of sustainable development into curricula and training practices.

In response to these challenges, the Erasmus+ project *Greenwave in Vet – A New SDG Perspective,* was developed to support the implementation of ESD within VET institutions. The project's central objective is the creation of a shared pedagogical-didactic model (PDM) designed to equip teachers with tools, frameworks, and strategies to incorporate sustainability meaningfully into teaching practices. This model seeks to go beyond the transmission of knowledge, aiming instead to foster critical thinking, participatory learning, and inner development as foundational dimensions of sustainability education.

The innovation of the "Greenwave" approach lies in the integration of multiple conceptual frameworks: the European GreenComp framework for sustainability competences, the Inner Development Goals (IDGs) as preconditions for transformative learning, and the triadic model of cognitive, emotional, and practical engagement in

learning processes (Öhman & Sund, 2021). Grounded in the principles of active pedagogy and inspired by Deweyan philosophy, the project positions students as active agents in their learning journey and emphasizes the relational and affective dimensions of education.

This monograph presents the conceptual foundations, methodological approach, and outcomes of the Greenwave in Vet project. It outlines the development of the PDM and discusses its application in different European contexts, with the aim of contributing to the advancement of sustainability education in VET and offering actionable insights for policy, teacher training, and curriculum design.

2. Theoretical Framework

by *Anna Daniela Savino*

The current global landscape, marked by intricate and evolving challenges, underscores the urgent need for effective strategies and timely actions; this necessity is reinforced by the United Nations' Sustainable Development Goals (SDGs), established in the 2030 Agenda, a significant advancement from Agenda 21. Central to this context are the Sustainable Development Goals, particularly Goal 4, which aims to ensure quality education, emphasizing the importance of Education for Sustainable Development (ESD) to promote sustainable lifestyles, human rights, gender equality, and other core values (Öhman, Sund, 2021). Educational institutions, responding to these needs, are intensifying efforts to integrate ESD into their policies and curricula. The goal is to develop critical competencies such as systemic thinking, anticipatory and creative thinking, and strategic and action capabilities. These competencies are crucial for shaping individuals who can not only understand but also address and lead change towards sustainability (Tejedor et al., 2019). Schools worldwide are responding to the challenge of incorporating sustainability into their educational policies through the adaptation of goals, content, and teaching methods (Öhman, Sund, 2021). Vare and Scott highlight the importance of viewing sustainable development as a process of social learning, focused – as said – on the ability to deal with dilemmas and contradictions. Scott argues that developing these abilities is a crucial objective for schools, contributing not only to social justice but also to human well-being (Öhman, Sund, 2021).

Competency-based education in sustainability can stimulate responsible action and motivate students to undertake or demand actions at local, national, and global levels. Developing sustainability competencies help students encompassing cognitive knowledge into practices but also understanding and overcoming dissonance that arises from the awareness of a problem but a lack of agency to address and eventually solve it. In this context, the GreenComp framework plays a crucial role, aiding education and training systems in developing people accustomed to thinking systematically and critically, concerned about the present and future of our planet. The 12 competencies of the GreenComp framework are applicable to students of all ages and educational levels, in formal, non-formal, and informal educational contexts.

The UNESCO-UNEVOC document identifies several challenges in updating technical and vocational education and training (TVET) systems to align with the SDGs. These challenges include a lack of awareness about sustainability, outdated skills, and the need for greater engagement of key stakeholders (UNEVOC, 2021; UNEVOC, 2017). As said, to further implement the SDGs in vocational training institutions, UNESCO proposes a holistic approach that integrates sustainable development into the curriculum, research, community, and institutional culture (UNEVOC, 2017:12). It is essential for the TVET sector to align its programs and standards with current green skill needs reflecting these changes in pedagogical strategies (UNEVOC, 2017).

The transition towards a green economy, catalyzed by the COVID-19 pandemic, requires a radical renewal of development paradigms, emphasized by the European Union. This transition anticipates that the shift to a low-carbon economy will open new job opportunities by 2030. Finally, the Action Plan of the EU Agency Cedefop underscores the importance of green skills across all sectors, with a special emphasis on strategic areas like construction. This implies the need to develop skills in areas such as energy efficiency, renewable energies, circularity, and digitalization, recognizing the importance of such skills in promoting competitive sustainability and effectively responding to the environmental challenges of our time.

In the educational field, there has been a significant shift towards integrating sustainable competencies into curricula. This movement is driven by the awareness that sustainability skills are crucial for shaping individuals capable of acting as agents of change towards a more sustainable future. These competencies include not just knowledge, but also the skills and attitudes necessary to understand and interact with complex systems, promoting actions that support the ecosystem and social justice. As highlighted by the GreenComp report – European framework of competencies in sustainability (2022), sustainability (a broad and partly ambiguous concept) refers to a variety of meanings and applications depending on the context and the group of people involved. It is often confused with sustainable development and so there is a need of clarifying the concepts: while sustainability is a long-term goal for a more balanced world, sustainable development refers to the methods and processes to achieve this goal sustainably. Sustainability emphasizes the urgency to consider the needs of all forms of life and the planet itself, establishing a limit to human activities so as not to exceed the planet's capacity.

Given these premises, let us now focus on some of the results of the project Erasmus+ "Constructing a Green Wave in VET – A New SDG Perspective" realized by different European countries. As it will be shown, this project aligns with the priorities of the new Erasmus+ program for environmental sustainability and UN objective 4.7, which aims to guarantee that all students acquire the knowledge and skills which are necessary to promote sustainable development as well as global citizenship, as said.

The final output of the project, as will be highlighted, is the creation of a common pedagogical and didactic model (PDM) to teach sustainability in Vet schools across the European countries, responding to the educational emergencies highligthed above.

The Green Wave VET project in fact, aims at exploring and improving the integration of sustainable education in Professional and Technical Training (VET) contexts, also focusing on how the 17 Sustainable Development Goals (SDGs) can be implemented in school curricula, particularly in the VET schools and building construction sector.

As it will be shown, the PDM designed bases its innovative character on one hand, stimulating the development of critical and creative-constructive skills to face the new challenges of sustainability always placing students at the center of learning process; on the other hand, offering an innovative model for teachers, aimed not only at the creation of new contents relating to sustainability but also at the development, in a metacognitive sense, of the pre-conditions that allow us to think and build within the framework and mindset of sustainability (Savino, 2024); for the benefit of both poles of the educational relationship, students and teachers, within this model various competencies will be developed: the Inner Development Goals (IDGs) on one side, the head-hands-heart framework plus the Öhman and Sund model of the three spheres of human dimensions on the other side, are therefore addressed and developed, which will be intended as structural pre-conditions that can further allow the development of the skills of the Sustainable Development Goals.

2.1. Conceptual Distinctions: Sustainability and Sustainable Development

The GreenComp report (Bianchi et al., 2022) elaborates on sustainability, a concept with diverse meanings and applications that vary by context and stakeholder group. While often conflated with sustainable development, sustainability represents a long-term objective for achieving global equilibrium. Conversely, sustainable development focuses on the methodologies and procedures aimed at realizing this sustainability objective. The distinctions between these concepts are currently under scrutiny, with some experts treating sustainability as a transdisciplinary science (Barth et al., 2023; Steifeld, Mino, 2009), thus underscoring the importance of education in this field. Sustainable development, initially a political construct (Bolis et al., 2014), predominantly involves the political domain, outlining actions and strategies for societal advancement. Therefore, this project emphasizes the necessity for clear definitions and understanding of these terms – sustainability, sustainable development, and their role

in education (Bianchi, 2020) – and discusses the implications of such clarifications for the study and project at hand.

2.2. The GreenComp Framework: Areas and Key Competences

The GreenComp framework, as said, plays a central role in this context, defining sustainability as a fundamental and cross-cutting competency at all ages. This competency is composed of various sub-elements aimed at developing the ability to think critically and systemically, planning and acting for sustainable futures. The approach to learning for environmental sustainability, part of this framework, aims at instilling a sustainability-oriented mindset from childhood, preparing learners to become conscious and active change agents respecting the limits of our planet.

The GreenComp framework is structured around four interconnected areas, each encompassing three key competences, for a total of twelve. These competences offer a comprehensive view of sustainability education, integrating cognitive, emotional, and behavioural dimensions.

The first area, *Embodying sustainability values*, focuses on developing a personal commitment to sustainability through reflection on values, the pursuit of fairness, and respect for nature. The second, *Embracing complexity in sustainability*, involves competences such as systems thinking, critical thinking, and problem framing – essential for analysing the dynamic, interconnected challenges of sustainability.

The third area, *Envisioning sustainable futures*, supports the capacity to imagine and plan for sustainable transformations, emphasising adaptability, creativity, and futures literacy. Lastly, *Acting for sustainability* translates knowledge and intention into action, both individually and collectively, through political agency, collaboration, and personal initiative.

Together, these competences form a flexible and transferable framework, intended to guide curriculum design, teaching practices, and educational policy in cultivating active, informed, and responsible citizens for a sustainable future.

Fig. 1 - Sustainability as a competency consists of 12 interdependent elements forming a single systemic entity or logical framework (GreenComp, 2022)

Visual representation of *GreenComp*.

The UNESCO (2017) framework of key competences for sustainability is also fundamental for achieving the sustainable development goals of the 2030 Agenda and training people as "citizens of sustainability". These skills represent transversal skills needed for all students of all ages around the world (developed at different age-appropriate levels). Key competences can be understood as transversal, multifunctional and context-independent and are considered crucial for promoting sustainable development (UNESCO, 2017, p. 10). Sustainability core competencies represent what sustainability citizens particularly need to address today's complex challenges.

Some useful aspects for the definition of the model also emerged from an analysis of the literature. First, the need to make a distinction between key competences and action competences in the context of sustainability. The key competences, identified by UNESCO, are essential to train individuals capable of tackling sustainability challenges. However, competence orientation presents challenges, especially in their integration into teaching practice. In contrast, the concept of action competence emphasizes the development of critical thinking, dialogue and debate skills, and focuses on being qualified participants in sustainability issues (Öhman, Sund, 2021).

Fig. 2

Box 1.1. Key competencies for sustainability

Systems thinking competency: the abilities to recognize and understand relationships; to analyse complex systems; to think of how systems are embedded within different domains and different scales; and to deal with uncertainty.

Anticipatory competency: the abilities to understand and evaluate multiple futures – possible, probable and desirable; to create one's own visions for the future; to apply the precautionary principle; to assess the consequences of actions; and to deal with risks and changes.

Normative competency: the abilities to understand and reflect on the norms and values that underlie one's actions; and to negotiate sustainability values, principles, goals, and targets, in a context of conflicts of interests and trade-offs, uncertain knowledge and contradictions.

Strategic competency: the abilities to collectively develop and implement innovative actions that further sustainability at the local level and further afield.

Collaboration competency: the abilities to learn from others; to understand and respect the needs, perspectives and actions of others (empathy); to understand, relate to and be sensitive to others (empathic leadership); to deal with conflicts in a group; and to facilitate collaborative and participatory problem solving.

Critical thinking competency: the ability to question norms, practices and opinions; to reflect on own one's values, perceptions and actions; and to take a position in the sustainability discourse.

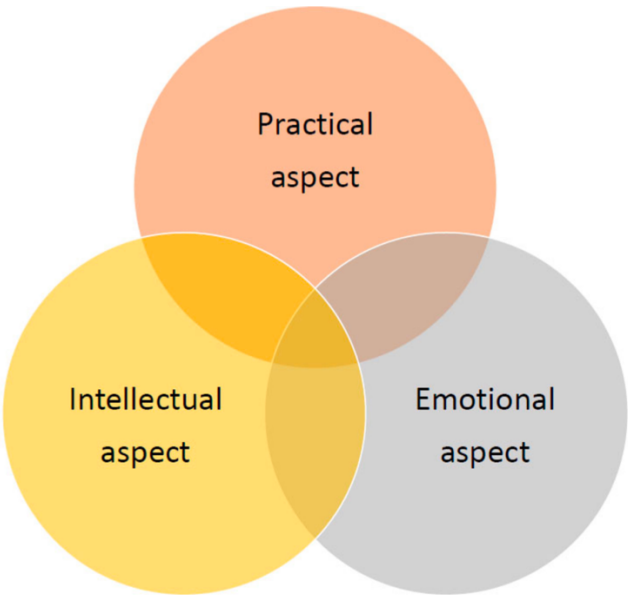
Self-awareness competency: the ability to reflect on one's own role in the local community and (global) society; to continually evaluate and further motivate one's actions; and to deal with one's feelings and desires.

Integrated problem-solving competency: the overarching ability to apply different problem-solving frameworks to complex sustainability problems and develop viable, inclusive and equitable solution options that promote sustainable development, integrating the above-mentioned competences.

Hence the need to employ a multidimensional approach in learning. According to Öhman and Sund (2021), to develop a solid commitment towards sustainability, it is important to offer students a variety of learning experiences that include intellectual, emotional and practical dimensions:

- acquiring knowledge on sustainability issues and relating personally to that knowledge (intellectual aspect);
- articulating emotional responses and aligning personal values with sustainability (emotional aspect);
- building motivation and capacity to engage in democratic actions (practical aspect).

Fig. 3 - Aspects of sustainability commitment. From Öhman and Sund, 2021, p. 8



These three fundamental aspects – going back to the description of the structure of our pedagogical and didactic model for Vet schools – needed to be integrated into the pedagogical model for sustainability. This approach requires active methodologies that place the student

at the center of the educational experience, facilitating the acquisition and development of knowledge, skills and competences necessary to act in a sustainable way. Such methodologies include problem solving, case studies, simulation, project-based learning, and service learning.

Recent studies indicate that better cognitive learning is achieved with community-oriented and constructive pedagogies that promote active and experiential learning. These educational practices increase cognitive learning about sustainability and incentivize interaction with stakeholders, favoring transdisciplinarity and stimulating systemic and critical thinking (Tejedor et al., 2019).

Frisk and Larson suggest the introduction of alternative forms of knowledge, such as procedural, effective, and social knowledge, to effectively educate for sustainability. They focus on skills such as systems thinking, long-term strategic reasoning, stakeholder engagement and team collaboration, as well as action orientation and the ability to act as change agents. Lambrechts and colleagues propose interactive and participatory, action-oriented and research methods as effective educational approaches for higher education for sustainable development (Tejedor et al., 2019).

Pedagogical strategies for sustainability, therefore, must be a set of procedures negotiated and applied in a reflective and flexible way, to promote teaching and learning that enhances understanding, emotion and practice in the education of students towards sustainability.

To conclude with, the pedagogical-didactic model for sustainability must incorporate these different elements and challenges, moving towards a holistic approach that takes into account key and action competences, and which promotes active and multidimensional learning to prepare students to be citizens aware and active in the field of sustainability.

