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Reinforcement of Workforce Training Programs—Insights from Pilot Testing Process to Enhance Greening Practices in Enterprises

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Abstract: As industries and organizations become greener, the demand for workers with green expertise will rise, making education, training, and skill development for the green transition more essential than ever. With an emphasis on local green skills shortages, our study focused primarily on qualitative insights from a specific sample of industry practitioners to explore emerging trends in green skills training, providing effective steps in curriculum improvements for teaching and learning in support of greening jobs and enterprises. It addresses the increasing demand for green skills in the workplace and offers practical insights on how to reinforce the workforce training process, through needs assessments, curriculum objectives, specific learning outcomes and targeted green skills, training components, and working methodologies. The feedback from the pilot process highlights the strengths of the training curriculum in enhancing green practices in enterprises, particularly in terms of content quality, communication methods and online interaction, workload and the practical application of green knowledge, and feedback mechanisms. Our study provides several theoretical and practical implications for various stakeholders (i.e., researchers, academics, trainers, and practitioners) interested in advancing the adoption of green practices. Also, universities and training institutions can benefit from this study by incorporating its findings into their curricula, thereby improving the relevance and impact of training and education programs.

Keywords: green and digital transformation; complex skills development; education and training curriculum program; sustainability education; curriculum design; quality education; process improvements

Citation: Fleacă, B.; Militaru, G.; Fleacă, E. Reinforcement of Workforce Training Programs—Insights from Pilot Testing Process to Enhance Greening Practices in Enterprises. *Sustainability* **2024**, *16*, 10377. https://doi.org/10.3390/su162310377

Academic Editors: Jianming Cai and Hao-Chiang Koong Lin

Received: 22 September 2024
Revised: 20 November 2024
Accepted: 25 November 2024
Published: 27 November 2024

1. Introduction

As industries and organizations continue to embrace sustainable practices, the demand for workers with green expertise is projected to grow substantially. The presence of green skills in the job market increased from 3% in 2019 to 5% in 2022. This trend indicates that employers are actively translating their commitment to the European Green Deal goals into concrete actions by greening their operations and workforce requirements [1].

The study by the European Centre for the Development of Vocational Training-CEDEFOP [2] pointed out that an important challenge for the coming years is accelerating up- and reskilling so that people have the skills to thrive in more digital and greener jobs. The occupational shifts driven by the green transition generate a substantial need for training and education, making it essential to equip both current and future workers with the necessary skills to ensure a fair and equitable green transition. For instance, providing training in foundational skills (i.e., numeracy, literacy, and problem-solving) for adults is a major challenge [3] since very few adults can go back to formal schooling, even if it is adapted to their daily schedules. Adult education courses must be highly flexible, targeting

skill gaps and supporting job transitions essential for achieving the goals of the European Green Deal.

To respond to evolving challenges, policies to support workers of all education levels to develop their skills and help them to move into sectors with high skill demands are therefore a priority in the recovery plans of many countries. For instance, strengthening and modernizing adult learning is a priority, and ongoing investments are needed to enhance the training infrastructure, including through individual training accounts, and to promote a culture of learning more generally [4].

Although numerous studies have explored various aspects of sustainability concerns and enterprise performance across a wide range of industries, cultural contexts, and business sizes, there remains a significant need for further research into the education and training systems responsible for preparing the current and future workforce. Equipping both students and professionals with the knowledge, skills, and attitudes necessary to manage existing business operations and address the diverse and often complex challenges of sustainable development and the green transition is still critically important.

The structure of this paper is as follows: Section 2 provides an overview of the existing literature to deeply define the scientific research problem and to formulate relevant research questions. Section 3 outlines the methodological approach to address the first research question through an assessment survey. It details the research objectives and variables with operational descriptions, including the measurement scales and scaling techniques employed. Furthermore, Section 4.1 outlines the current findings from assessing green learning needs and pinpoints the specific green skills and knowledge that are most relevant for enhancing greening practices in local enterprises. The second research question is tackled by Section 4.2, which presents the design of a tailor-made curriculum for greening practices of local enterprises. Section 5 discusses the implementation of the tailor-made curriculum during the pilot testing process with Romanian employees. Finally, Section 6 offers concluding remarks and suggests steps for further improvements.

2. Literature Review

The concerns for continuing education have brought the attention of scholars towards investigating how green creativity components (i.e., task motivation, creativity skills, and expertise) and environmental dynamism can aid organizations in boosting their innovative practices [5]. Additionally, the critical roles of digital and interpersonal skills were mentioned as those that will be significantly needed in the future in terms of the performance of employees, especially in economies where the demand for technological, social, emotional, and higher cognitive abilities is increasing [6].

The challenges of organizations in their path towards a green transition have been extensively analyzed. For instance, the study by Madrid-Guijarro [7] demonstrated the relevance of the mediating effect of management commitment (i.e., values, skills, and attitudes) to encouraging environmental performance in enterprises and recommended management training programs to provide decisional factors with the skills and pro-environmental knowledge and awareness needed to adopt a long-term environmentally sustainable business strategy. Other studies [8] investigated the relationship between academic directors and corporate eco-innovation in Chinese A-listed firms. The findings demonstrated that advanced knowledge, skills, and expertise have a positive impact on company eco-innovation and a significant contribution to enhancing environmentally friendly activities and sustainability practices.

Special emphasis was placed on sustainable development practices within public administration, highlighting the importance of education in this area for equipping future leaders with the knowledge and skills needed to advance sustainable development. Consequently, there is an increasing demand for training and education programs focused on sustainable development [9].

Other scholars took a more systemic approach and developed frameworks such as circular business models to help enterprises implement practices to achieve sustainability

goals [10] or sustainable business models [11] used for depicting sustainability activities and evaluating and monitoring the alignment and progress of the organization's sustainability efforts. A study on the automotive industry further argued that green entrepreneurial orientation and green innovation can assist enterprise managers in understanding the factors leading to sustainable performance. Particularly, automotive firms should incorporate green technology and promote green innovative processes and production to sustain the growth of their businesses [12].

The critical roles of employees in the pursuit of organizational green practices and sustainability performance were also analyzed, and the results emphasized the importance of incorporating green practices into human resource management—such as green job descriptions, recruitment, selection, training, performance appraisal, and rewards—as a key strategy to enhance sustainable performance and achieve a balanced approach to environmental, economic, and social outcomes in organizations [13]. Other studies investigated how organizational performance is influenced by green competencies and the willingness of employees and their interdependence and mutual relations. The results recommended an innovative human resource management approach to influence employees' willingness to participate in green activities [14].

The concern for green skills was also tackled by a study on Italian enterprises operating in the food sector characterized by technical complexity and subjected to several national and international regulations. The findings argued that green human resource management practices, i.e., green recruitment and selection, may foster employees' willingness to take part in green training, and the participation of employees in specific training programs to improve green and soft skills should be particularly considered for sustainable enterprises [15]. Other findings underscored the crucial role of leaders' competencies in shaping the social orientation of SMEs, emphasizing the importance of training in competencies for sustainable development [16].

The role of education in having a well-prepared workforce for green transformation and Industry 4.0 challenges was also addressed. For instance, novel approaches to engineering education [17] include combining fundamental hard skills, including first-principles thinking, with soft skills, such as empathy, creativity, communication, and collaboration, for designing future-ready curricula or for the employment of the engineering talent of young students in developing innovation processes in technical universities [18]. Other studies on engineering students from Denmark, Finland, France, and Ireland confirmed the strong emphasis on normative, strategic, and system thinking competencies in engineering, but the absence of recognition of anticipatory competence raises several concerns, as it conflicts with the forward-looking approach essential to sustainable development [19].

The study by Fleaca [20] also recognized the importance of integrating sustainability into the curriculum through well-designed teaching processes, ensuring that educators are adequately prepared to teach and train students in sustainability competencies. Future teachers should understand the importance of sustainable development education as an important social problem and consider the need for more training in this area to raise awareness and enable the transformation of education to achieve the sustainable development goals proposed by the 2030 Agenda [21]. The need for increased access to education in the field of sustainability to prevent environmental degradation and social problems and to prepare individuals for jobs that contribute to sustainable development was also acknowledged [22].

Designing effective strategies to incorporate interconnected learning methods into the curriculum is a considerable challenge. Teaching sustainability is inherently complex, as it demands an interdisciplinary approach and the ability to apply knowledge across diverse contexts. Educators play a vital role in facilitating learners' abilities to transfer knowledge between different fields, helping them to identify and understand the connections between sustainability concepts across multiple academic disciplines [23].

Consequently, locally focused research into specific educational and training contexts (such as the Erasmus+ project, aimed at developing green skills and knowledge for the

workforce) can offer valuable insights to guide curriculum improvements for teaching and learning in support of greening jobs and enterprises. Recognizing the responsibility of higher education providers to take concrete steps in enhancing learners' green and digital readiness, our study offers practical insights into how to reinforce the workforce training process—through needs assessments, curriculum objectives, specific learning outcomes and targeted green skills, training components, and working methodologies—and can serve as an innovative approach to sustainability education and training. This approach directly addresses the increasing demand for green skills in the workplace.

With an emphasis on local green skills shortage, our study focused primarily on qualitative insights from a specific sample of industry practitioners to explore emerging trends in green skills training. This may be particularly relevant to Romania, a country facing persistent challenges related to skills shortages, especially in the context of the green and digital transitions [24,25]. In Romania, the percentage of people aged 25–64 who participated in education and training increased from 1.0% in 2020 to 5.4% in 2022, yet it remains significantly below the EU average of 11.9%. Additionally, less than one-third of Romania's adult population possess basic or above-basic digital skills, compared to 54% in the EU [26]. Addressing these skills shortages and mismatches by aligning education and training with labor market needs and enhancing the attractiveness of adult learning is a crucial component of the recovery and resilience plan, particularly for achieving a fair digital and green transition [24,26].

Therefore, our research problem was focused on understanding the mechanisms by which specific training approaches influence the acquisition of green skills, exploring how tailored training programs can bridge the gap between current workforce skills and the demands of greening practices in local enterprises. To further explore the research problem, two research questions were considered to address different aspects of green skill development and its impact on greening jobs and enterprises:

(1) What specific green skills and knowledge are most relevant for enhancing greening practices in enterprises?
(2) How can the training curriculum be structured to effectively equip the local workforce with green skills?

3. Methodological Approach

To address the first research question, an assessment survey was conducted to identify the specific green skills and knowledge within a research sample of 32 Romanian employees selected for participation in the training activities. The demographic structure of the research sample was built on several variables measured by a nominal scale and frequency distribution, such as:

- Age: 20–29 years old; 30–39 years old; 40–49 years old; 50–59 years old; 60+ years old;
- Type of function: execution vs. management responsibilities;
- Employment status: government organization; self-employed enterprise; freelancer/entrepreneur; private enterprises; NGO;
- Sector of activity: services; energy and extractive; finance and insurance; education/research; ICT; trade; water, sanitation and waste management; industry/production; public administration; other;
- Size of enterprise: number of employees: $\leq$10; 11–50; 51–250; >250.

The survey captured opinions and expectations regarding the actual understanding of environmental challenges and business practices within existing enterprises to tap into green market opportunities. In this regard, Table 1 designates the structure of the study, including the link between the research objectives, operational variables, and related measurement scales and techniques. The variables were built on the ESCO classification [27] and used a mix of transversal, sector-specific, and cross-sector green skills in coherence with local green concerns, resources, and capacity constraints.

Table 1. The framework of the survey for needs assessment.

Research Objectives	Research Variables	Operational Description	Measurement Scales and Scaling Technique
O1. To measure the perception of green concepts.	Transversal green skills	Adopting ways to foster biodiversity and animal welfare	Nominal scale and frequency distribution
		adopting ways to reduce the negative impact of consumption	
	Sector-specific green skills	Pollution legislation	
		Promoting responsible consumer behavior	
	Cross-sector green skills	Maintaining recycling records	
		Environmental legislation	
O2. To quantify the level of green skills and knowledge.	Non-digital components	Learning to learn; analytical skills; creativity and innovation; problem-solving; communication skills; teamwork skills	Interval scale and four-point Likert scale
	Digital components	Information and data processing; digital communication and content creation; digital problem-solving	
	Knowledge of greening practices	Environment; green jobs; green enterprise	Interval scale and three-point Likert scale

The content of green skills and knowledge was linked to the European Skills Agenda, which highlights the concurrent green and digital transitions reshaping how people live, work, and interact [28]. Training curricula must focus on developing complex skills related to new green products and practices to support this transformation. In addition to technical abilities, the workforce increasingly demands transversal skills such as collaboration, critical thinking, and creative problem-solving. Therefore, we evaluated relevant descriptors for complex skills, incorporating both digital and non-digital components as outlined by Life Comp [29], Entre Comp [30], and Digi Comp 2.0 [31].

For non-digital components, particular emphasis was placed on the following descriptors [29,30]:

- Learning to learn, which includes the ability to organize one's own learning autonomously and understand preferred learning strategies;
- Analytical skills, involving the selection of sources directly related to key concepts and the ability to analyze, synthesize, and evaluate the quality of information;
- Creativity and innovation, which refers to the ability to transform ideas or solutions into entirely new forms and respond creatively to problems and opportunities;
- Problem-solving, which encompasses the ability to identify and analyze problems in challenging situations, make justifiable evaluations, and seek out the root causes to understand the underlying issues;
- Communication skills, involving transparent communication, stating clearly the ideas to express, and considering cultural barriers when planning communications.