Following what has been said and given the urgency of a structured education for school teachers about the general theme of sustainability as well as specific training for each type and level of schools across Europe, the Erasmus project “Greenwave in Vet Erasmus + Project” was considered to thouroughly fit this educational need highlighted so far in this discourse.

In addition to the previously discussed frameworks, it is important to consider other influential conceptualizations that have con-

tributed to the clarification of the notion of sustainability, particularly in its relationship with education. As highlighted by Bianchi (2020), the development of sustainability-related competencies has evolved through various attempts – both theoretical and institutional – to define comprehensive competence frameworks. A review of these efforts reveals significant variation in how sustainability and sustainable development are defined across academic literature and policy documents, reflecting a lack of shared conceptual ground (Sustainability competences. A systematic literature review).

Despite this "sea of labels" (Bianchi, 2020), a common theme emerges: sustainability implies an urgent need to consider the well-being of all forms of life and the ecological limits of the planet. It is thus framed as a long-term objective that requires immediate educational interventions to foster awareness and competencies capable of supporting a transformation in how individuals interact with the environment – both physically and spiritually.

This position is reinforced by widespread consensus on the importance of equipping learners of all ages with the competences needed to "tackle sustainability challenges and re-learn to live in tune with the planet on which our economy and our society depend" (Wiek et al., 2011; UNESCO, 2007). Accordingly, the Greenwave in Vet Erasmus+ project seeks to respond to this global educational imperative by proposing a targeted intervention for teachers and students within the VET context. Its aim is to strengthen sustainability competences, understood as "an interlinked set of knowledge, skills, attitudes, and values that enable effective, embodied action in the world with respect to real-world sustainability problems, challenges, and opportunities, according to the context" (Wiek et al., 2011).

In complement to the GreenComp and Öhman and Sund frameworks, the Inner Development Goals (IDGs) offer a psychological and relational foundation for enabling sustainability-oriented competences. Their relevance will be discussed in the following section. a psychological and relational foundation for enabling sustainability-oriented competences. Their relevance will be discussed in the following section.

2.3. The Inner Development Goals (IDG) Framework

An additional conceptual framework that informed the development of the Pedagogical-Didactic Model (PDM) for sustainability education is the Inner Development Goals (IDG) framework (www.innerdevelopmentgoals.org). This model emphasizes the inner capacities, qualities, and skills individuals must develop to meaningfully engage with sustainability challenges.

To understand its relevance, it is important to reflect on the concept of educational poverty. According to Botezat (2016), educational poverty can be assessed across four dimensions, as defined by ISTAT: 1) participation, 2) resilience, 3) the ability to build new relationships, and 4) standard of living. Of particular interest is the third dimension, which involves problem-solving abilities, communication skills, and prosocial attitudes – key traits in intra- and interpersonal relationships.

This highlights the central role of educational institutions as spaces that nurture relational skills, understood both as teachable and learnable (Damiano, 2021).

The function of the education system, therefore, appears to be of fundamental importance for the promotion and development of basic skills, and consequently, for the correct functioning of the student and the future citizen in society (Rosa, 2015). In this regard, the teacher's task is to continually ask herself/himself the question previously described in order to try to remove the obstacles that can affect the four sub-dimensions depicted. The importance of continually investing in culture and education is evident, which in other words is equivalent to being able to build a winning future from the point of view of social living skills and other people's recognition (Bilégué, 2019). We therefore recognize the individuality and specialty of each one and an interrelated and interconnected system in which each represents an element we can interact with and therefore create an evolution in progress. In this context, the role of the teaching-learning process is constantly reorganizing and restructuring, and it is for this reason that it is important to establish the foundations of an educational perspective open to the challenges of society and knowledge (Perla, Vinci, 2021). It is from this perspective that it is believed that

learning develops as a consequence of relationality, in turn as a consequence of affectivity. The teacher, therefore, should consider the development of the so called "inner structures" also when thinking about developing the concept of sustainability: with regards to the principles of the inner development – as it is addressed in the framework of the Inner Development Goals (IDG) – we refer to the background and method highlighted in the *Transformational skills for Sustainable Development* (www.innerdevelopmentgoals.org).

Let us go more in depth about this concept and work: the report of Thomas Jordan is focused on the account of the first phase of Inner Development Goals project that gathered researchers, CEOs, HR managers, sustainability managers and leaders of the Swedish academic institutions such as The Stockholm School of Economics, the Center for Social Sustainability at Karolinska Institutet, the Lund University Centre for Sustainability Studies and Stockholm University. During 2020 a series of five consultative meetings were held within a network comprising about 80 managers, researchers and organizational consultants discussing particularly the general frame of the project and the survey design: two surveys were made, the first one launched on the 1st March 2021 and the 2nd on the 19th April.

The aim of the surveys – as well as the entire project – was to identify skills and qualities felt as essential to further develop the competences needed to accomplish the UN SDGs: the main idea was to build "*an inventory of what such crucial abilities, qualities and skills are perceived to be and create a framework that clearly articulates these in ways we can reach a high level of agreement about*" (Inner Deveopment Goals report, p. 5); the starting point of the whole vision about the project was a common belief that "*there is a blind spot in our efforts to create a sustainable global society*" (ibidem) since although we accumulated much knowledge about environmental problems, climate change, poverty, public health etc., and so we know a lot about causes and factors that realized the actual situation of the planet, we still are not clear about what skills and personal qualities of the single individuals, as well as collective communities, need to be acquired in order to make the change highlighted by UN SDGs. So, the initiators of the IDG project were motivated by the belief that what was missing on the part of education was a

"*keen insight into what abilities, qualities or skills we need to foster among those individuals, groups and organizations that play crucial roles in working to fulfill the visions*" (ibidem). Therefore, what was on theme in this shared vision was the urgency to find the ontological pre-condition that allows the sustainability skills to be developed.

In fact "*The argument is that we talk far more about what ought to be done to resolve the problems out in the world, than we talk about how to build skillfulness among the actors who are in a position to make the vision happen*" (ibidem, p. 3) and so the purpose of the IDG initiative was to draw attention to the need to support development of abilities, skills and inner qualities: building a framework that describes these qualities was the first achievement of the project.

A draft of IDG framework was presented and discussed at the workshop on 28 April with about 150 participants, in 12 May at the MindShift conference at SSE with 1.500 participants and also in May 29th at the Integral European Conference; secondly, as said, two surveys were then designed to outline which skills and qualities were seen as relevant in order to work more effectively towards the SDGs, formulated in the following way:

1. *What abilities, qualities or skills do you believe are essential to develop, individually and collectively, in order to get us significantly closer to fulfilling the UN SDGs?*
2. *In the following text boxex, please write 3-7 abilities, qualities or skills and add, if you want, a brief comment on why you feel these abilities, qualities or skills are essential.*

– The design and the description of participants, with methods, analysis of the responses and general outcomes of the surveys are outlined in the report, mainly carried out by T. Jordan and M. Booth (ibidem, p. 8) –

So, what was felt as important for the final elaboration of the PD Model of the Greenwave Vet project was to encompass these findings in it; the most important trait and focus of the all project was the identification of the main categories of qualities and skills that are related to this Inner Development intended as the pre-condition of Sustainability: different skills and qualities included in the IDG

framework are often overlapping and interdependent, some are more fundamental and prerequisites for others, but, leaving this aside, what is relevant is on one side the intention of leaving the framework defined but on the other side thinking about it as also open; the focus is that the IDG framework could be seen as a useful pedagogical framework for the elaboration of a new pedagogical and didactic model for teaching sustainability at school (ibidem, p. 12).

A full and analytic deepening of all the 23 skills and qualities are in the report as follows:

Fig. 4 - Overview of the Inner Development Goals framework

BEING Relationship to self	**THINKIN G Cognitive skills**	**RELATING Caring for others and the world**	**COLLABO-RATING Social skills**	**ACTING Driving change**
Inner compass	Critical thinking	Appreciation	Communication skills	Courage
Integrity and authenticity	Complexity awareness	Connectedness	Co-creation skills	Creativity
Openness and Learning mindset	Perspective skills	Humility	Inclusive mindset and intercultural competence	Optimism
Self-awareness	Sense-making	Empathy and compassion	Trust	Perseverance
Presence	Long-term orientation and visioning		Mobilization skills	

How was utilized the IDG framework for the design of the PDM is clarified further in the next section: it can be said that the IDG framework was intended to be used as a pedagogical tool to led us to the elaboration of our pedagogical-didactic model as anticipated; in particularly the IDG's grid was a help to identify the leading questions for teachers. These questions that will be highlighted below were meant to be asked to teachers and taken as a guide for the building lessons about Sustainability – as shown in the following graph of PDM.

Fig. 5

3. Methodology

by *Alessia Scarinci*

3.1. Research Approach and Data Collection

As said, the Erasmus+ project "Constructing a Green Wave in VET – A New SDG Perspective", carried out between 2021 and 2024 by partners from the Netherlands, Denmark, Spain, and Italy, aligns with the environmental priorities of the Erasmus+ program and with UN Sustainable Development Goal 4.7. This goal aims to ensure that all learners acquire the knowledge and competences necessary to promote sustainable development and active global citizenship.

The Greenwave project focused on strengthening the integration of sustainability education within the contexts of Vocational Education and Training (VET), with particular attention to the construction and education sectors. The overarching objective was to design and implement educational interventions aimed at enhancing teachers' and students' sustainability competencies. The University of Bari (UNIBA) played a pivotal role by leading three core activities:

1. **Mapping and Analysis**: Identification and analysis of existing educational approaches related to sustainability in VET, as well as emerging needs across partner countries.
2. **Understanding and Promotion**: Exploration of how VET systems work with the 17 SDGs, especially in the building sector, to identify context-specific challenges and best practices.
3. **Development of a Pedagogical-Didactic Model (PDM)**: Design of an innovative model integrating methodologies such as Prob-

lem-Based Learning (PBL) and Project-Oriented Learning (POL), while embedding emotional, relational, and cognitive dimensions in the learning process.

The methodological approach adopted was qualitative, participatory, and action-oriented. The project followed a structured sequence of phases:

- **Desk Research and Document Review**: A mapping of policies, strategies, and practices from VET institutions in partner countries was conducted. This included analysis of curricula, green training standards, good practices, and teacher professional development initiatives.
- **Empirical Inquiry**: Two questionnaires were administered to VET teachers (140 respondents) and students (492 respondents) to explore their perceptions, knowledge, and practices related to sustainability education.
- **Theoretical Anchoring**: The model design drew from the GreenComp framework (Bianchi et al., 2022), the Inner Development Goals (Jordan, Booth, 2021), and Öhman and Sund's triadic model (2021), which highlights the integration of cognitive, emotional, and practical dimensions in sustainability learning.
- **Co-Design Process**: The empirical and theoretical insights were synthesised and refined through iterative feedback and collaboration among project partners, leading to the co-construction of the PDM.

This underscored the need for targeted teacher training, grounded in European frameworks, to better equip VET educators in delivering effective, future-oriented sustainability education.

The methodological approach adopted in the development of the Pedagogical-Didactic Model (PDM) for sustainability in VET education was anchored in the responsibilities assigned to the University of Bari Aldo Moro (UNIBA) within Work Package 1 (WP1) of the Greenwave project. WP1 focused on laying the conceptual and operational foundations of the project, with the aim of mapping existing practices, tools, and competencies related to sustainability in VET across the partner countries.

The methodology was primarily qualitative and interpretative in nature, combining desk-based document analysis, comparative synthesis, and expert-driven reflection. UNIBA coordinated the collection and review of strategic documents, policy frameworks, and pedagogical models submitted by the project partners. These materials were mapped and analyzed through a systematic "pen-and-paper" approach, involving detailed reading, categorization, and thematic coding of content relevant to sustainability competencies and teaching practices.

The research team adopted a multi-stage process:

1. **Document Mapping and Inventory**: A comprehensive review of partner contributions, including national frameworks, institutional strategies, and case studies, was undertaken. Each document was examined for references to sustainability education, competence models (such as GreenComp and UNESCO), and pedagogical innovation.
2. **Comparative Analysis**: Key themes and recurring challenges were extracted and compared across national contexts. This phase enabled the identification of gaps and overlaps, and helped highlight transferable strategies.
3. **Conceptual Integration**: Insights from the literature and policy analysis were combined with the theoretical frameworks explored in WP1 – specifically GreenComp, Öhman and Sund's model, and the Inner Development Goals (IDGs) – to construct the conceptual architecture of the PDM.
4. **Validation through Iteration**: Preliminary results were shared within the project consortium for feedback and refinement, ensuring alignment with the practical needs and cultural diversity of the participating VET systems.

This process ensured that the PDM was not only grounded in robust theoretical foundations but also responsive to the real conditions of European VET schools. Before detailing the model's structure, it is essential to define what is meant by a pedagogical-didactic model, or "*dispositivo pedagogico-didattico*". In educational research, such a model refers to an intentional and coherent configuration of strat-

egies, relationships, contents, and tools designed to guide learning. It operates as both a theoretical construct and an operational device, connecting pedagogical principles with teaching methodologies.

A pedagogical-didactic device does not simply transmit knowledge, but shapes the relational and cognitive environment in which learners interact, reflect, and construct meaning. In the context of the Greenwave project, this concept takes on a multidimensional value, encompassing emotional, cognitive, and practical dimensions, and supporting the development of sustainability competencies in a transformative and situated manner and way.

3.2. The Pedagogical-Didactic Device: From Theoretical Foundations to Operational Design

The development of the pedagogical-didactic device in Action R2 of WP1 resulted in a model designed to integrate sustainability principles within VET education systems. This device should be understood as a complex structure encompassing conceptual, methodological, and operational elements that guide both the planning of training activities and daily teaching practices through a systemic and transformative approach.

The theoretical foundation draws from Basil Bernstein's conceptualization of the pedagogic device (1990, 2000), defined as a set of distributive, recontextualizing, and evaluative rules that shape how knowledge is transformed into pedagogical discourse and transmitted in educational settings (Singh, 2002; Bertram, 2012). According to Bernstein, the pedagogic device operates on three levels: the production of knowledge (e.g., academic research), its recontextualization (e.g., teacher training and curricula), and its reproduction (e.g., classroom instruction). This transformation process involves both an instructional discourse (focused on contents and competencies) and a regulative discourse (focused on implicit norms and relational dynamics).

Within the Greenwave project, the device merges theoretical frameworks such as GreenComp, the Inner Development Goals (IDGs), and the 2030 Agenda into an operative matrix supporting

instructional design. Active methodologies – like Problem-Based Learning (PBL), Project-Oriented Learning (POL), simulations, and case studies – are central to the device. These strategies facilitate not only knowledge acquisition but also the development of ethical, emotional, and relational dimensions of learning.