For digital components, specific emphasis was placed on the following descriptors [31]:

- Information and data processing, which involves recognizing the usefulness, timeliness, accuracy, and integrity of digital information and distinguishing reliable from unreliable sources;
- Digital communication, which includes the ability to edit information for communication through email, slide presentations, social media posts, and blogs, as well as sharing content on social networks and collaborative platforms to gather feedback;
- Digital content creation, which refers to combining various media to express creativity and creating visual representations of knowledge using digital tools;

- Digital problem-solving, which involves staying informed about the latest digital technologies, understanding their potential, and leveraging these technologies to represent and solve problems effectively.

Furthermore, the survey was built on the Proposal for a Council Recommendation on Learning for Environmental Sustainability [32], emphasizing that education and training should empower individuals to understand and act on environmental issues. This involves fostering a critical understanding of sustainability topics from multiple perspectives, acknowledging uncertainties, building sustainability competencies, and adopting a lifelong learning approach [32]. To this end, a range of sustainability subjects were chosen to integrate environmental, social, and economic pillars, enabling the practical application of these concepts within current green business practices. Additionally, to better leverage local knowledge, strengths, and capabilities, specific emphasis was placed on various green topics, such as [33,34]:

- Environment, including resources and the circular economy, EU environmental strategies for processes, goods, and services, and Environmental Management Systems.
- Green jobs, covering social, ethical, and integrity principles for organizations, sustainable lifestyles and responsible education, economic growth and decent work, green jobs and local community engagement, social and labor protection, occupational health, and safety.
- Green enterprises, addressing sustainability reporting standards, green business models, green entrepreneurship, green finance and investments, green procurement practices, and fair-trade certifications for goods.

This diverse knowledge base from economic, social, and environmental areas helps learners transfer insights across contexts, develop interdisciplinary understanding, and address complex current challenges that demand critical thinking across disciplines [35].

Finally, the survey was built on the questionnaire, with 11 (eleven) questions considering the nominal scale and 11 (eleven) questions based on the ordinal (Likert) scale. A nominal scale was employed to measure demographic variables for individuals (such as age, job function, and employment status), enterprises (including size and sector of activity), along with perceptions of green concepts. In contrast, an interval scale was used to quantify self-assessments of complex skills and the green topics to be addressed in the training. Also, the survey instrument's reliability and relevance were considered by a pilot test with a small sample of industry professionals before the full survey rollout.

4. Designing Training Curricula

This section addresses the first research question and presents the current results of the needs assessment (Section 4.1). Afterwards, the second research question is approached, and learning outcomes for complex skills development are built into the training curricula focused on green concepts and local concerns (Section 4.2).

4.1. Analysis of Workforce Needs for Green Transformation

The needs assessment was conducted using a questionnaire, with data collected through an online survey distributed to a targeted sample of 32 Romanian practitioners. These participants were direct beneficiaries of an ongoing Erasmus project designed to enhance the local workforce's readiness to address the structural changes anticipated from the green and digital transition.

The demographic composition of the sample was somewhat skewed, with 40% of participants aged 40–49 and 44% aged 50–59. The remaining 16% of the sample was nearly evenly distributed across the other age groups. Regarding employment status, the majority were employed by private enterprises (59%), followed by 35% who were entrepreneurs or freelancers, and 6% who worked in local government organizations. Notably, nearly 60% of the respondents had purely technical responsibilities in their jobs, while the remaining 40% reported having decision-making roles in their activities.

In terms of operating industries, the employers represented a diverse range of sectors: 65% were from the services sector, 19% were from education and research, 13% were from local industry and production, while the remaining 3% were distributed across the ICT, finance and insurance, and energy sectors. Also, almost half of the sample consisted of small enterprises with a maximum of 10 employees, followed by 22% from medium-sized enterprises, whereas 15% of individuals worked in large-sized enterprises, and only 13% of them were from large organizations.

To assess the workforce's perception of green concepts, the greening practices used to evaluate their operational understanding (i.e., including transversal, sector-specific, and cross-sector skills) were selected from the ESCO classification dataset [27]. These practices were aligned with recurrent shortcomings identified during the early stages of the current Erasmus+ project, particularly in the conception phase. Table 2 presents the respondents' awareness of key greening practices within the enterprises.

Table 2. The awareness of greening practices in enterprises.

Green Skills	Operational Description	Greening Practices	Rather Unknown	Rather Known
Transversal	Adopting ways to foster biodiversity and animal welfare	Maintaining stable ecosystems and combatting mass extinction, for example, by making conscious dietary choices that support organic food production and animal welfare.	53%	47%
	Adopting ways to reduce the negative impact of consumption	Applying principles, policies, and regulations aimed at environmental sustainability, including reducing waste, energy, and water consumption, the reuse and recycling of products, and engagement in the sharing economy.	81%	19%
Sector-specific	Pollution legislation	Being familiar with European and national legislation regarding the risk of pollution.	53%	47%
	Promoting responsible consumer behavior	Promoting policies, actions, and education programs that encourage healthy lifestyles that lead to changes in consumers' attitudes, shopping habits, and expectations.	69%	31%
Cross-sector	Maintaining recycling records	Maintaining records and processing facts and figures about the type and volume of different recycling operations.	91%	9%
	Environmental legislation	Being aware of environmental legislation, policies, and principles.	44%	56%

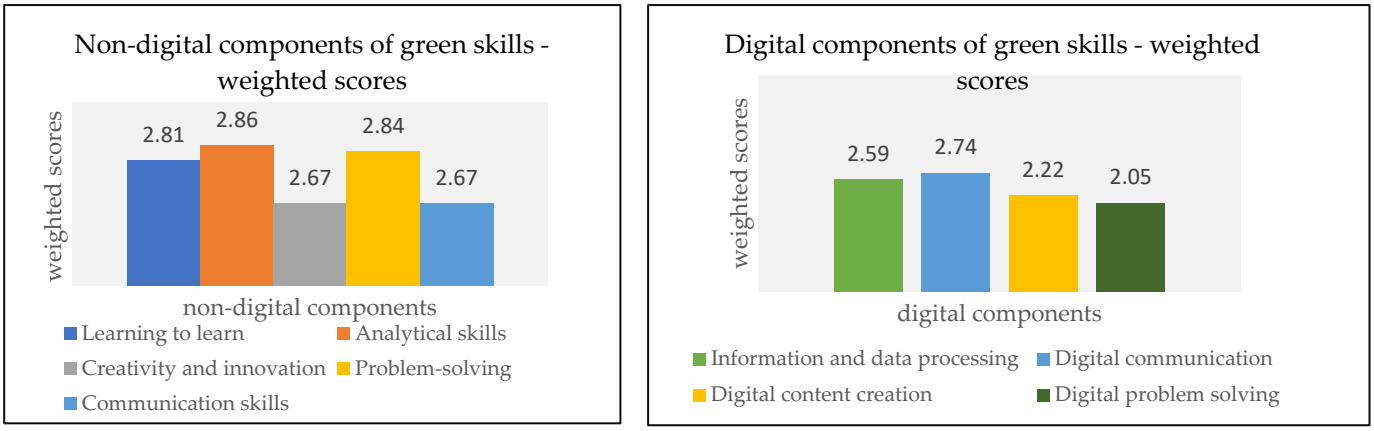
We may note that the respondents recognized the value of green practices but struggled to integrate them into their daily operations due to a lack of expertise or inadequate infrastructure. The respondents seemed to have a basic understanding of environmental concepts but lacked the detailed knowledge to implement effective green practices in the enterprises. For example, the least recognized practices included adopting methods to reduce the negative impact of consumption, with 81% of respondents indicating unfamiliarity, and maintaining recycling records, with 91% reporting a lack of awareness. As regards the level of green skills mentioned by the respondents, Table 3 displays the data analysis.