As such, the pedagogical-didactic device is not merely a tool but a dynamic model capable of triggering reflection and transformation in learners and educators. It fosters learning environments that blend disciplinary knowledge, active participation, and ecological awareness. Ultimately, the device developed in Action R2 represents a concrete example of rethinking education as a practice of care, responsibility, and social transformation.

Further inspiration for understanding and structuring the pedagogical-didactic device comes from the SEP model – *Sensibilizzare, Educare, Proteggere* – outlined in recent educational research (Perla, 2014; Perla et al., 2022). The SEP device operates as a latent structure supporting the entire research-training process, highlighting the variables, transitions, and roles that characterize the educational environment. Drawing on the distinction between micro and macro social worlds (teachers and researchers), the SEP model emphasizes a shared, co-constructed process involving all educational stakeholders.

The SEP framework identifies four interdependent phases: (1) macro and micro planning, where objectives are defined and methodologies selected; (2) implementation, including participant mapping, opinion leader training, and laboratory-based co-creation; (3) use of documentation tools, such as questionnaires, video recordings, and focus group transcripts; and (4) co-construction and synthesis through shared reflection (Perla et al., 2022). This multidimensional structure strengthens the alignment between pedagogical intent and formative action, and reinforces the collaborative and systemic vision underpinning transformative sustainability education.

In line with this, the Greenwave project's device reflects similar qualities of flexibility, replicability, and embeddedness within real institutional contexts, thereby functioning not only as an instructional guide but as a participatory and reflexive platform for educational change.

4. Results of the Needs and Context Analysis

by *Alessia Scarinci*

As said, the Green Wave VET project, in particular, focused on three main actions: (1) mapping existing educational approaches about sustainability in VET contexts and the analysis of emerging needs; (2) the understanding of how VET contexts promote sustainable education; (3) exploring ways to work effectively with the 17 Sustainable Development Goals (SDG), especially in the construction building sectors.

First, these actions were aimed at identifying the best practices and understanding the specific needs of different contexts in the education of sustainability; secondly, it was developed an innovative pedagogical-didactic model for the training of sustainability skills, which can be integrated within various methodologies: in particular, these are Problem-Based Learning (PBL), Project Oriented Learning (POL), interwoven with the Emotional-Affective-Relational instances that intervene in the teaching-learning process, as is also verified by the most recent findings of affective neuroscience.

The European partners involved in the project had the main objective to produce and create teaching materials, lessons, webinars, meetings and multiplier events to boost and foster the encompassing of SDGs and sustainability in their schools' curricula.

The development of the pedagogical-didactic model (PDM) for sustainability started from the analysis of the reports requested in the initial phase of the project from the various partners and from the results and questionnaires administered to teachers and students of the VET institutes involved in the project as partners. Some key challenges emerged from the analysis:

- **Difficulties in Legislation and Regulation Management**: There is a discrepancy between national policies and strategies and European recommendations on sustainability. Furthermore, the presence of non-contextualized guidelines and resources that do not consider the specificities of the education and training systems of each country was noted.
- **Need for Teacher Training**: From the analysis of the questionnaires, a significant need for teacher training in the field of sustainable development emerged. There is little awareness of sustainability and a lack of practical skills in education for sustainable development. These gaps are reflected in the difficulty of integrating the goals of the 2030 Agenda into lessons and developing students' green skills.

These insights informed the design of a PDM that is flexible, multidimensional, and grounded in both European policy frameworks and the practical realities of VET institutions.

4.1. Insights from the Documentary Analysis (Action R1)

The first step of the Greenwave in VET project, carried out under Action R1 of Work Package 1 (WP1), involved an in-depth documentary analysis by all partner institutions. This action aimed to explore how sustainability is currently integrated into VET systems and to provide a foundational understanding for the development of the Pedagogical-Didactic Model (PDM). The University of Bari coordinated this process.

The analysis was based on a shared table of contents, which guided each partner to explore the following dimensions:

- **Key Policies and Regulations**: Review of national and regional legislation regarding sustainability in vocational training. Partners reported heterogeneity across countries, with some systems strongly aligned with European strategies (e.g., Green Deal), while others lacked coherent national guidelines.
- **Frameworks, Standards, and Indicators**: Examination of national and European frameworks used to define and assess green

competences. While many countries referenced GreenComp or UNEVOC guidance, few had fully operationalized these into assessment tools or educational standards.

- **Practices and Projects**: Documentation of institutional strategies and best practices already in place. These ranged from isolated eco-oriented school projects to integrated curriculum reforms, although most remained at the pilot or local initiative level.
- **Environmental and Construction Courses**: Identification of sustainability content specifically within construction and related technical courses. Some partners noted an increasing offer of environmental topics, yet often limited to theoretical modules with scarce connection to hands-on VET practice.
- **Teacher Training and Professional Development**: Mapping of both formal and informal training opportunities for VET teachers on sustainability topics. The analysis highlighted a general lack of structured, recurring training initiatives, with most efforts dependent on individual interest or temporary project funding.
- **Challenges and Obstacles**: Partners collectively reported a series of critical issues, including:
  - Inconsistent policy implementation across different educational levels.
  - Limited resources and time dedicated to interdisciplinary sustainability education.
  - The absence of shared metrics for evaluating green competences in the classroom.

From the analysis of the reports received from the partners, it emerged that there are significant difficulties in legislation and in the management of regulations and strategies in different countries. Despite the presence of European documents produced by UNESCO, guidelines, and resources, these materials are not contextualized for each nation, each of which has unique characteristics and educational and training systems. There is a gap between what is recommended at the European level and what is actually implemented at the national level. This raises questions about how to translate the proposed guidelines, strategies, and methods into practice. In relation to the reference framework, the Sustainable Development Goals are used as

a guide to develop training. However, there are currently no specific indicators to evaluate and measure sustainable education, despite the positive experience of the Basque government in this field.

These findings provided a clear rationale for the subsequent development of the PDM, aiming to respond directly to these gaps and needs. The analysis also validated the relevance of a systemic and structured pedagogical intervention, grounded in European frameworks and capable of being adapted to various VET realities.

4.2. Results from the Questionnaires Administered to Teachers and Students

To complement the documentary analysis, the Greenwave in VET project included the administration of two questionnaires – one for teachers and one for students – across the partner countries. The goal was to collect data on the awareness, practices, and perceptions related to sustainability education within VET settings, with particular focus on the construction sector. The teacher questionnaire consisted of 26 questions and received 140 responses; the student questionnaire, made up of 23 questions, gathered 492 responses.

Teachers' Questionnaire Results

The sample consisted predominantly of male teachers (84.5%), mostly aged between 41 and over 51, with many having over 10 years of experience in the same institution. The majority of respondents were from Denmark, followed by Italy, Spain, and the Netherlands. Their disciplines included carpentry, construction technologies, floorlaying, energy, safety, and painting. This experienced teaching body operates within a system where sustainability education is becoming more prominent but is still unevenly supported.

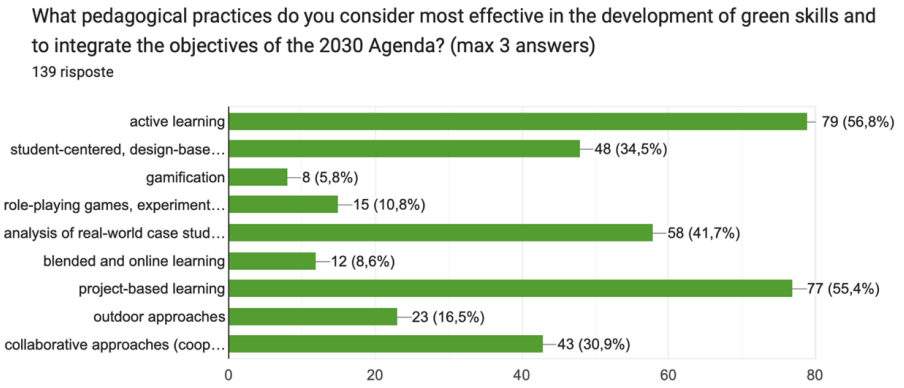
One of the clearest signals from the data is the lack of continuous professional development: nearly 70% of teachers had either never or only rarely participated in sustainability-focused training. This correlates with the fact that less than half felt confident in their ability to promote sustainability competences in their students.

Even more concerning is the gap in available resources. Two-thirds of teachers stated they lacked the materials or institutional infrastructure to integrate the SDGs meaningfully into their curriculum. This indicates a structural limitation that hinders even the most motivated educators.

Yet, motivation and institutional support are not lacking. Over 85% of teachers said their institutions support sustainability education, and an equal percentage reported that students are interested in these topics. This enthusiasm is important capital to build on.

Despite the challenges, many teachers are already applying advanced pedagogical practices. Project-based learning, real-world case studies, and student-centered approaches were all widely reported. Moreover, 87.5% use digital tools and technologies to facilitate green skills learning, and over two-thirds feel confident about their assessment methods (e.g., portfolios, observation grids, authentic tasks).

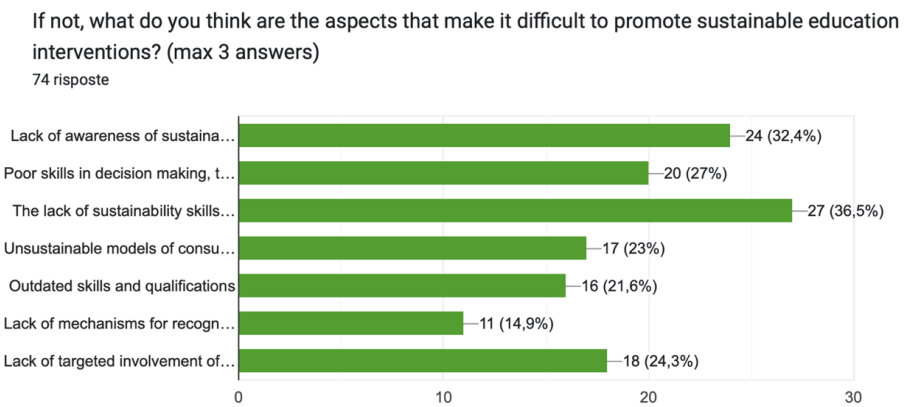
Fig. 6 - The chart chart highlights the main pedagogical practices



The results analyzed allow us to highlight some teachers' needs of a predominantly training nature. The difficulties encountered in putting sustainable development interventions into practice, in fact, in line with what has been expressed by UNESCO-UNEVOC (2017; 2021), mainly concern the lack of skills of the teacher in education for sustainable development:

- Lack of awareness of sustainability, of the challenges society needs to address both the local and global level and the potential role of educators and students.
- Lack of practical skills and action competences in relation to education for sustainable development (competences expressed by the document Learning for the Future of UNECE – framework which presents a significant set of categories reflecting a wide range of learning experiences).

Fig. 7 - The chart highlights the main difficulties encountered by teachers in promoting sustainable development initiatives



This also entails difficulties in integrating the objectives of the 2030 Agenda into one's teachings as well as possible effects on the development of students' green skills. The teachers also highlight a lack in terms of the educational offer of their institute in terms of sustainability and development of green skills that does not respond to market demands, in line with the premise made at the beginning of a lack of skills in the sector building that needs to be filled.

In summary, teachers are engaged and willing but often under-equipped. Their needs revolve around updated training, institutional alignment, and better resource availability – an ideal context for the application of the PDM developed in this project.

Students' Questionnaire and Interviews

The student questionnaire, which collected 492 responses, aimed to explore how young people in VET contexts perceive sustainability, the extent of their knowledge of the 2030 Agenda, and their engagement with sustainability-oriented education.

The findings reveal significant gaps in knowledge and awareness. Many students demonstrated only a limited understanding of sustainability concepts and particularly of the Sustainable Development Goals (SDGs). This aligns with what was reported by teachers regarding student preparedness. Interestingly, a notable percentage of students responded "I don't know" to questions about sustainability initiatives in their schools, suggesting either a lack of communication or an absence of such initiatives.

Despite this, there are encouraging signs. A substantial number of students expressed interest in environmental and sustainability topics. Where education on these matters is present – particularly through hands-on projects, interdisciplinary teaching, and real-world examples – students reported greater engagement.

The students' responses confirm that experiential learning is effective. Activities linked to sustainability projects, environmental impact measurement (e.g., waste, energy, water usage), and collaborative problem-solving scenarios were among the most appreciated and remembered by respondents.

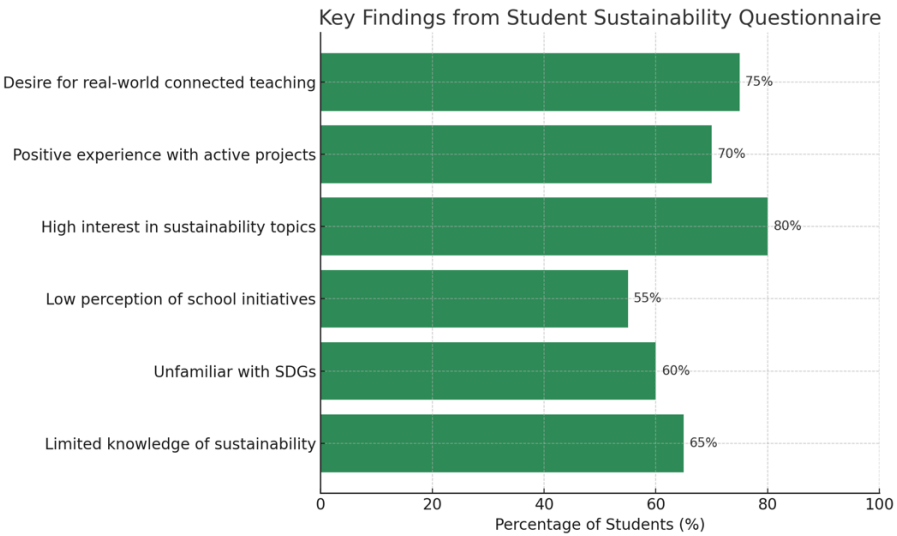
This aligns with GreenComp's emphasis on developing values, knowledge, and skills through meaningful and participatory learning. However, students often felt that these experiences were sporadic and not fully embedded in their curriculum.

From these responses and subsequent focus group interviews, it emerges that students are eager to engage with sustainability when given the opportunity, especially when the content connects to their future profession and local community. This confirms the importance of the PDM model's emphasis on emotional (values), intellectual (knowledge), and practical (action) dimensions of learning.

In summary, students are interested but often insufficiently exposed. Embedding sustainability as a cross-cutting theme in VET programs, supported by teacher training and institutional strategies,

remains essential to empower this generation to become active agents of the green transition.

Fig. 8 - The horizontal bar chart illustrating the key findings from the student sustainability questionnaire



These results underscore the need for structured training pathways, institutional support, and curriculum innovation in line with GreenComp and the Agenda 2030 SDGs. The Pedagogical-Didactic Model (PDM) serves as a concrete response to these needs.

5. The Structure of the Pedagogical-Didactic Model (Action R2)

by *Anna Daniela Savino*

The results from the documentary analysis and the questionnaires administered to teachers and students, as presented in the previous chapter, clearly demonstrated the urgent need for structured, integrated educational tools to support the implementation of sustainability in VET curricula. The lack of shared frameworks, insufficient teacher training, and the absence of coherent pedagogical strategies across partner countries underscored the necessity to move from analysis to action.

In response, the Greenwave project, as said, undertook the design and development of a Pedagogical-Didactic Model (PDM) aimed at equipping VET educators with the competencies, methods, and conceptual tools to effectively teach sustainability.

5.1. The Pedagogical-Didactic Model for Transformative Sustainability Learning

The pedagogical-didactic model was developed as a critical integration of various frameworks, notably the recent advances in the Inner Development Goals (IDGs, 2021; Ankrah et al., 2023). A review of the literature highlights a distinction between key competencies and action competencies in the context of sustainability. The latter, defined by UNESCO in 2017, are essential to prepare individuals to effectively tackle sustainability challenges.

However, the competency-based approach presents significant challenges, particularly in integrating these competencies into actual teaching practices. In contrast, action competencies emphasize the development of critical thinking, dialogue, and debate, stressing the importance of being informed and active participants in sustainability issues (Öhman, Sund, 2021).

To address these challenges, adopting a multidimensional approach to learning has proven essential. Education for Sustainability (EfS) requires a pedagogy that combines both educational ("sustainability competencies") and professional ("green skills") competencies. These include cognitive, emotional, and volitional elements, enabling learners to take effective, context-aware action in response to real-world challenges (Bianchi, 2020).

Debates in the EfS field have underscored the importance of values in building competencies. Recognizing the crucial role of attitudes and values in sustainability learning, key studies have shown that sustainability competencies should integrate knowledge, skills, attitudes, and values (Wiek et al., 2011; Redman, Wiek, 2011). Brundiers et al. (2020) also described key sustainability competencies as distinctive, multifunctional abilities essential to dealing with specific environmental challenges.

This model aims to equip students with not only the theoretical knowledge needed to understand sustainability but also practical experiences that prompt reflection on personal values. It supports the development of engaged, active citizens committed to a sustainable future. Rooted in Mezirow's theory of transformative learning, this approach emphasizes a deep shift in students' perspectives, beliefs, and behaviors – encouraging them to develop a renewed self-awareness and understand their role as global citizens (Bianchi, 2020).

To foster real engagement with sustainability, students must be offered learning experiences that simultaneously engage the intellectual, emotional, and practical dimensions. An educational approach that combines knowledge acquisition and application, emotional responses, and active problem-solving has proven effective in training informed, capable individuals aware of environmental issues (Tejedor et al., 2019). This multidimensional model favors active teaching methods that place students at the center of the learning process,

strengthening their ability to act sustainably through activities like problem-solving, case studies, simulations, hands-on projects, and service learning.

Transformative Sustainability Learning (TSL) aims to challenge students' assumptions, inviting them to explore a holistic and integrated view of the world around them. Based on the principle of "head, hands, and heart," TSL offers a holistic learning experience structured around three key domains:

- **Cognitive Domain (Head)**: Fosters intellectual engagement through critical analysis and deep understanding of global sustainability challenges.
- **Psychomotor Domain (Hands)**: Translates theory into hands-on experiences, allowing students to apply their knowledge through practical activities, from construction to gardening.
- **Affective Domain (Heart)**: Encourages students to internalize positive values and attitudes toward sustainability, transforming them into responsible actions within a dynamic learning community.

This transformative path not only provides students with the theoretical tools to understand sustainability but also immerses them in practical experiences and value reflection, promoting the growth of active, engaged citizens working toward a sustainable future.

5.2. Core Dimensions and Guiding Questions of the PDM

Based on these premises and conceptualizations the first draft of the PDM was elaborated, which was shared with the partners, finalized and used by teachers and students involved in the project along with the teaching material built by the partners. The aim of the specific project result was to make a European model for how to proceed with the SDG-implementation process depending on the starting level of a class of students. The result consisted of an illustration and an explanatory text. The model needed to have a main focus on the VET building and construction sector, but it was thought to be

considered whether to use it in an even more generic way, profitable for all VET sectors. The final first version of it was as follows:

GREENWAVE VET PD MODEL

CRITICAL THINKING – BRAIN

1. How do you think this global issue is related to your students' local community?
2. What challenges do you think this target could represent for your students?
3. How can your students formulate current or potential problems relating this targe

VALUES – HEART

1. How could your students reflect on their personal values related to this target?
2. How can they learn about equity and justice through this topic?
3. How can they relate this target to healthy and resilient ecosystems?

ACTION – HAND

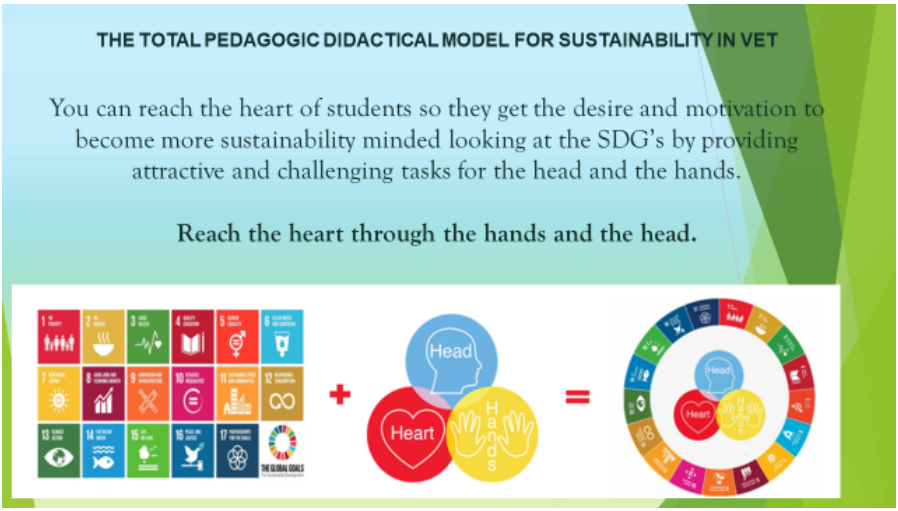
1. How can students propose alternative solutions to sustainability challenges?
2. How can interdisciplinary work stimulate creative thinking?
3. How can students engage in political or collective action for change?

What was requested by the project result 2 to be given to the teachers belonging to the Vet Schools involved in the Greenwave project was "a graph with leading questions": the PDM was to be intended as a practical tool to be used "for planning of the capacity building for teachers and the subsequent development of teaching, training and learning materials/methods" (Project Result Details 2, Greenwave in Vet Project 2022). After sharing with the project partners and gathering comments, the PDM was given to the teachers addressed by the partner schools.

The graphic of the PDM was finalized and shared on the project website www.greenwaveinvet.eu.

The path that led to this conceptual frame was dual-focused: on one hand, it was intended to be, following the project guidelines, a practical tool for teachers to help them conceive and incorporate the matter of sustainability in their curricular teachings; on the other hand, it was developed from philosophical inspirations drawn from different sources. These include John Dewey's philosophical and pedagogical theories, the triadic pedagogical model of Intellectual-Practical-Emotional aspects for learning, and the EU Unesco-Unevoc key competences mentioned earlier, all framed within various collaborative methodologies.

Fig. 9



A scheme of the matrixes considered includes:

Fig. 10

► 1. **UNESCO 2017-UNEVOC KEY COMPETENCES** GIVE VALUES SUPPORTING THINKING FOR COMPLEXITY ENVISIONING ALTERNATIVE SUSTAINABLE FUTURES ACTION FOR SUSTAINABILITY: INDIVIDUAL, COLLECTIVE, POLITICAL LEVEL
► 2. **SDGs** AGENDA 2030 TOPICS and TARGETS
► 3. **DEWEY'S PHILOSOPHICAL HERITAGE** (focused on three main points): INTERPRET CHANGE INTEGRATE CHANGE AT SCHOOL RELATION BETWEEN SCHOOL, SOCIETY AND LIFE

Particularly on J. Dewey's thought was taken in consideration his sense of rebuilding the entire society through the school, therefore is conception about education as the key, mile stone for the social progress, seen as human progress first and foremost and for Democracy (Ibidem); being a pragmatist, idealist, strumentalist, neo-Idealist activist and behaviourist, his whole vision pointed a school as a Democratic school for an open and liberal society where the human being can flourish; therefore, mainly through the reading of J.Dewey's work *The School and Society*, the centrality of the student in his/her personal inner development is fundamental leading his/her adulthood towards the concept of being a citizen that builds the society with democratic ideals. This is the reason why all the new conceptualization about the Inner Development Goals drawn our attention for the elaboration of the PDM about sustainability skills development: the very personal and intimate sphere of each student as human being were to be addressed first in order to be able to develop sustainability skills, as will be showed further on.

The PDM features required were asked by the project results as to be simple, clear, path giving, practical and compassing the three dimensions of learning (Intellectual, Practical, Emotional) as suggested by the EU Reports named and the different models mentioned as well as it was required to link related content to SDGs in VET contexts by underlining alternative materials, processes and products in the building construction sector.

With regards to the Intellectual-Emotional and Practical aspects and competences that a teacher could think about developing while planning his/her lesson by using the PDM, the leading path to the designing of it was:

Fig. 11

INTELLECTUAL ASPECT

► **Acquire knowledge on sustainability issues and relate with this knowledge** (based on key competences from Unesco)

CONTENT AND METACOGNITION

- Position yourself/locate yourself beteween Global and Local dimensions

COMPETENCE

- System thinking-Critical thinking-Problem framing

☐ DRIVING QUESTIONS FOR TEACHERS

► 1. How do you think this Global issue is related to your students' local community?
► 2. What challenges do you think this Target could represent for your students?
► 3. How can your students formulate current or potential problems relating this Target with their own local community?

EMOTIONAL ASPECT

► **Acquire one's emotional response and relate emotionally to sustainability issues** (based on key competences from Unesco)

VALUES AND BELIEFS

- Position yourself on ethical standards and beliefs

COMPETENCE

- Valuing sustainability-supporting fairness-promoting nature

☐ DRIVING QUESTIONS FOR TEACHERS

► 1. How could your students reflect on their personal values related to this Target?
► 2. How can your students learn about equity and justice around sustainability with this Topic?
► 3. How can your students relate this Target to an healthy and resilient ecosystem?

PRACTICAL ASPECT

► **Develop one's ability, motivation and desire to play an active role in finding democratic solutions to sustainability problems** (based on key competences from Unesco)

ACTION PLANNING-ENVISIONING FUTURE

- Position yourself in critically thinking and managing transitions

COMPETENCE

- Envisioning alternative sustainable futures with others and act for change

☐ DRIVING QUESTIONS FOR TEACHERS

► 1. How can your students be elicited by this Target to think about alternative solutions, considering risks as well in Vet context -materials, processes, products?
► 2. How can you help your students, by linking different disciplines related to this Target, adopt a relational way of thinking and create new ideas?
► 3. How can your students think about demanding and promoting effective political action towards sustainability?

As discussed, the Inner Development Goals (IDG) provided the ontological foundation to approach sustainability through the inner transformation of individuals, reaffirming Dewey's perspective on the primacy of individual development in societal change.

This model highlights the need for an integrated educational approach – one that goes beyond delivering content to foster a deep emotional and practical engagement with sustainability. The goal is not only to inform students about global challenges, but to empower them to care, act, and lead. By connecting knowledge with values and action, we aim to shape learners who are critically aware, emotionally invested, and actively involved in building a more sustainable future.

Fig. 12

5.3. Operational Design of the Pedagogical-Didactic Model

The operational articulation of the Pedagogical-Didactic Model was designed around four interdependent phases:

1. Target Audience

The model is tailored for VET teachers and students. Contextualizing the level of sustainability competences and training needs was essential (see Section 4, Results of the Needs and Context Analysis). This was done through:

- Reports analyzing relevant policies, regulations and international frameworks.
- Questionnaires administered to teachers and students to explore sustainability awareness, pedagogical approaches and institutional strategies.

2. Identification of Skills and Learning Objectives

The model aligns with the eight key competencies for sustainability defined by UNESCO, and integrates the European GreenComp framework. Special focus is given to action competence – the ability, will and commitment to actively engage in addressing sustainability issues.

Learning objectives include:

- Developing critical and systemic thinking to connect social, economic and environmental dimensions of sustainability.
- Acquiring practical skills to reduce environmental impact and promote sustainable resource use.
- Engaging in civic and professional initiatives that support sustainability, cultivating leadership and collaboration.
- Reflecting on ethical implications and embedding sustainability values into personal and professional decision-making.

These objectives guide the design of learning experiences aimed at forming responsible, proactive, and value-driven individuals.

3. *Methodologies*

The PDM emphasizes student-centered, experiential, and active learning methods. Core methodologies include:

- Problem-Based Learning, PBL, is a teaching strategy that places students, in small groups and under the supervision of a tutor, faced with the task of seeking and analyzing information to solve concrete problems. This approach not only promotes hypothesizing and identifying learning needs to better understand the problem, but also to achieve established learning objectives. In this context, solving the problem is not the main goal, but rather developing the ability to critically analyze information and data from different sources and learning from the solving process. PBL focuses on the development of cognitive, interpersonal and instrumental skills, useful for dealing with real situations close to professional practice. The main objective of PBL is to provide training that equips the future professional with tools and skills for intellectual problem solving. Distinctive features of PBL include: (1) emphasis on student responsibility for their own learning; (2) transdisciplinary or multidisciplinary nature of the problems; (3) inseparability between theory and practice; (4) focus on the process rather than the products obtained; (5) the role of the teacher moving from instructor to facilitator of learning; (6) focus on self- and peer-assessment rather than teacher-defined learning outcomes; and (7) emphasis on developing interpersonal and communication skills.
- Project-Oriented Learning, POL, also known as project-based learning, is a teaching method that has its roots in constructivism, developed by key figures such as Vygotsky, Bruner and Piaget. This approach is based on the idea that learning is built through the interaction between personal experiences and mental structures, allowing students to develop a network of mental structures that facilitate the creation of rational and meaningful relationships with the environment and society. In Project-Oriented Learning, students are placed at the center of the learning process, becoming the protagonists of their education. This method

emphasizes student development through finding solutions to real, current problems, promoting an integrated and dynamic implementation of knowledge. Furthermore, this approach allows for a notable empowerment of students, as they are actively involved in their own learning path, contributing to greater motivation and involvement in the educational process.