Considering a four-point scale, the weighted scores for non-digital components reveal an unsatisfactory level for creativity and innovation (2.67), communication skills (2.67), followed by learning to learn (2.81) and problem-solving (2.84), as presented in Figure 1a.

Regarding digital components, this target group scored low for digital problem-solving (2.05), which questions their ability to effectively use the latest digital technologies to address green issues, such as optimizing resource use, reducing waste, or improving energy efficiency. They tended to have problems with creatively expressing and communicating green concepts in the digital environment (2.22), as shown in Figure 1b.

Table 3. The weighted scores for green skills assessment.

Non-Digital Components	Weighted Scores
Analytical skills	2.86
Problem-solving	2.84
Learning to learn	2.81
Creativity and innovation	2.67
Communication skills	2.67
Digital components	**Weighted scores**
Digital communication	2.74
Information and data processing	2.59
Digital content creation	2.22
Digital problem-solving	2.05



(**a**) (**b**)

Figure 1. Weighted scores for green skills assessment: (**a**) non-digital components; (**b**) digital components.

We may note that this target group scored low for creativity and innovation components, which are key to developing new solutions to environmental challenges, while strong communication skills are also necessary for promoting and coordinating green practices across an organization. Also, a good ability to learn and adapt is crucial in the context of green practices, where new technologies, regulations, and methods are constantly emerging and effective problem-solving skills are vital for addressing the diverse and often complex challenges associated with implementing green practices.

To further scope the training program with the needs of this target group, the respondents were asked to rank their interests in different green topics considering a three-point scale, starting with 1—not useful, 2—somewhat useful, and 3—very useful. The results are presented in Table 4 in decreasing order of usefulness.

As Figure 2 presents, the practitioners likely viewed green knowledge related to the environment (an average weighted score of 2.61) as essential for understanding and mitigating environmental impacts. The focus on green jobs (an average weighted score of 2.52) reflects an expectation to understand how to integrate green practices into various roles and responsibilities. This involves knowledge about sustainable job practices, the skills required for green roles, and the benefits of green employment for individuals and organizations. Also, they were likely to explore strategies for promoting green practices (an average weighted score of 2.49) within the enterprise, such as sustainability reporting, green procurement, and green business models.

Table 4. The practitioners' expectations regarding the usefulness of green knowledge.

Question: Which Subjects Would be Useful for You to Understand the Knowledge for Greening Enterprises?	Weighted Scores
1. Environmental subjects	**2.61**
1.(a) Resources and circular economy	2.97
1.(b) EU environmental strategies for processes, goods, and services	2.94
1.(c) Environmental management systems	1.94
2. Green jobs subjects	**2.52**
2.(a) Social, ethics, and integrity principles for the organization	2.91
2.(b) Sustainable lifestyle and responsible education	2.88
2.(c) Economic growth and decent work	2.81
2.(d) Green jobs and local community engagement	2.78
2.(e) Social and labor protection	1.94
2.(f) Occupational health and safety	1.84
3. Green enterprises subjects	**2.49**
3.(a) Business conduct principles (sustainability reporting standards)	2.88
3.(b) Green business models	2.88
3.(c) Green entrepreneurship, green finance, and investments	2.81
3.(d) Green procurement practices	2.69
3.(e) Fair trade certifications for goods	1.22

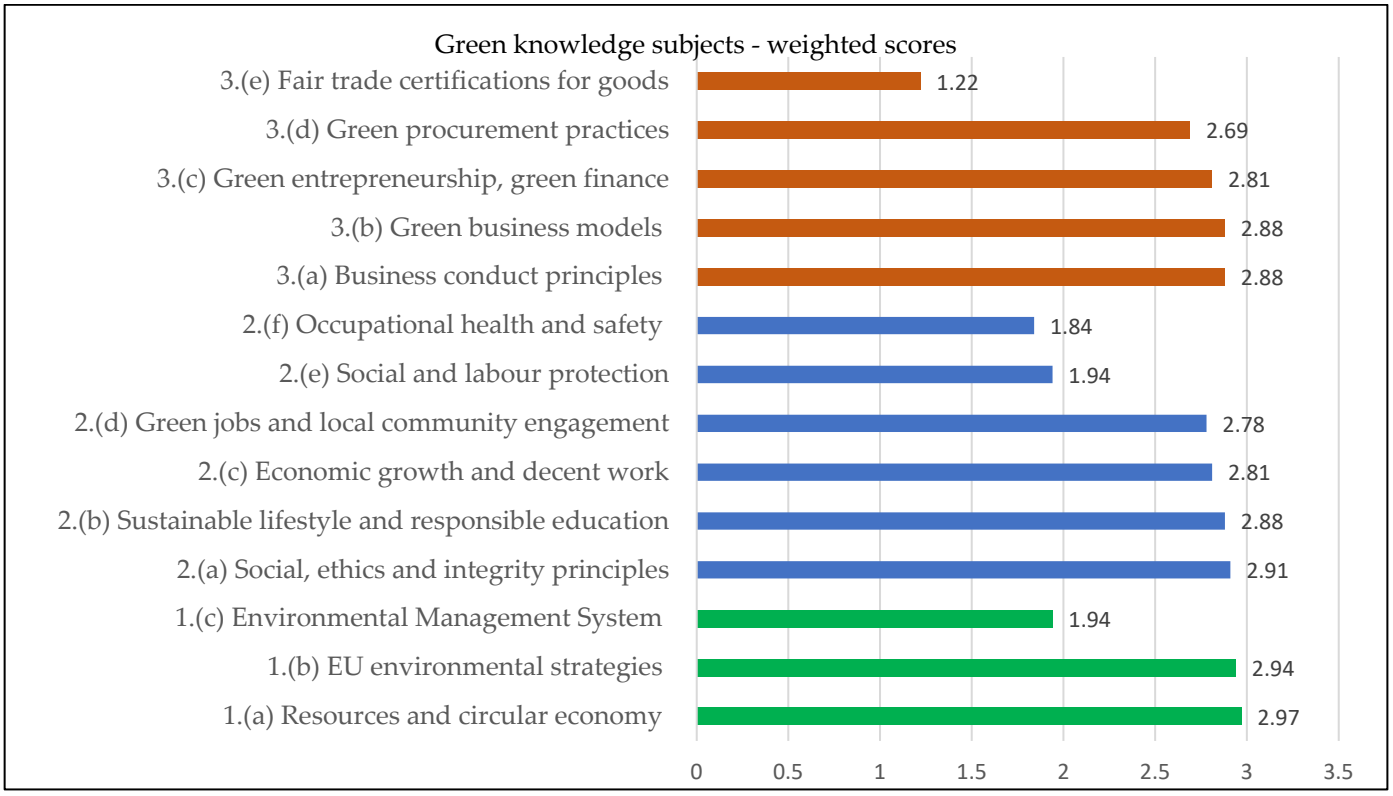


Figure 2. Weighted scores for green knowledge–the practitioners' views.

4.2. Designing the Tailor-Made Curriculum for Greening Practices

The methodology of the training curriculum was developed with a focus on data analysis, demographic insights, and the specific needs and characteristics of the target group. Key findings from the needs assessment that shaped the development of the curriculum structure include the following:

- Practical learning opportunities, concerning the non-digital components assessed in Table 3: the curriculum was expected to incorporate hands-on learning experiences that link green practices to participants' existing skills and knowledge, helping them recognize the relevance and benefits of sustainability in their work.
- Industry-specific case studies, in relation to the results from Table 2: the curriculum needed to feature case studies and examples related to energy efficiency, waste management, and sustainable resource use, illustrating how green practices can be applied to daily tasks.
- Focus on service sector needs in relation to the demographic structure of the selected research sample mostly represented by the participants from the service sector: emphasis needed to be placed on green office practices, sustainable procurement, digitalization to reduce waste, and energy efficiency.
- Basics of green practices in relation to the results from Table 2: the curriculum was designed to cover fundamental green practices, highlighting simple, impactful steps. Case studies from similarly-sized businesses that have successfully implemented green practices needed to be used for effectiveness.
- Creativity and innovation focused on developing non-digital components assessed in Table 3: creativity and innovative problem-solving were promoted with practical exercises related to real-world green challenges. Project-based learning and case studies were considered to help employees apply their skills to specific environmental issues in their roles.
- Digital content creation concerning the digital components assessed in Table 3: the sessions included digital content creation that supports green initiatives, such as using digital tools to produce sustainability infographics and videos showcasing environmental projects.
- Real-world applications concerning the green subjects assessed in Table 4: digital skills were integrated into the curriculum with green practices through practical exercises in real-world sustainability contexts and encouraging cross-disciplinary learning.

From this perspective, Table 5 outlines the objectives of the training curriculum designed to promote the adoption of greening practices within enterprises and to equip employees with the knowledge and skills [36] necessary to integrate green concepts into their daily work.

Table 5. Training curriculum objectives.

General Objective	Specific Objectives
To develop a system-thinking approach to green concepts by understanding how elements interact within and between systems	1. To become acquainted with the link between green transformation and enterprise performance 2. To acquire knowledge for the adoption of greener business practices 3. To understand, integrate, and use different green skills and knowledge to enable changing behavior and practices

Secondly, the green learning outcomes of the curriculum were designed in line with the specific structure (i.e., practical learning opportunities, industry-specific case studies, focus on the service sector, basics of green practices, creativity and innovation, digital content creation, and real-world application), which aims at the particular needs of this target group. To further shape the curriculum, a set of nine specific green learning outcomes were included based on four essential reference frameworks—Green Comp (green competence), Entre Comp (entrepreneurship competence), Life Comp (personal, social, and learning to learn competence), and Digi Comp 2.0 (digital competence)—that promote education for sustainability. These frameworks can provide a common foundation for learners and guide educators in cultivating the knowledge, skills, and attitudes needed to live, work, and act sustainably within an organizational setting [29–31,36]. As shown in Table 6, these specific

learning outcomes served as a critical foundation for the tailor-made curriculum aligned with the growing need for greening practices within enterprises.

Table 6. The specific green learning outcomes of the training curriculum.

Specific Objectives	Learning Outcomes (LO)	Targeted Skills
O1. To become acquainted with the link between green transformation and enterprise performance	Understanding of current enterprises' challenges as sustainability problems (LO1)	Creativity and innovation
	Understanding the connections between specific business issues and environmental change (LO2)	Problem-solving
O2. To acquire knowledge for the adoption of greener business practices	Learn about other contexts (local, national, and global) and fields (environment, social, economic, and cultural) (LO3)	Problem-solving
	Combine knowledge to understand the impact of technological change, digitization, and globalization on climate change (LO4)	Communication skills
	Distinguishing reliable information from unreliable digital sources (LO5)	Information and data processing skills
O3. To understand, integrate, and use different green skills and knowledge that enable changing behavior and practices	Learn to use green knowledge in real-life situations (LO6)	Communication and problem framing
	Learn to adopt opportune decisions for sustainable growth, green jobs, and enterprises (LO7)	Communication and problem framing
	Creating visual representations of knowledge (e.g., diagrams, infographics) using digital media (LO8)	Digital content creation
	Exploiting technological potentials to represent and solve problems (LO9)	Digital problem solving

5. Pilot Testing Process of the Tailor-Made Curriculum

The tailor-made training curriculum was piloted with the selected research sample of 32 Romanian employees between March and June 2024 to address the green skills and knowledge gaps. This training was part of an ongoing Erasmus+ project and consisted of 30 h of work, divided into 13 h of direct training sessions and 17 h dedicated to learning assignments, practical applications, and project-based work.

During the conception phase of the training program, two rounds of focus group sessions were conducted with a small group of local industry experts and academics, allowing for the collection of in-depth insights into the adoption of green practices and their alignment with broader enterprise sustainability goals. Based on the analysis of these insights and internal team brainstorming, twelve thematic lessons were identified for inclusion in the training curriculum concerning the learning outcomes specified in Table 6:

- LO1: lessons from L1 to L12; individual work for each of the lessons;
- LO2: lessons L6, L9, and L10; related assignments;
- LO3: lessons L1, L2, L6, L7, and L11; individual work and related assignments;
- LO4: lessons L3, L4, and L5; individual work and related assignments;
- LO5: individual work for each lesson from L1 to L12;
- LO6: the case studies for lessons L3, L5, L8, and L9 and assignment L7—project work;
- LO7; assignment L7—project work;
- LO8: assignment L7—project work;

- LO9: quizzes in L2, L4, L6, L8, and L10-L12; case studies for lessons L3, L5, L8, and L9 and assignment L7—project work.