- The case study is a teaching strategy that presents a real situation with one or more problems. The student must analyze the situation, propose solutions, answer questions and so on. This method promotes independent learning and can be done individually or in groups, offering different learning opportunities. The case study is based on real and significant situations from the student's personal or professional point of view. The goal is to make the student reflect and develop an action plan to solve complex problems through multifactor analysis. It can range from a simple description of the problem to an in-depth investigation with documentation and research. Case studies can be combined with other strategies, such as problem-based learning or project-oriented learning, and are often used in alternative methodological approaches focused on self-study. Furthermore, they characterize cooperative learning, where the implementation is structured for the group of students. Key elements of a case study include addressing real socio-environmental conflicts; the deepening of the interrelationships between various factors, contexts and entities; the analysis of the problem; the integration of disciplinary and metadisciplinary contents; and the promotion of critical reflection.
- Simulation, including role-playing and simulation games, is a teaching strategy that encourages experiential learning. Participants imitate an environment as realistically as possible, staging the spatial elements and characters involved. Fundamentally based on dramatization, simulation not only allows the expression of feelings and the representation of events but also encourages personal reflection. This learning method strengthens communication skills, teamwork, and cognitive and metacognitive skills related to the topic covered. The simulation can be conducted in classrooms or other environments that offer a deeper sense of realism, allowing for a creative reproduction of reality that en-

hances individual or group contributions. Efficient in exploring complex socio-environmental conflicts, the simulation allows us to understand historical and procedural aspects and the role of the institutions and individuals involved. It is a useful tool for gaining a general understanding of problems and delving into social and educational issues, as well as preparing people to handle similar situations in reality. As highlighted by López Torres et al., simulation facilitates a holistic and transversal approach to sustainability issues, involving social, environmental, economic, political, educational and cultural aspects. Simulation practice allows to analyze complex systems and everyday interactions, offering a learning opportunity that goes beyond the capabilities of a traditional classroom. The main characteristics of a simulation include: (1) the approach to real socio-environmental conflicts; (2) the detailed analysis of the interrelationships between factors and contexts; (3) the critical analysis of problems, from identifying conflicts to creating solutions; (4) the integration of interdisciplinary content; and (5) the stimulation of critical awareness in participants. These methodologies can be integrated with video lessons, practical workshops, study visits and group projects.

These methods are often complemented by video lessons, field visits, workshops, and group-based cooperative learning projects.

4. Evaluation

To assess effectively, it is crucial to consider how integrated, coherent and contextualized student knowledge is. Formative assessment is fundamental, allowing teachers to monitor learning in real time.

Formative assessment, through constant feedback, becomes an essential guide for assessment in the twenty-first century. This methodology is effective for clarifying learning objectives, ensuring continuous monitoring, providing feedback, responding to student progress, encouraging adaptation and improvement of learning outcomes, and engaging students in a process of self- and peer-assessment.

Formative assessments are crucial for identifying and correcting learning gaps, avoiding profound misunderstandings or misapplications of skills. Tools like rubrics become essential in 21st century classrooms, offering teachers and students clear guidelines for defining acceptable performance levels.

It is also important to teach students to evaluate their own learning, helping them to master content and improve their metacognitive skills. This includes learning how to learn and reflecting on your own learning process. This approach helps students become more aware and autonomous in their educational journey (Scott, 2015).

For the final evaluation the tools that can be used:

- **Tests and Quizzes**: Regular assessments on sustainable construction theory and the 2030 Agenda.
- **Presentation of Projects**: Evaluation of group projects based on innovation, feasibility and integration of sustainability principles.
- **Individual Portfolio**: Creation of a portfolio that documents individual learning and participation in projects.

These evaluation tools not only assess student performance but also inform the ongoing refinement of the pedagogical-didactic model itself.

6. Evaluation and Impact of the Greenwave Project

by *Alessia Scarinci*

6.1. Evaluation Methodology and Tools

The final two tasks of the project – which are still ongoing – are Task 5 and Task 6: "Task 5 Plan and conduct an evaluation with VET students, who have been 'the target' for the new materials/methods. Task 6: Make a second and final version of the model, based on the sayings from the students, the teachers and the managers" (Project Result Details 2, Greenwave in Vet Project 2022).

For the final evaluation of the entire process of the project activities and outputs – and to accomplish these final tasks – the following tools were used:

- Partners' questionnaire
- Teachers' questionnaire
- Students' interviews

These instruments were designed to assess the integration, coherence, and contextualization of student knowledge, as well as the effectiveness of the pedagogical-didactic model. Formative assessment played a central role, enabling real-time monitoring of learning progress. This approach clarified learning objectives, facilitated timely feedback, and promoted both self- and peer-assessment.

Rubrics served as essential tools in this formative evaluation process, offering transparent criteria for assessing sustainability-related competences. Additionally, students were guided to evaluate their

own learning processes, fostering greater metacognitive awareness and autonomy in line with the emphasis on learning how to learn (Scott, 2015).

Evaluation tools were tailored to assess the depth of student understanding, the relevance of applied skills, and their engagement with sustainability values and actions. The triangulation of partner reflections, teacher feedback, and student interviews allowed for a comprehensive understanding of the project's impact.

6.2. Reflections from Project Partners

The Greenwave in VET project catalyzed a wide-reaching shift in awareness and practice regarding sustainability education among its European partners. As documented in the reflective questionnaires (Appendix 1 and 2), all partner institutions recognized significant personal and institutional growth. Participants reported:

- A clear increase in sustainability awareness, even in countries already advanced on the topic (e.g., Netherlands, Denmark).
- Appreciation for the hands-head-heart model, central in linking pedagogy to ethical values and action.
- Recognition of the importance of cross-national collaboration, which highlighted disparities and enabled mutual inspiration.

In their reflections, partners frequently emphasized the added value of participating in a transnational initiative, which allowed them to compare educational systems, teaching cultures, and institutional strategies. Many recognized that the project provided a rare opportunity for critical self-reflection on existing practices and offered a structured framework to move beyond ad-hoc sustainability actions toward a more coherent strategy. For some institutions, especially in Italy and Spain, Greenwave became a catalyst for initiating discussions at the management level about embedding sustainability across the curriculum, rather than treating it as a supplementary theme.

Several partners highlighted the importance of the bottom-up methodology used during the project, which encouraged teachers

and trainers to co-construct the model and feel ownership over its development. This participatory design was seen as a key factor for successful local adaptation and long-term impact. Partners appreciated the flexibility of the model and its grounding in theoretical frameworks like GreenComp and the Inner Development Goals (IDGs), which helped make sense of the deeper educational dimensions of sustainability work.

Crucially, many noted that the Greenwave model's simplicity and clarity – especially the "questions-based" framework – made it usable and adaptable for different school contexts, even where sustainability was not yet a structured priority. Several partners stated that the integration of emotional, intellectual, and practical dimensions was particularly innovative and inspiring, bridging what is often a gap between theoretical sustainability goals and real classroom practices.

6.3. Commonalities and Differences Across Countries

The Greenwave in VET project, through cross-national collaboration and data gathering, offered a unique lens into the diverse realities of sustainability education across Europe. From the reflective partner questionnaires and supporting documentation (Appendices 2, 3, and 4), several key patterns and divergences emerged.

Shared Challenges and Priorities: Despite contextual differences, all partners reported a common need to:

- Strengthen teachers' competences on sustainability content and methodologies.
- Improve the institutional integration of SDG-related education across curricula.
- Move from isolated practices to structured, whole-school sustainability strategies.

These shared needs confirmed the relevance of the Pedagogical-Didactic Model (PDM), especially in its adaptability and ease of implementation. Partners noted that the model provided both direction and flexibility, allowing it to be applied meaningfully in varying policy and institutional contexts.

Geographical Variations in Implementation:

- **Northern European countries** (Denmark, Netherlands) demonstrated more systemic approaches to sustainability education. VET schools here often benefit from stronger institutional autonomy, long-standing environmental cultures, and well-established bottom-up practices. These contexts facilitated early and enthusiastic adoption of the PDM, particularly in connecting sustainability education to real-world vocational practices.
- **Southern countries** (Italy, Spain), while equally committed, faced more barriers. These included rigid curricula, limited teacher training opportunities, and lower initial awareness among both students and staff. Implementation in these contexts tended to rely on individual teacher initiative or externally funded projects, such as Erasmus+ programs. However, these constraints also made the structured and guided format of the Greenwave model especially impactful and appreciated.

Emerging Impact and Cultural Shifts: Partners across all regions observed a growing cultural shift within their institutions, spurred by participation in the project. Teachers and managers began to rethink the role of sustainability not as an isolated subject, but as a transversal, civic, and professional dimension. The PDM's focus on "head, heart, and hands" was noted as particularly effective in helping educators translate abstract sustainability goals into concrete classroom practices.

Moreover, the project helped to foster a shared European pedagogical language around sustainability, bridging differences through common tools (like the PDM) and goals (such as the GreenComp framework and the Inner Development Goals). This supported a sense of alignment without erasing local particularities – one of the project's most valued outcomes.

6.4. Impact on Teachers

The second questionnaire administered to teachers – conducted after the implementation of the Greenwave project – revealed en-

couraging outcomes. Respondents showed a significant increase in their awareness and understanding of sustainability issues, as well as improved confidence in integrating the SDGs into teaching practices.

Compared to the initial results, where only 47.9% of teachers felt they had the necessary skills to promote sustainability education, the follow-up responses pointed to:

- A broader and clearer conceptual grasp of sustainability.
- Increased integration of project-based and problem-based learning strategies aligned with GreenComp.
- A greater sense of personal and professional growth, particularly among teachers who actively participated in project activities and training.

Despite these advances, gaps remain. A portion of teachers still noted challenges regarding access to up-to-date materials and institutional frameworks that fully support systemic green education. The continued need for professional development in action-oriented sustainability competences was also reiterated.

The contrast between the first and second questionnaires illustrates a tangible shift in both mindset and practice. While the Greenwave initiative catalyzed meaningful pedagogical transformations, sustained impact will depend on embedding these gains into institutional policies and continuous training opportunities.

6.5. Impact on Students

Student feedback, gathered through final interviews with 16 students from various partner countries, highlighted important dimensions of impact from the Greenwave project. Participants shared that the project helped them:

- Become more aware of sustainability issues, especially within their own learning environments and local communities.
- Develop a better understanding of the SDGs and how these relate to their vocational studies and future professional roles.

- Reflect on personal values and attitudes towards the environment, often for the first time.

Students expressed appreciation for the use of hands-on, experiential learning approaches, such as project work, site visits, and group simulations. These methodologies helped them better grasp complex sustainability issues in a practical and memorable way. The interviews revealed that students particularly valued being actively involved and having opportunities to collaborate and problem-solve.

While students acknowledged that sustainability was not yet consistently embedded in their curricula, many described the Greenwave activities as a turning point. Several noted they felt more empowered to contribute ideas for sustainable solutions in both their studies and future work contexts.

Overall, student interviews confirm that integrating emotional, cognitive, and practical dimensions – as promoted by the PDM – supports the development of both awareness and action competence. These qualitative insights reinforce the results from the student questionnaires and underscore the potential of the Greenwave model to create lasting educational impact.

7. Conclusions

by *Alessia Scarinci* and *Anna Daniela Savino*

The "Greenwave in Vet project" has been a journey.

A journey of learning for all the people involved in it. An inspirational movement has accompanied the whole project, starting from the partners going through the teachers and students with all the people encountered on the way.

The issue of sustainability has shown an amazing power of transformation: when put on the table, with all the educational intervention that have been created and put in place within this project, sustainability can really inspire people of any age and push them to act for the good of the whole community.

The core of the project has been felt as *education*: because is precisely *education* that bonds generations together.

The educational relashionship, which is the focus of the rapport between teachers and students, is the vehicle through which sustainability can be conveyed, perhaps in the best way beside the others.

Coming to know better all the dimensions in which sustainibility is being studied and acted, thanks to all the activities required by the Greenwave in Vet project, for the partners, teachers, students who have been the actively participants of the same project, has brought a new level of awareness, inspiration, desire to act for the good of our planet and people.

The results and outcomes, gained day by day, activity after activity, with particular attention to all the international meetings held, are strongly encouraging: we have gathered positive implementation of

consciousness about the beauty and the need of sustainability as well as a novel sense of power and faith in our young generations.

The adults of reference for the younger generations must necessarily offer guiding criteria and compasses, which are presented to the students not first of all on a moral-ethical level but primarily on a cognitive-emotional-affective level – as the ethical level is a consequence of all of the others –: we immagine the parents, when disussing at home with their children coming back from school on one hand, and the teachers creating lessons with the help of the novel Pedagogic-didactical Model designed on the other, deepening in the path outlined, putting sustainability "on the table" with their own *desire* for sustainability in the widest sense, they can elicit the very best of the inner dimension of the young ones. To whose hands the future of our world is handed over.

The intention of the whole project was to awake and "move" this inner dimension for an inner growth of any human being encountered on the way: the inner development with all its dimensions is the pre-condition of a new mindset to realize the beauty of sustainability.

The benefit that could be derived from such paths as it has been the Greenwave in Vet project, we believe, can be threefold by virtue of the natural interdependence between educators, children/students and teachers.

Paulo Freire insisted on the humanity of educators and Maria Montessori warned them of the "*fatality of childhood*" (2019, p. 41): what happens to a child during his childhood will be fatal to him.

This project with all the studies and activities created has shown us that.

If it is true that the future of our planet is handed to young generations then it is our duty to educate them to manage it according to the health and consequent blossom of it.

We, as points of reference for the young ones, need to be truly aware of our commitment then, moved by new inspiration and consciousness of our role for the life of the whole world.

We would like to conclude this journey with the words of Maria Montessori: the "doctor" refers to an episode that happened in the Children's Home in Milan – that we report in full –, because it offers us, with the expressive power that only a work of art possesses, a

symbol containing a message that cannot be forgotten: in these following words is enclosed, as in a precious casket, all the fundamental message that every adult who wants to be an educator must keep in his/her own inner space.

The whole Greenwave Vet Erasmus project has shown the potentialities hidden in the teaching sustainability for both teachers and students: by insisting on and encompassing all the different key competences shown in the various EU Reports named in subjects curriculum with also the underlining of the Inner Development Goals, it is clear to what extend is possible to strengthen the skills required for the change we are aiming for the sustainability and the life on our planet.