Table 7 outlines the lessons of the training curriculum focused on promoting green practices within enterprises.

Table 7. The framework with training components of the curriculum.

Training Lessons	Targeted Green Subjects	Training Methodology for 30 h Volume of Work	
		Synchronous Communication	Asynchronous Communication
L1. Sustainable management in the national and European context	1.(b)	Online session (1 h)	n/a
L2. Responsible education and sustainable living in the green economy era	2.(b)	Online session (1 h)	Individual work (1/2 h) Assignment L2—quiz
L3. Food sustainability and eco-system protection	1.(b)	Online session (1 h)	Individual work (2 h) Assignment L3—case study
L4. Sustainable consumption and changes in consumer behavior	3.(b)	Online session (1 h)	Individual work (1/2 h) Assignment L4—quiz
L5. Sustainable business models in the green economy	3.(b)	Online session (1 h)	Individual work (2 h) Assignment L5—case study
L6. Integrating European sustainability reporting standards into sustainable business practices	3.(a)	Online session (1.5 h)	Individual work (1 h) Assignment L6—quiz
L7. Sustainability reporting in the context of the green economy	3.(a)	Online session (1.5 h)	Individual work (2 h) Assignment L7—project work
L8. Sustainable supply chain management: responsible practices in the procurement of goods and services	3.(d)	Online session (1 h)	Individual work (2 h) Assignment L8—case study
L9. Benefits of implementing Environmental Management Systems ISO 14001 [37]	1.(c)	Online session (1 h)	Individual work (2 h) Assignment L9—case study
L10. Sustainable waste management: legislation, procedures, and education	1.(a)	Online session (1 h)	Individual work (1 h) Assignment L10—quiz
L11. Integrating ethics and integrity principles in the green economy ISO 26000:2021 [38]	2.(a)	Online session (1 h)	Individual work (1 h) Assignment L11—quiz
L12. Occupational health and safety in the context of the green economy: standards and ISO 45001:2018 [39]	2.(f)	Online session (1 h)	Individual work (1 h) Assignment L12—quiz
Final evaluation		*Assessment test and feedback (2 h)*	

The purposeful use of digital technologies was integrated through 12 digital lessons and practical exercises, including online search activities, surveys, digital communication, and content creation. The curriculum was delivered entirely online, utilizing synchronous communication through the Zoom platform for live sessions and asynchronous communication via the Moodle platform for individual tasks, quizzes, tests, and assignments. These activities were designed to help the participants effectively gather, assess, and apply environmental data, enabling them to make knowledgeable decisions and strengthen their green initiatives.

The training methodology included weekly online interactions for live, face-to-face sessions. The learners were expected to utilize all available materials—such as digital lessons, guidelines, case studies, and exercises—for both individual study and homework assign-

ments. They were also encouraged to ask questions through synchronous communication during scheduled sessions or asynchronously via the Moodle platform.

The final evaluation was based on three main criteria: the accuracy of the work, the clarity of responses, and adherence to homework deadlines, and each participant received constructive feedback, highlighting the learning performance.

At the end of the pilot period, feedback was collected to assess the participants' satisfaction and identify areas for improvement. A combination of open-ended and dichotomous questions, along with a five-point Likert scale, was used to gauge participants' satisfaction with key aspects of the curriculum design (Figure 3) and training methodology (Figure 4).

The feedback gathered from the pilot training session could help refine the course content and highlight the training's practical impact on the participants' ability to implement green practices within their enterprises.

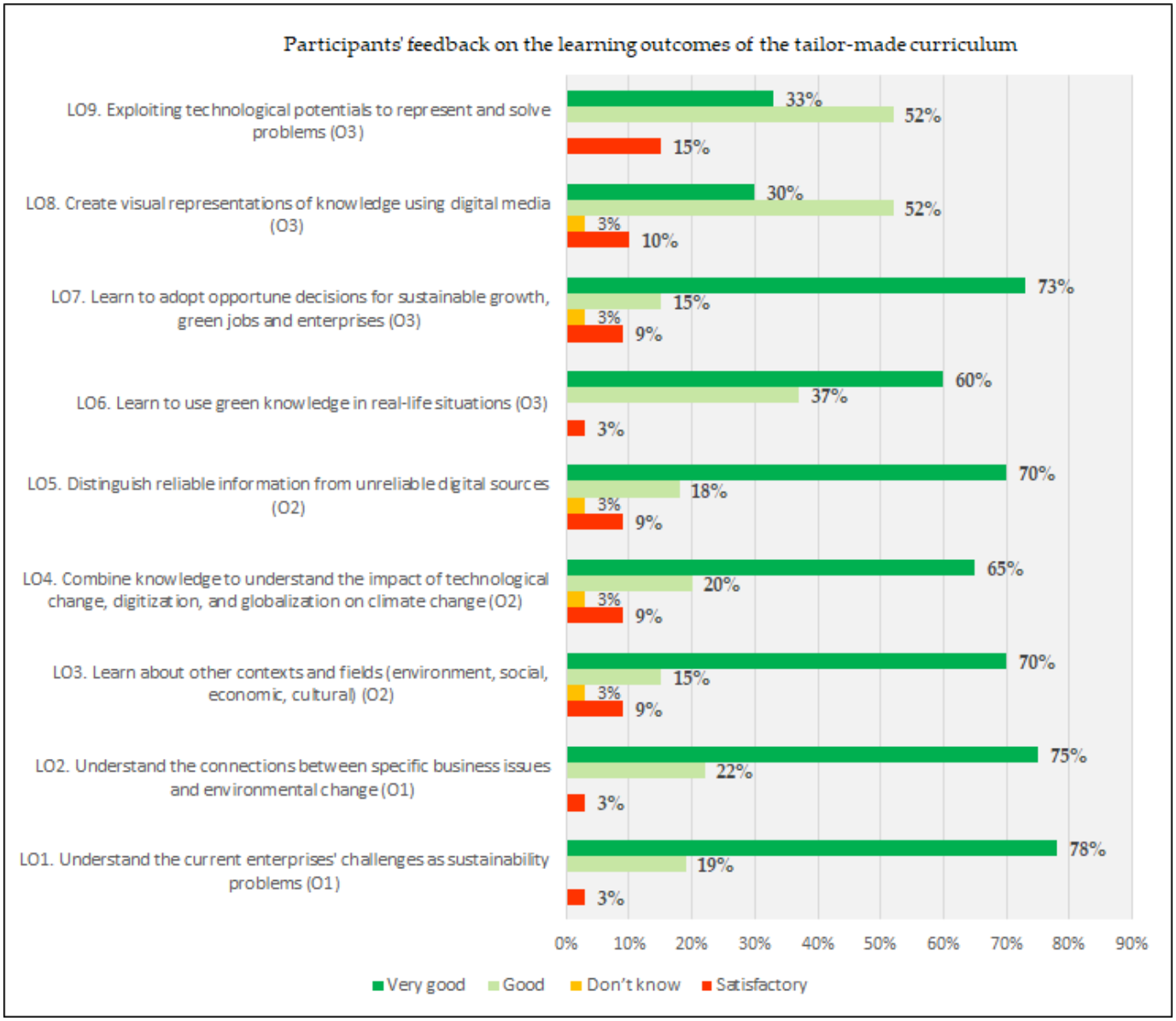


Figure 3. The distribution of participants' feedback responses on the learning outcomes of the tailor-made curriculum.

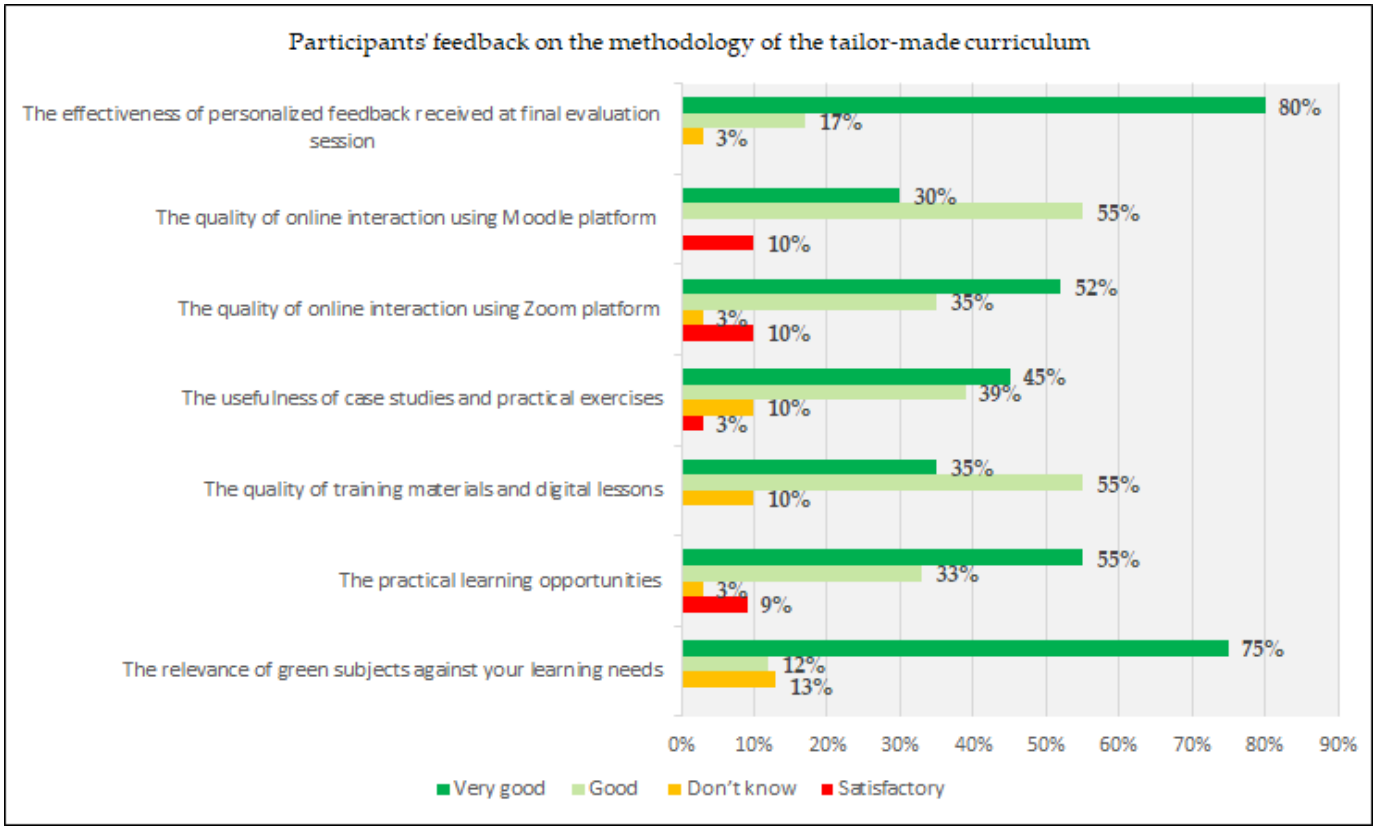


Figure 4. The distribution of participants' feedback responses on the methodology of the tailor-made curriculum.

In summary, the proposed tailor-made curriculum represents a testing mechanism in the context of the current Erasmus+ project aimed at reinforcing the workforce's readiness for greening practices in local enterprises. This innovative approach to sustainability education was designed to address the growing need for green skills in the workplace. One of the most original aspects is the integration in the curriculum of four key competency frameworks: Green Comp (green competence), Entre Comp (entrepreneurship competence), Life Comp (personal, social, and learning to learn competence), and Digi Comp 2.0 (digital competence), ensuring that the selected research sample is equipped with a diverse skill set necessary for leading and implementing green practices in their workplaces. This focus on lifelong learning not only benefits individual career development [40,41] but also ensures that enterprises have a workforce capable of working across sector boundaries [42] and with the latest green technologies [43,44].

The fully online delivering methodology, combining synchronous and asynchronous learning, is particularly innovative, offering flexibility to a wide range of participants regardless of their location or schedule, which reflects the modern shift towards digital education [44,45].

In the long term, the training curriculum has the potential to create a culture of sustainability within enterprises. As more employees are trained to implement green practices, these practices can become ingrained in a company's operations and culture, leading to sustained environmental benefits.

6. Discussion

This section presents valuable insights into the effectiveness of the tailor-made curriculum and areas for future improvement, as shown in Figures 3 and 4. The analysis of the curriculum design revealed a positive appreciation of the usefulness of training objectives, where almost 75% of the participants reported an improvement in their understanding of

current enterprises' challenges, making better connections between specific business issues and environmental challenges. Most learners highly appreciated the relevance of green subjects against their needs (75%), whereas a small proportion of 13% had no opinion on these subjects. The structure of the curriculum received strong positive appreciation from more than half of the learners, especially the practical learning opportunities with real-life applications, which helped them to recognize the relevance and benefits of green practices in daily work (55%).

Specific attention was devoted to the effectiveness of the training lessons. The participants generally appreciated the comprehensive and well-structured training materials, including digital lessons (55%), case studies, and exercises (39%). They found that these resources effectively covered key green concepts and environmental issues, providing them with the knowledge needed to apply green practices in their work. For example, the case studies on successful green enterprises were particularly well received, as they offered real-world examples of how greening initiatives can be integrated into business operations.