This project has given a strong reinforcement to the idea that also the Teacher Education requires a deep thinking about pedagogy and didactics around sustainability: by conducting an initial survey to both teachers and students across the European countries involved in the project aimed at identifying the educational needs around sustainability and subsequently building the Pedagogical-didactic model with which constructing the lessons it has been clear that:

1. There is a need to fill the gap across the subjects and the teaching sustainability.
2. It is possible to create a link between all disciplines and the core of sustainability.
3. The Teacher Education of all EU countries involved in the project needs and welcomes a common Pedagogical-didactic Model to share in order to help teachers to plan their lessons about sustainability.
4. There is a pre-condition that helps thinking, strengthening and acting for the sustainability which regards the Inner development skills of all human beings.

To conclude with, a greater emphasis should be given to the Teacher Education across the EU countries by training teachers especially to the link between sustainability issues, curricular subjects and Inner Development Goals.

Hoping to put one little but powerful brick on the building of a new "sustainable" and beautiful home in this world to which all of us

belong, so that our *Greenwave* in Vet students could have learnt a bit better "how" to move in their world, we want to leave these words of a Maria Montessori's work (2020, pp. 20-21) as a sort of heritage:

Learn to "move".

The tables, chairs and armchairs, light and transportable, will allow the child to choose the position he likes: he will be able to sit down, rather than sit in his seat: and this will be both an extreme sign of freedom and a means of education. If an ungainly move of the child causes a chair to fall noisily, he will have a clear proof of his own inability: the same move, among the desks, would have gone unnoticed. Thus the child will have the opportunity to correct himself, and when he has corrected himself, he will have the obvious proofs of this: the chairs and tables will remain still and silent in their place; then it will mean that the child has learned to move. On the other hand, with the ancient method, the proof of the discipline achieved was in the opposite fact, that is, in the immobility and silence of the child himself. Immobility and silence that prevented the child from learning to move with grace and discernment, so that, when he found himself in environments where there were no desks, he easily overturned light objects. Here, on the other hand, the child learns a demeanor and an ability to move that will be useful even outside of school: he, although a child, will become a person of free but correct manners. The teacher of the Children's Home in Milan had a long shelf built next to the window, on which she placed the lecterns for the choice of the iron joints necessary for the first drawings (…). But the shelf, which was too narrow, had the disadvantage that the children, in choosing the pieces, often dropped a lectern on the floor, overturning with great noise the iron joints that were on it. The teacher then thought of having the shelf better adapted; but as the carpenter was late in coming, it came to pass that the children succeeded in executing their manoeuvres so skilfully that the lecterns did not overturn, in spite of their uncertain balance.

The skill of the children's movements had remedied the defect in the furniture[1].

1. Montessori, M., & Lamparelli C. (Ed.) (2020). *Educare alla libertà*. Milano: Oscar Mondadori, pp. 20-21.

8. Appendices

by *Alessia Scarinci*

8.1. Appendix 1

1. Greenwave partners' perceptions of commonalities and differencies, future perspectives about education on sustainability

The following questions were submitted to each partner to gather their perceptions about the entire project, what were felt as commonalities and differencies among the countries, what was felt about sustainability education in the future after the Greenwave experience.

To start with, the following guidelines had been given to the partners to grasp the general perceptions of all the people involved in the project (named as GREENWAVE PARTNERS)

- Please answer these questions (also giving a brief summary of your notes during the TPM in Randers) to describe your thoughts and feelings about the "Greenwave project"
  – we want to evaluate the general impact of the project to each one of us, in terms of personal growth and to our school –

– What is your general perception about how the issue and teaching of sustainability is felt in your school and in your country?

– What do you think are the technical commonalities/differences among the EU countries in the field of sustainable building construction?

– What are your considerations about the teaching materials created, webinars and meetings held during the project in terms of educational impact?

– To what extend the "Greenwave in Vet project" has inspired you about teaching sustainability?

– Which impact do you think the "Greenwave in Vet project" will have in the next future at your school?

All the people involved in the project gave their answers outiling their perceptions about commonalities and differencies among the European countries as well as their opinions based on the Greenwave experience about the future of sustainability in Vet context.

8.2. Appendix 2

Considerations from the greenwave in vet partners: commonalities and differencies across EU about education on sustainability

1. Commonalities and partners' perceptions about the Greenwave in Vet project

It could be definetly said that this project made a big difference about the general perceptions and overview about sustainability compared to the previous considerations that all the people involved in the project as partners of Greenwave in Vet had before the same project: the raising of awareness on the personal level of the people/professionals involevd in the project about the issue of sustainability through webinars, activities, events and materials generated by the Greenwave project was felt as the biggest achievement; even people coming from Netherlands, which is felt to be ahead as country about all aspects about sustainability in comparison with the other EU countries, reported a feeling of improvement in the knowledge and awareness on sustainability in general.

Thanks to the project, generally speaking for all the people who worked on Greenwave it became clear such a distinction between the southern European countries and the northern European countries: the knowledge of sustainable solutions in building-construction schools is on the table Spain and Italy, but using these solutions and

developing the construction sector is happening faster in Netherlands and secondly in Denmark than in Spain and Italy. This is perceived as a result of culture, national policy and national financial situation.

Even when people reported a strong impact that the project had on their personal knowledge about sustainability issues and education, for some sustainability is felt to be still in its infancy: from Denmark which is making steps forward to it, the subject seems to not really appeal to young people yet. This sometimes is perceived as a difficulty to properly implement this within the lessons at school.

Some of the perole involved in the project said: "*I don't think the project has had any specific effects on the school, but the project has helped to push students and teachers' mindset about sustainability*".

During the project the partners generally reported to have discovered that the Netherlands and Denmark have major similarities when we talk about sustainability: the reasons for that are felt to lie in things such as equality in climate, education system, residents and institution.

A great example about sustainability in all aspects, was perceived from all the partners, to be Netherlands: moving from the general perceptions to the core of the project and so the education on sustainability, Netherlands is implementing the SDG's in the school curricula and lessons for many years. Strong and vivid icon for all the other countries.

Given this what was strucking about the project was that even for Netherlands Greenwave was a fantastic, enthusiastic new source of inspiration and improvement for education on sustainability:

"*About learning during the project, I can say I learnt a lot.*
Hands, head, heart is an old concept but good it became important again.
The link with the SDG's was a great new insight.
The toolkits for the implementation in the school, departments and lessons was new.
The webinars were great.
The learning activities were put into a nice frame.
The relation in between all SDG's and building and construction was clarified (for the first time)"

On the same line Italy state: "*The work carried out over the last two years through meetings and developing shared teaching models in terms of environmental sustainability and the webinars created have had an important impact. They have created moments of reflection for our teachers and students. in particular, the webinars proposed reflections on materials and construction techniques and led us to reflect on how much work still needs to be done to have sustainable cities, and on what we should improve in terms of environmental impact. The project aims to create a green mentality and through all the various steps of the project faced from time to time we have certainly sown the green mentality*".

The relationships created by the Greenwave project between partners generated a new force and source of contents and methods to offer for the implementation of teaching sustainability across Europe: this could be said to be a relevant and full of inspiration and hope for the entire teaching.

As a common and shared vision about the efficacy of the project could be reported as such: "*I believe the project has helped us to see clearly what our next development should be. In the project there is a lot of fine materials to implement in our teaching and training right now – this is good, but the biggest impact is, that we now have an idea about what our next steps should be as a school – also broader than VET and building and construction. In three to four years the SDGs will be visible in our school as a whole. In our teaching and training, in our strategy and in our school environment. Inspired by our Dutch partners we will include our school board in this process*".

2. Differencies and new insights across EU

Indeed, a whole new module called Green wave in VET has been created in the school from Netherlands as well as videos in which teachers explain how all their courses are paying attention to sustainability: giving new ideas about teaching as well as hints on the facility management was a very goos additional value for the school thanks to the project.

On the same line, new improvements came as a source of inspiration from the imputs given by the project such as "*I think that we as a school should take some more steps, for example waste collection and reuse of furniture and/or equipment*".

Another common opinion shared by the partners with regards to take Netherlands as a virtuous example on sustainability was the building of the school partner: "*our sustainable building shows that we walk the talk*" has been said and this aspect had a great impact on the participants coming from the other countries.

The differencies between the European countries involved in the project was felt also by Denmark: highlighting the "how" the build and construct process taks place, the schools are felt to be very different, with diverse workshops and facilities: "*Holland is further along on the road to implement the SDGs on a school strategic level. This will be the next step in Denmark. In Spain it is now mandatory to include the SDGs, which will have a huge impact. But it is still very much up to the local teacher to decide on how this is done. Italy is not as far yet – here it is very much up to the local teacher to decide if and how the SDGs should be included in the teaching and training*".

On the same line Italy states: "*All the countries involved in this project are working on Bioclimatic Design and sustainable building materials. Obviously in some countries such as those in Northern Europe it is much more common to see cities houses buildings constructed in this way, it depends a lot on national legislation and how various governments push in this direction*".

Also Spain underlines some differencies: "*Among the differences, we were aware of the development of timber construction in Germany, especially through Passivhaus certification. Thanks to the project we have seen that in Denmark, above all, and it seems that this is also extensible to the Netherlands (Koning Willem I building, that one with zero emissions) the construction solution with wood is quite developed. In Spain there are signs that this sector is on the way to develop wood construction with the creation of several CLT manufacturing companies*".

It is felt as a great value to understand these differencies among countries, this could only be the criterion that can generate and allow

a growth: becoming aware of the steps that need to be taken for an improvement of any dimension could only come from a comparison.

Also, as said, the difference is felt with regards to the national regulations about the general construction sector*:* "*The different building regulations also have an impact on this. In some countries the building regulations are becoming really strict regarding sustainability. This will definitely have an impact on the teaching and training in the VET-schools – and will motivate the use of the SDGs*".

And again on the building processes related to the ducation system in general*:* "*There is a big difference between the countries regarding how the build and construct – obviously. And the schools have very different workshops and facilities. Holland is further along on the road to implement the SDGs on a school strategic level. This will be the next step in Denmark. In Spain it is now mandatory to include the SDGs, which will have a huge impact. But it is still very much up to the local teacher to decide on how this is done. Italy is not as far yet – here it is very much up to the local teacher to decide if and how the SDGs should be included in the teaching and training. A big difference also is, that in Denmark children learn about the SDGs in the primary school on every level. This means that we need to plan our teaching and training in this perspective*".

Still on education another difference is felt: "*A big difference also is, that in Denmark children learn about the SDGs in the primary school on every level. This means that we need to plan our teaching and training in this perspective*". So the project has been felt to have given to the school partner in Denmark a new perspective on what the next step should be in terms of including the SDGs in a broader sense in education and more strategically.

On the same wavelenght as Denmark even though strating from another perspective Spain states: "*As of today, webinars are the materials generated that are most highly valued by students and teachers. They are a didactic and inspiring tool that can be used in a cross-cutting way to talk about sustainability in other branches of VET, particularly in construction*". The project created, once more, new perspectives: "*The rest of the materials generated, we believe that many of them are also inspiring and constitute a first step in*

the teaching activity in training cycles in the professional family of Building and Civil Engineering. This applies, in particular, to CIFP Someso. Our materials, in fact, have been agreed with the students and had, from the beginning, their approval. Our intention is to use those that best suit our circumstances and that we consider most attractive. To this end, at the beginning of the next academic year, an internal dissemination day will be held among the members of the department.During the dissemination days we have noticed an interest of the part of the teaching staff of this family in accessing information about these materials as well as the materials themselves".

With regards to the motivation, that needs to be taken as point of reference when it comes to speak about teaching sustainability, a difference is felt also on the teaching methods used across the EU countries: "*There is a difference in how we motivate the use of SDGs. In Spain it is top-down (it is mandatory), and in Holland and Denmark it is more bottom up. We believe that the right way would be to do both. In Denmark we need to address the SDGs in a more strategic manor – or else we risk that only some teachers implement them in their teaching and training*" so good suggestions came from the confrontations and activities created within the project.

The project and the interactions between partners generated new insight also for those countries which are ahead in terms of encompassing suatinability in the shool curricula in fact. "*We made new partnerships, and we learned a lot about other school systems. Through this project we have gained new perspectives on how to implement SDGs in our teaching and training. But the two most important learnings for our part is:*

1. *We need to address the heart/feelings more when we plan our teaching and training if we want to make lasting changes.*
2. *We need to address the SDGs in a more strategic way as a school".*

Thanks to the project activities in Spain there is a new feeling about improving the attention to sustainability: "*Ideally, sustainability should be worked on as a cross-cutting issue that is not restricted only to something academic, that is, to try to imbue students with its*

importance and to contemplate it in all the activities they carry out, both in and outside the educational centre.

Nowadays, in CIFP Someso we are far from that. The reasons are very diverse, but a key one is the lack of material resources (teachers involved in projects don't get a reduction of lessons, for instance) as well as the apathy of the students, very little given to getting involved in dynamics outside the purely academic ones.

In Spain, sustainability was not included in any VET curriculum. It is clear that a commitment is needed at state level, on the part of the government and educational institutions, so that it is taken into account in educational centres and is not something secondary or ancillary. In the next academic year, with the new VET law, a professional module on sustainability will be included in the curriculum of all training cycles. This is the first step in this direction. The SDGs will be dealt with in this module".

8.3. Appendix 3

1. Future on sustainability: a common point of view about teaching sustainability across EU

With regards to both motivation for students, teaching SDGs and the support that institutions have to give to teachers about encompassing sustainability in school curricula, a diffrence is felt bewteen Southern countries and Northen countries, in fact partners from Spain state: "*We are all aware that a shift is needed to include sustainability in education and to emphasise the sustainable development of the planet. Awareness-raising is the way forward and should start at early stages of learning. This work must have a generalist approach, i.e. it does not depend solely on individual teacher initiatives. Support from educational institutions is needed*".

Generally speaking, the differences between countries about all the dimensions related to sustainability and especially to the relation sustainability-school-quality of teaching is felt as linked to the general setting of the national education systems: "*At the present time, Netherlands and Denmark are much more advanced in the imple-*

mentation of sustainability, SDGs for example, at all educational levels", this is therefore to be addressed to "*the differences between the educational systems: the figure of the specialised workshop teacher in Europe is still present, for example, bricklayers, while in Spain VET teachers have a university degree. This fact penalises the quality of teaching. Educational resources and the involvement of companies in Danish and Dutch VET is much better than in Italy and Spain*".

Also the the recruitment of teachers is acknowledged to be very different and this has an impact on the quality of teaching. Common perceptions come from Italy and Spain: "*First, the main difference is related to our education systems. In italy, we have a public education system that complements vocational training schools (VET). In the other partner countries, the education system is very lean, dynamo, allows students after the first years of common education to make an informed choice whether to continue in vocational education and then specialize or to continue their education that will lead them to university*".

Despite the various differencies registered from Greenwave partners among their home countries on all levels and dimensions in which sustainability is related to education, schools, institutions and quality of teaching as well as technical features/processes about building and construction works, commonalities are reported with regards to the future about sustainability: "*In our particular case, we were certainly not aware of the approaches to sustainability followed by our Danish and Dutch partners. Our knowledge of sustainability was very basic and generic. Now that we have implemented this project, our awareness of sustainability has increased significantly and, thanks to what we have experienced and observed, as well as the materials generated, we have a starting point for this. The materials developed in the project will be used in the teaching activities of some modules of Building and Civil Engineering.We hope that there will be future projects related to this topic in future Erasmus+ calls*". The contributions that the Greenwave project made for each country is felt to be relevant and so future perspectives on other projects similar to Greenwave in Vet are desidered.

Is also felt as a common point the moving forward of EU in the same direction: "*Among the common points, it was noted that, although each country has its own specific building regulations, there is a tendency to unify towards a European standard in terms of contents and minimum requirements*" Spain notes.

Beside Spain, also Italy states: "*We learned to better understand the various stages of evolution of a European project, and to compare ourselves with the different educational models of the partner countries. The Green Wave Project has been extremely important for our vocational school, we have had the opportunity to strengthen European identity and active citizenship and to participate firsthand in the various stages of carrying out the work planned for each Project Result. From a work point of view this meant added value in terms of improved skills and from an educational point of view a plus for the staff, faculty and students*".

8.4. Appendix 4

1. Envisioning the future about sustainability: teachers's and students' point of view on sustainability

Here are the results of the first questionnaire administered to teachers and students involved in the project: the analisys showed, as said, a strong need of education about sustainability.

The result of the second questionnaire will follow to make a comparison and a final evaluation and impact of the Greenwave project. Is it possible to understand the vision of the futeure on the teachers'point of view by comparing the answers given in the two questionnaires administered.

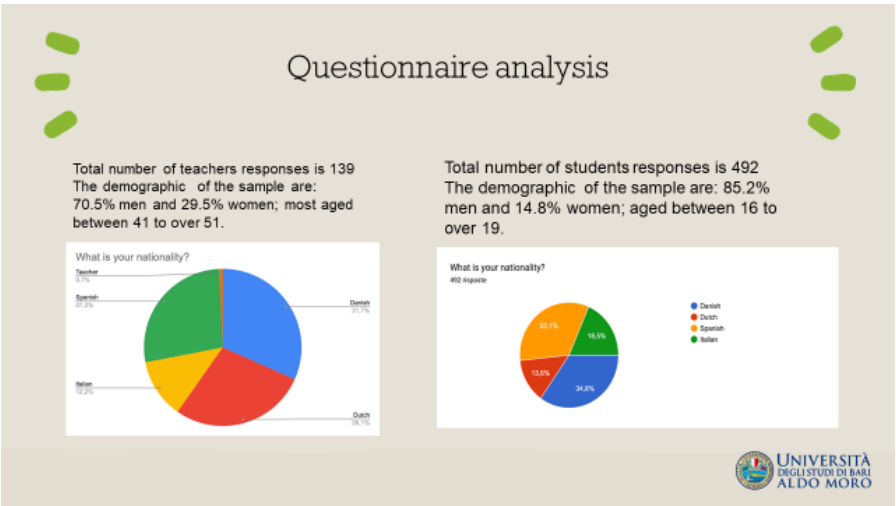
For the students' point of view we will compare the results of the first questionnaire with the final interviews to 16 students as requested by Result 6 of the project.

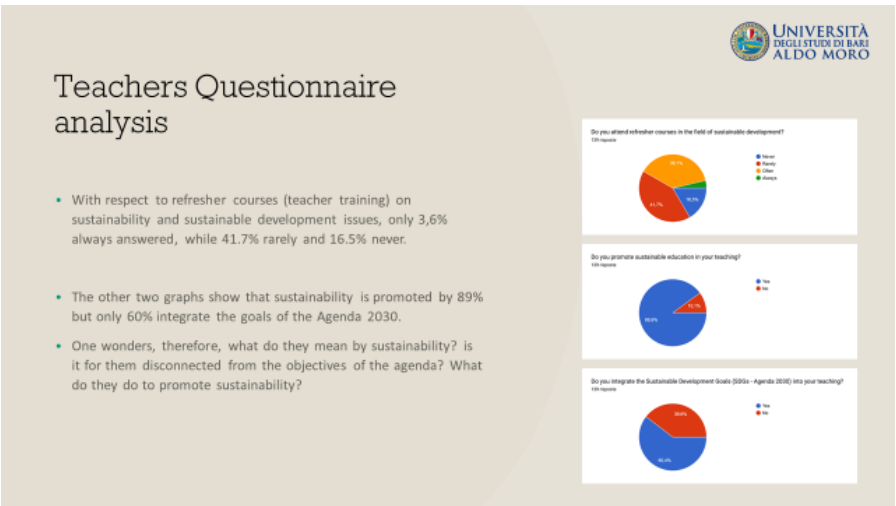
- **Teachers' point of view about sustainability**

First teachers' questionnaire

The questionnaire intends to understand how VET contexts promote sustainable education and through which projects and actions.

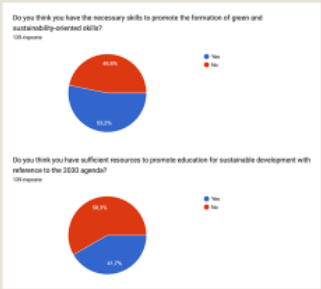
Here follows the preliminary results of this survey, analyzing the teachers' answers.





Teachers Questionnaire analysis

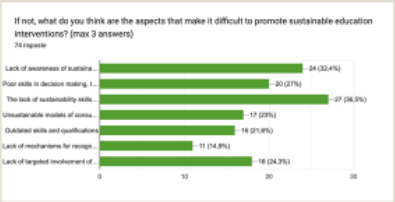
- Also, in relation to questions on the implementation of SDGs in educational actions and the promotion of sustainability, to the question "Do you think you have the necessary skills…» and «Do you think you have sufficient resources to promote education for sustainable development…" 53.2% believe they have the necessary skills, while 46.8% do not; only 41,7% believe they have the necessary resources while 58,3% do not.

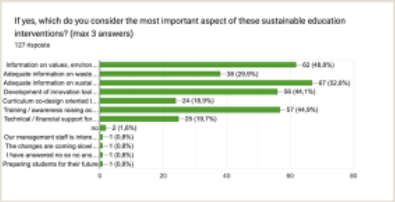


- But at the same time the responding teachers feel supported/motivated by their institution to promote education for sustainable development: 79.9% yes and 20.1% no (discrepancy).

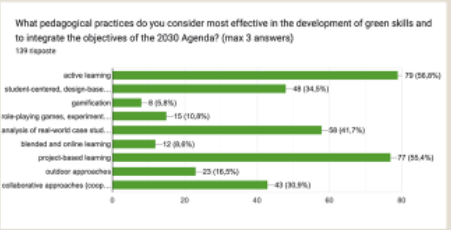
Teachers Questionnaire analysis

- According to most of the sample analysed, their own institution promotes education interventions for sustainable development (85,6%).
- In promoting interventions for sustainable development, respondents highlighted the following major difficulties: lack of awareness of sustainability, the lack of sustainability skills of teachers and / or school managers, Poor skills in decision making, teaching and practical implementation, lack of targeted involvement of key actors, including young people, the community and businesses.
- While the aspects they consider most important for sustainable development education are: Adequate information on sustainable materials and techniques, Information on values, environmental commitments and results achieved (e.g. waste reduction, water consumption, atmospheric and acoustic emissions), Training / awareness raising actions on sustainability issues, Development of innovation tools and methods.





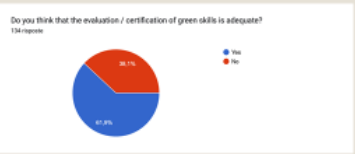
Teachers Questionnaire analysis

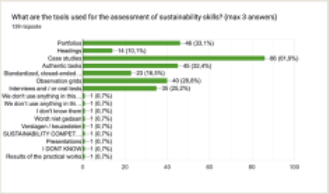


- The pedagogical practices considered most effective in teaching and developing green and sustainability skills are: active learning, project-based learning, analysis of real-world case studies taken from local context, student-centered, design-based, project-based, transformative (situated) learning contexts.
- Teachers also state that they use technologies in pedagogical practices to support the development of green skills (77% of respondents).

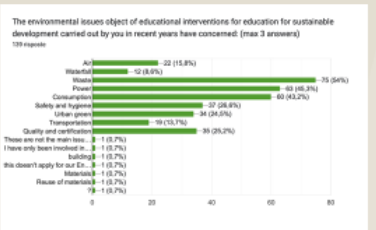
Teachers Questionnaire analysis

- For the evaluation, the most commonly used tools are: case studies, authentic tasks, portfolios, observation grids. There are 7 responses highlighting that sustainability related skills are not assessed and nothing is done about it. We ask what are the skills related to sustainability for them? Is there a framework they reference? (Do they know the greencomp?)
- It is believed that the assessment and certification of green skills is adequate for 61.9%.





Teachers Questionnaire analysis



- According to 82.7% of the teachers, students are interested in sustainable development issues.
- The environmental issues covered in educational interventions for sustainable development education carried out in recent years have mainly concerned waste, consumption, power and quality and certification.
- 63.3% of teachers believe that the recent political guidelines on green education have led to an adaptation or modification of the educational offer of their institute and of their teaching practice.

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Teachers Questionnaire analysis

- Finally, for 63.3% the training offer of their institution in terms of sustainability and development of green skills responds to market demands, for 36.7% it does not (what can be done? What actions?) .
- 59% affirm that the institution involves companies in the discussion of the sustainable development objectives and on sustainability issues. (perhaps increasing the involvement of companies would improve the response to market demands and also upskilling).

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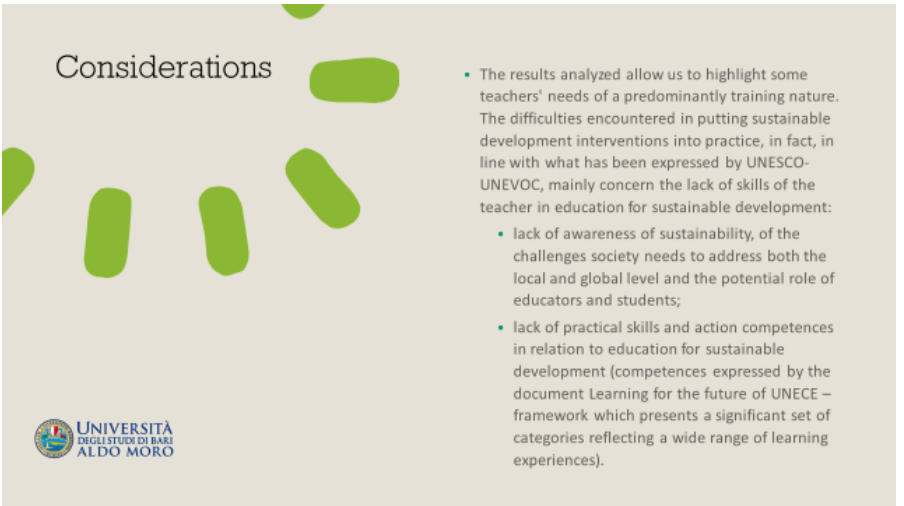
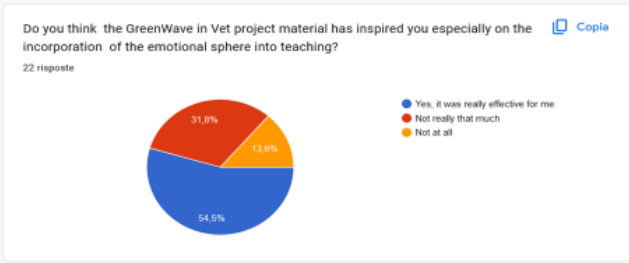


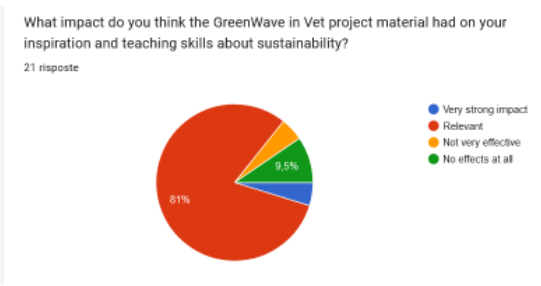
Second teachers' questionnaire

2° Teachers'questionnaire analysis

- One of the new questions as evaluation of the interventions made by the Greenwave project was related to the inspiration that the creation of the new materials might have had on teachers: as shown the incorporation of the emotional sphere in the creation of the lesson, as the PDM was built for, was really effective as a source of inspiration for the lesson planning of the teachers.
- The 54,5% of teachers answered they were inspired by the materials produced by the project



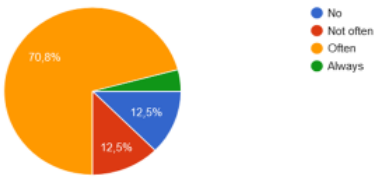
- The second new question was about the impact that the Greenwave in Vet project had on the inspiration of the general teaching practice and the increasing of teaching skills about sustainability: the 81% answeredthe project had a relevant impact on their teaching skills and inspiration to teach sustainability



- The following questions were about the usage of digital tools and specific materials chosen among the variety offered and the majority of teachers affirmed to have profited by the webinars in particular created for the project

Did you use any digital tools to plan or deliver the lessons about sustainability?