However, some of the learners suggested that part of the digital lessons could benefit from more interactive elements, such as simulations or mobile applications, to better illustrate sustainability reporting as well as engagement in the sharing economy through greening business models. This feedback aligns with studies that emphasize the importance of interactive learning tools [46] and digital learning ecosystems [47] in enhancing engagement and digital skills in sustainability education.

The methodology of the training was also evaluated by participants. The weekly online interactions were highlighted as a key strength of the training program, allowing the learners to engage directly with the instructor. Synchronous communication was critical for deepening the understanding of how green elements interact within and between systems. However, there were some challenges with asynchronous communication via the Moodle platform. A few participants reported that they struggled with navigating the platform or found the response time to their questions slower than expected. To address this, it was suggested that additional tutorials or support resources be provided to help maximize the platform's potential.

Additionally, 80% of the participants valued the personalized feedback, which not only assessed their current performance but also offered guidance on how to further develop their skills in applying green practices within their enterprises. This aligns with best practices in adult education, where personalized feedback is known to enhance learner motivation and outcomes [48].

Finally, the feedback also indicated that the training had a tangible impact on the participants' ability to implement greening practices. Several learners reported that they had already begun to apply what they learned in their workplace, such as initiating green office practices, sustainable procurement, or advocating for digitalization to reduce waste, energy efficiency, and recycling programs. This immediate application of knowledge underscores the effectiveness of the training curriculum in bridging sustainability theory and green practice, which is also mentioned by Montanari [49] and Tomassi [50].

Although the training was designed to be fully online, some of the participants may have struggled with digital engagement due to varying levels of comfort with technology. This could have affected their ability to participate in the training and benefit from the curriculum fully. The reliance on asynchronous communication via the Moodle platform resulted in delayed responses to the learners, which could be particularly challenging for complex topics that require immediate clarification or guidance.

While the curriculum covered a wide range of topics related to green practices, some participants found that the depth of the content on certain topics was insufficient for their specific needs. A more modular approach with industry-specific modules or case studies could improve the applicability and impact of the training for learners from different fields.

The feedback from the piloted session highlights the strengths of the training curriculum in enhancing green practices in enterprises, particularly in terms of content quality, online interaction, and the practical application of knowledge. These led to the conclu-

sion that the specific objectives of the curriculum were achieved and that the participants improved/developed their green skills and knowledge with both non-digital and digital components. Also, the perception of the selected greening practices was improved, and the participants became more aware of the detailed knowledge to implement effective green practices in their enterprises.

Several theoretical implications of our study are noted, including the proposed model for the reinforcement of workforce training programs (i.e., needs assessments, curriculum objectives, specific learning outcomes and targeted green skills, training components, and working methodology). This expands the existing body of knowledge on green skills development and could drive future research to explore the effectiveness of green skills in diverse industries and cultural contexts. Also, the tested learning outcomes grounded on essential reference frameworks (i.e., GreenComp, En-treComp, LifeComp, and DigiComp 2.0) are provided as a foundation for academic course development, encouraging an evidence-based approach to curriculum design that aligns with current sustainability trends and labor market demands for green skills. Expanding the literature review and connecting our findings to existing frameworks can further highlight this study's contributions.

In addition, some practical implications for interested stakeholders are noted below:

- The content of the tailor-made curriculum can offer a practical guide for trainers to incorporate hands-on activities, simulations, or case studies that enable learners to apply green skills in various operational contexts. Also, this can encourage partnerships between academia and industry, fostering internships or collaborative projects where students can apply theoretical knowledge of green practices in real-world settings.
- The tested training methodology via online interactions and the mix of synchronous and asynchronous communication with learners underscore the reinforcement of learning through enhanced accessibility and inclusivity, as well as cost efficiency, ensuring that universities and training institutions demonstrate sustainable practices in the training process itself.
- The practical application of green knowledge with both non-digital and digital components ensures that learners acquire relevant green skills, becoming well prepared to contribute to sustainability efforts within their workplaces.
- Theoretical knowledge about green practices (i.e., transversal, sector-specific, and cross-sector green skills) can serve as a foundation for practitioners to recognize the long-term impact of sustainability initiatives and integrate these into organizational strategies.

However, this study's limitations are noted in terms of its limited sample size and diversity, since the pilot session was conducted with a relatively small sample of Romanian employees, which may not fully capture the diverse perspectives and learning needs of a broader audience. Also, geographical and cultural homogeneity may limit the applicability of the findings to other cultural or geographical contexts.

In a broader sense, further research is required to increase the training curriculum's robustness in terms of sample size, delivery format, content scope and workload, communication methods, evaluation processes, and feedback mechanisms. Addressing these limitations in future iterations will be essential to ensure that the training is more inclusive, interactive, and impactful, ultimately leading to more effective and widespread adoption of sustainable practices within enterprises.

7. Conclusions

The study directly addressed the initial research problem by providing actionable insights and a viable training framework through a structured assessment of skills gaps and tailored curriculum design. It offers a tested and integrated approach to sustainability education, combining high-quality content, effective online interaction, and practical knowledge application. Developed within a current Erasmus+ project framework, this curriculum is tailored to enhance workforce readiness for implementing green practices in local enterprises. By focusing on locally relevant educational contexts, this innovative

approach may be replicated in other cultural contexts, addressing the increasing demand for a workforce skilled in sustainability and greening initiatives.

By integrating green practices, this tailor-made curriculum not only equips individuals with the necessary knowledge but also fosters the development of essential skills (i.e., non-digital and digital components) that are crucial for driving green growth, economic performance, and environmental responsibility in the workplace.

Our study provides several theoretical and practical implications for other stakeholders (i.e., researchers, academics, trainers, and practitioners) from diverse disciplines interested in advancing the adoption of green practices within enterprises and ensuring that the training aligns with the broader sustainability goals of enterprises. Also, universities and training institutions can benefit from this study by incorporating its findings into their curricula, thereby improving the relevance and impact of training and education programs.

Author Contributions: Conceptualization, B.F. and G.M.; methodology, E.F.; software, B.F.; validation, B.F., G.M. and E.F.; formal analysis, G.M.; investigation, B.F., G.M. and E.F.; resources, B.F.; data curation, B.F.; writing—original draft preparation, B.F., G.M. and E.F.; writing—review and editing, B.F., G.M. and E.F.; visualization, B.F.; supervision, G.M.; project administration, B.F.; funding acquisition, E.F. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by the National University of Science and Technology POLITEHNICA Bucharest, grant number PubArt. The APC was funded by PubArt.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The original contributions presented in the study are included in the article, further inquiries can be directed to the corresponding author.

Acknowledgments: This research was carried out within the framework of the ERASMUS + project, grant number 2022-1-RO01-KA220-HED-000085618.

Conflicts of Interest: The authors declare no conflicts of interest.

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