24 risposte



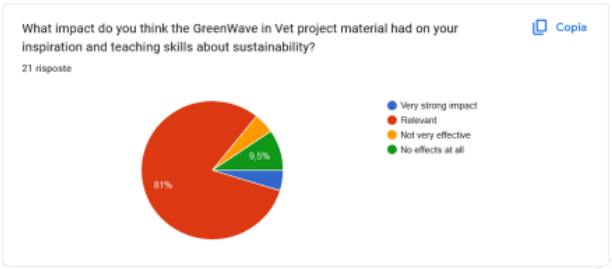
- The following question was crucial: meant to be straightforward to register any improvement generated by the all project activities on teaching skills, the great majority of teachers answered the project had a very strong impact on them

Taking into consideration the teaching materials, meetings and webinars put in place within the "GreenWave in Vet project" what impact do you think all the activities had on your teaching? (If your answer is no, please disregard the following questions)

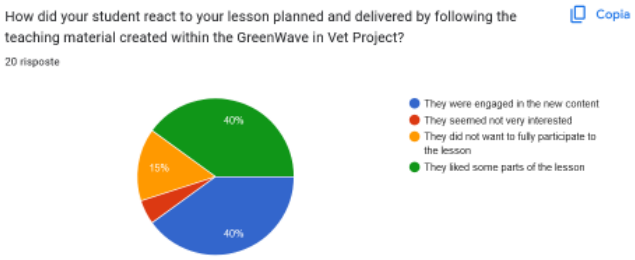
Copia

31 risposte

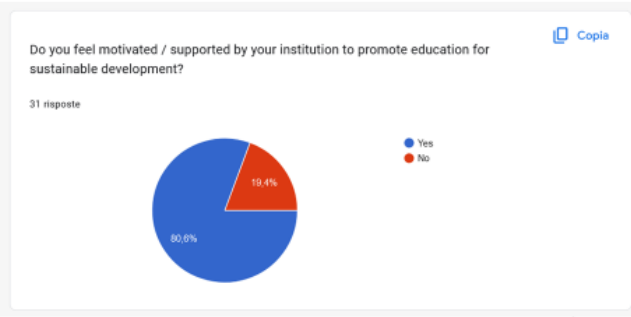
- The following question was meant to register the impact that the project had on teachers' inspiration, awareness on sustainability and personal growth as inner development related to sustainability concepts and SDGs, as well as related teaching skills, generated by the entire Greenwave project: the 81% of teachers answered the impact of the project was relevant; while still a littele minority of them felt to not have received any impact from the project



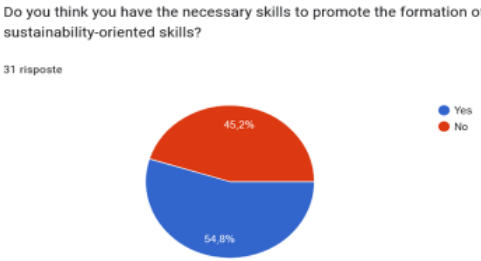
- The following question was related to the reaction of students during the new materials used by teacher to teach sustainability in their lessons: those who had the chance to use the Greenwave materials reported to have noticed a relevant engagement and interest of the students



- The following questions were meant to register any increasing of the motivation of teachers as well as feelings of being supported by their schools to promote educational intervetions for sustainable development: the 80% of teachers repoted yes, while still the 20% of them felt not supported



- The following question was about the feelings of teachers as to be skilled in promoting green skills in their students: the 54,8% of teachers answered yes while still the 45,2% of them answered no; with regards to the resources available to promote green skills education the majority of teachers still feel to have few of them at their disposal to teach and promote green skills for their students



8.5. Appendix 5

1. Comparison before and after the greenwave project-considerations about the future: teachers' point of view

As it is clear from the graphs shown, it is possible to grasp the impact of Greenwave in Vet project had on the teachers involved: generally speaking, although not all the teachers belonging to the schools which were partners of the project, took actively part in the Greenwave project activities, those who had the chance to participate show a relevant increase both on their personal growth and inner development about the awereness on sustainability as well as inspiration and on practical teaching skill related to sustainability and SDGs incorporation in the lessons.

In line with the perceptions of the people and professionals involved in the project as partners who actively participated and created the entire project activities, the teachers involved could affirm that the whole Greenwave in Vet project had a strong impact on them on variuos levels and dimensions.

Still much more needs to be done on sustainability, as the teachers who answered the questionnaires witnessed, on the boosting of the awereness of what is sustainability, what are the green skills, what and how needs to be incorporated in the curricular lessons, but it can be said the educational interventions such as the Greenwave in Vet project really can work, increase, foster and boost the general awareness and specific skills about sustainability and sustainable development.

- **Students' point of view about sustainability**

First students' questionnaire

Student questionnaire

- These three graphs show that 48.2% of students are interested in problems related to sustainability, while 32.7% are sometimes interested and 19.1% are not interested (differently from what teachers say).
- These answers are also connected to questions related to the possibility of discussing environmental problems with friends or teachers: it emerges that only 43.1% talk about them with friends and only 51.4% discuss them with teachers.

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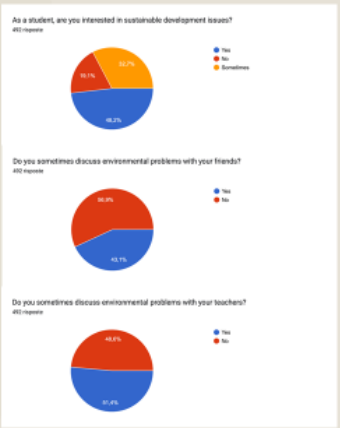


Students questionnaire

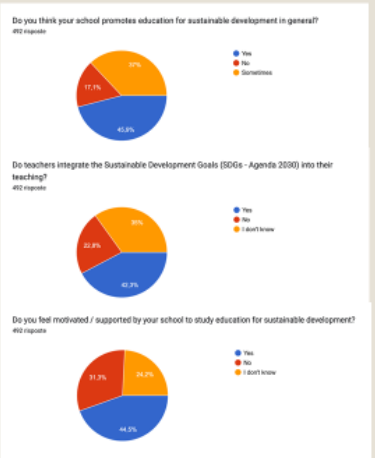
To the question «Do you think your school promotes education for sustainable development» 45.9% of the students answered «yes», 37% don't know and 17,1% no.

To the question «Do teacher integrate the Sustainable Development Goals…» they answred yes 42.3%, I don't know 35% and 22.8% no.

To the question «Do you feel supported/motivated by your school to study edcuation for sustainable development», 44.5% answred yes, 24.2% don't know and 31.3% no.

The percentage of "I don't know" answers regarding the integration of the SDGs in educational paths suggests that they probably don't know what they are and appears in line with what the teachers said.

Moreover, these answers show a not entirely positive perception by students regarding the motivation to study sustainability, even if 73% answered in the affirmative to the question on the promotion of sustainability by teachers.



Considerations

- This also entails difficulties in integrating the objectives of the 2030 Agenda into one's teachings as well as possible effects on the development of students' green skills. The teachers also highlight a lack in terms of the educational offer of their institute in terms of sustainability and development of green skills that does not respond to market demands, in line with the premise made at the beginning of a lack of skills in the sector building that needs to be filled.
- These aspects emerged and were confirmed by the students.
- The students' answers highlight some crucial points:-
  - Poor knowledge of the concept of sustainability and above all of the objectives of the 2030 agenda (quite in line with what was highlighted by the teachers)
  - A not entirely positive perception of the promotion of sustainability at school and by the school
- These aspects are more evident in questions with the "I don't know" option, unlike in questions with the possibility of a yes/no answer, the perception detected tends to be more positive.

Considerations

- However, a positive datum emerges from the analysis of the questionnaire and from a reading of the activities carried out during the training days in Horsens, i.e. a good mastery by the teachers of active and student-centred teaching practices capable of developing the knowledge, skills and the attitudes of the students so that they can plan and act with sustainability in mind (GreenComp framework) and of evaluation tools capable of certifying the skills acquired by the students.
- In conclusion, we can say that both in terms of teacher training and in the development of the pedagogical-didactic model, it is necessary to work on green skills with reference to the European framework which must become the guiding tool for planning interventions on sustainable development.

8.6. Appendix 6

by *Anna Daniela Savino*

Second students' questionnaire

The most important points to be highlighted that emerged from the students'answers to the first survey are:

- Poor knowledge of the concept of sustainability and above all of the objectives of the 2030 agenda (quite in line with what was highlighted by the teachers).
- A not entirely positive perception of the promotion of sustainability at school and by the school.

After the educational activities promoted by the entire Greenwave in Vet project the students (two students interviewed from each partner) were asked the following questions:

1 - *To what extend the "Greenwave in Vet project" has inspired you about studying sustainability?*

2 - *Which impact do you think the "Greenwave in Vet project" will have in the next future at your school?*

3 - *What did you like the most about the project? Why?*

Here follows a summary of all the interviews made to the students belonging to the partners'schools from each country at the end of the school year.

The students from Danmark from the two parters'schools both said, that they were very inspired by the new materials presented to them from the teachers: materials made from wood, grasses, seaweed, recycled plastic. The materials are used to construct houses in a new and more sustainable way instead of using glass wool; they also thought that their teachers have got new insights in sustainability – and the importance of working with sustainability.

They said to have liked the way their teacher challenged them to think in a sustainable way because they had to be inventive, use their brain and skills in a new and different way.

On the same wavelenght, students from Spain reported:

"*Until now, all the projects I have done in my school have used concrete and steel. Thanks to the Green wave project, now I consider designing houses with a wooden structure*".

"*I was not aware of the potential of wood in Galicia and thanks to this project I have discovered that we have a great wealth that can be used to build much more sustainable and healthy houses*".

With regards to the materials used within the lessons:

"*According to the teachers, some of the materials developed in this project will be used in the next school year*".

"Some of the materials elaborated in this project will be used in the next school year based on the new curricula since there will be a new subject on sustainability".

About what they liked the most and why about the project they reported:

"*This project has made me ask myself what I can contribute to sustainability when I leave school and start to work in a company*".

"*The webinars that were created during the project. I find them very intuitive and educational. It brings up materials that I was completely unaware of*".

Students from Netherlands reported:

After a number of guest lectures about sustainability, nature inclusive, bio-based construction, it got me thinking. The guest lecture from Global Goals put me to work, so I started reading about the global goals and looking at what best suits our home. After the guest lesson on materials, I was also completely taken into the best choices, so I discovered that hemp is a good insulation because it grows back, he showed us a type of glass that I have never seen before. By bringing samples he took the whole class with him and I was quickly interested.

The global goals have inspired us to conduct research into sus-

tainability. This had a major impact on our research as we knew what to pay attention to. Some of the things we have done research into are nature inclusivity, bio-based construction and sustainable construction. Consider the global goals of 'life on land', 'sustainable cities and communities' and 'affordable and clean energy'.

With regards to the perception of the impact that the project had on them, they said:

"*Everything becomes more sustainable, more environmentally friendly and better for the future. Our school already has solar panels and sustainable materials and much more could be added in the future. In this way they pass on to the students that sustainability is important for this generation. If we all do more research into sustainability with the entire new generation and contribute, we will keep the planet alive for a little longer*".

"*By giving a project about sustainability, nature-inclusive construction and bio-based construction, we ensure that we think more about sustainability in subsequent projects. This will ultimately ensure that we can make more sustainable choices on our own in the future that will ensure that the world becomes more sustainable piece by piece*".

The answers to the question about what did they like about the project and why they answered:

"*How much I have learned about sustainability, biobased, nature inclusive and environmental friendliness. The research into different materials that are best to choose, such as hemp insulation, etc. I also really enjoyed designing the house, sketching it in broad outline and working it out later. I also really liked the model and material board because you were really working with your hands*".

"*The principle that we had a 'real client' has ensured that we have less difficulty in this in the future. I also liked the creativity we could use in designing a sustainable dream home.I only now realize that all this information is important for the future, after doing all this research I am very happy with the knowledge I now have. With*

this I can contribute to a better world for our generation".

Other two students interviewed from Netherlands about being more aware of sustainability issues, materials, techniques thanks to the Greenwave in Vet project said:

"*We have noticed more attention on sustainability at school… we have been very busy especially this year: we worked on a project about building a small house with different materials and we learnt a lot about alternative materials, insulations, transports*".

"*Yes, I think we will be able to use them in the future! That's a good thing!*"

With regards to the feelings and impressions of the two students about the impact that the project could have in the next future they reported:

"*Students will look differently at the materials to use when building… I learnt how to give to materials a second life… I will do it!*"

"*Yes, I think in the future it will impact everyone, it will be more common to used alternative materials, different heating systems..; also it is important for your own house!*"

About the learning, the improvement of learning on sustainability thanks to the aim of the project – which was embedding sustainability in the whole school curricula not only proposing isolated projects or thematic sessions about it – the students said:

"*We have been discussing a lot during the year about sustainability… people get bored if you work on a single project… while discussing almost everyday made it very intersting!*"

"*Discussing continuously during every lesson has helped a lot… we learnt a lot how to used biobased materials*!!"

The enthusiasm of the students while reporting their perceptions about their learning thanks to the project carried out during the year was great!

Students from Italy responded:

"*The thing I enjoyed most having addressed sustainability issues related to materials, new construction techniques having talked about it with my teachers*".

"It was very interesting to talk about what we can do to improve environmental sustainability in construction and new techniques, and to have European inspiration on what are the construction techniques in northern Europe".

About the impact that "Greenwave in Vet project" will have in the next future at your school, they answered:

"*I believe that my school will invest time in sharing the results of the project and the work done with the next classes, it will certainly be an inspiration for future teaching models*".

"*This project has been very inspiring for our school, has allowed us to compare ourselves with other teaching models, and will surely enable us to improve our European dimension for the future. Certainly the project has strengthened the green wave in us students, this is a topic that is very much felt in Italy*".

At the end, about what they liked the most about the project they said:

"*I really enjoyed watching the webinars and seeing what other European countries are doing to maximize sustainability in their buildings, through these webinars we were able to learn more about and evaluate the impact of other building techniques on our environment. At school we study construction techniques, the use of environmentally sustainable materials, we have the opportunity to participate in seminars with leading companies in the field of sustainable materials*".

"*The webinars have allowed for more interactive and certainly very interesting lessons*".

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This contribution focuses on some results of the project Erasmus+ "Constructing a Green Wave in VET – A New SDG Perspective". This project aligns with the priorities of the new Erasmus+ program for environmental sustainability and UN objective 4.7, which aims to guarantee that all students acquire the knowledge and skills necessary to promote sustainable development and global citizenship. The final output of the project is the creation of a common pedagogical and didactic model to teach sustainability in Vet schools across the European countries involved in the project. The Green Wave VET project aims to explore and improve the integration of sustainable education in Professional and Technical Training (VET) contexts. Focusing on how the 17 Sustainable Development Goals (SDGs) can be implemented in construction and education sector. University of Bari, elaborating the PDM, focused on three actions: (1) mapping existing educational approaches about sustainability in VET contexts and the analysis of emerging needs; (2) the understanding of how VET contexts promote sustainable education; (3) exploring ways to work effectively with the 17 Sustainable Development Goals (SDGS). The PDM bases its innovative character on one hand, stimulating the development of critical and creative-constructive skills to face the new challenges of sustainability; on the other hand, offering an innovative pedagogical-didactic model for teachers, aimed at the creation of new contents relating to sustainability and at the development, in a metacognitive sense, of the pre-conditions that allow us to think and build sustainability.

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