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Establishing Competency Standards of Implementing Green Citizen Skills To Strengthen Employability of Green Jobs

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green citizen skills, employability, competency standards, green jobs, sustainable development

ABSTRACT
This study addresses the global shift towards sustainable economies, which requires a workforce with proficiency in green practices. The research develops competency standards for Green Citizen Skills, aimed at enhancing employability in green jobs and responding to the increasing demand for sustainability-focused skills. A mixed-methods approach, including literature reviews, expert consultations, and validation through Delphi methods, was employed to formulate actionable frameworks for integrating Green Citizen Skills into vocational education and training systems. The findings highlight the alignment of key elements such as Unit of Competency, Unit Titles, and Performance Criteria with vocational frameworks, ensuring their relevance and adaptability across both educational and professional contexts. Furthermore, competency components like Range of Variables and Critical Aspects are connected to sustainability principles, resource efficiency, and active community engagement, promoting a holistic approach to green job readiness. This study emphasizes the importance of bridging the skills gap between educational outputs and industry demands, fostering a workforce capable of contributing to sustainable development goals. The developed standards provide practical tools to enhance green job preparedness, empowering individuals to support economic, social, and environmental sustainability. Ultimately, this research contributes to the creation of a skilled workforce equipped to drive the transition to a more sustainable global economy.

Introduction

Green Citizen Skills are a crucial component in the workforce transition toward sustainability. These competencies empower individuals to contribute effectively to green initiatives, such as resource conservation, waste reduction, and environmental advocacy. As industries increasingly adopt environmental standards, the demand for a workforce skilled in sustainable practices continues to grow. Tricarico et al., (2024) highlights that

green jobs drive social and technological innovation, transforming how energy services are produced and managed. Similarly, the Gulled, (2023) emphasizes that the rapid decarbonization of economies not only increases the demand for green skills but also underscores the need for reallocating workers from "brown" jobs to "green" jobs. Bone et al., (2023) notes that the transition to a green economy is reshaping industries and further heightening the demand for green skills. Perdamaian et al., (2021) underlines that Education for Sustainable Development (ESD) equips learners to take action for environmental integrity, economic viability, and social justice, laying the foundation for sustainable behaviors and cultures. According to the ILO, (2024), investments aimed at achieving net-zero carbon emissions could create millions of jobs globally. Therefore, key aspects to be explored in this research include employability, competency standards, green jobs, and sustainable development.

Employability plays a critical role in enhancing the workforce's capacity to adapt to and meet the specialized demands of green jobs, thereby supporting the development of a sustainable and competent labor market aligned with the transition to a green economy. According to the OECD, (2024) (2024), effective career guidance systems act as bridges between students' interests and labor market needs, ensuring alignment with the requirements of the green economy. Similarly, the European Commission, (2021) underscores the importance of fostering sustainability competencies in higher education as a key strategy to address labor market demands and improve employability in green sectors. Jelonek & Urbaniec, (2019) highlights that sustainability competencies not only enhance the employability of higher education graduates but also ensure they are well-equipped to meet the evolving needs of the labor market. Fodor et al., (2021) reinforces this by emphasizing the necessity for graduates to possess the skills demanded by green jobs, thus contributing to a sustainable workforce. Furthermore, Muhammad et al., (2024) points out that Green Technical and Vocational Education and Training (GTVET) equips individuals with the green skills necessary to enhance their employability and adaptability in the evolving green economy.

Competency standards are crucial as they provide clear, measurable, and actionable benchmarks for the critical green skills required in green jobs, ensuring a skilled and competitive workforce capable of driving sustainable development and meeting the demands of a rapidly evolving green economy. The Gulled, (2023) highlights that effective career guidance systems serve as bridges between students' interests and labor market needs, aligning talent with the requirements of the green economy. Similarly, the European Commission, (2021) emphasizes the importance of developing sustainability competencies in higher education to address labor market demands and foster employability in green sectors. Rahmaningtyas et al., (2023) reinforces this by noting that sustainability competencies significantly enhance the employability of higher education graduates, ensuring they can meet both current and future labor market needs. Nikolajenko-Skarbalė et al., (2021) further argues that aligning higher education curricula with labor market needs is essential to developing competencies that enable students to effectively tackle sustainability challenges. Additionally, the OECD and Cedefop, (2014) stress that Green Technical and Vocational Education and Training (GTVET) plays a vital role in equipping individuals with the green skills needed to enhance their employability and adaptability in the green economy.

Green jobs play a pivotal role in advancing sustainable development by fostering economic growth, promoting environmental preservation, driving innovation, and building resilience to global environmental challenges. According to Hariri et al., (2024),

green jobs encompass a range of promising sectors, including renewable energy, green technology, waste management, and infrastructure development grounded in sustainability principles. The APEC Secretariat, (2024) emphasizes that green jobs optimize employment structures, promote sustainable development, and accelerate industrial transformation, thereby enhancing regional coordination and social inclusion. Pereira et al., (2024) highlights the concept of green human resource management as a contemporary model aimed at harmonizing relationships between employees, enterprises, and ecological systems. The European Commission, (2021) notes that green jobs and sustainability-related skills are essential to the transition to a green economy, ensuring resilience and competitiveness in a carbon-neutral future. Swamy, (2022) adds that green jobs are fundamental to achieving zero emissions by 2050 and mitigating the environmental impacts of industrialization.

Sustainable development is essential for fostering a balanced and integrated approach to addressing environmental, economic, and social challenges. It ensures the efficient use of resources, equitable growth, and long-term resilience for future generations. According to United Nations, (2020), the 2030 Agenda for Sustainable Development emphasizes a commitment to promoting balanced development—economically, socially, and environmentally—across all nations, ensuring no one is left behind, with particular attention to the poorest and most excluded populations. Karuppiah et al., (2021) highlights that overcoming barriers to circular economy practices can lead to equitable resource utilization, economic growth, and long-term sustainability, particularly in emerging economies. Similarly, Amekudzi-Kennedy et al., (2020) underscores the importance of circular economy practices as a vital initiative in achieving sustainable development goals. Fisher et al., (2021) points out that socially equitable economic development enhances community resilience and sustainability by providing equitable opportunities for all individuals to contribute meaningfully while addressing environmental and economic challenges. Lah, (2025) emphasizes that the sustainability agenda focuses on optimizing human well-being and socio-economic life within planetary boundaries. Tănasie et al., (2022) further asserts that integrated frameworks promoting cross-sectoral collaboration and participatory planning are critical for achieving equitable growth, efficient resource use, and long-term resilience.

Despite the growing emphasis on green jobs, a significant gap persists between the competencies taught in education systems and the skills demanded by green industries. Clearly defined competency standards for Green Citizen Skills are crucial to bridging this gap and enhancing employability in sustainable job markets. Gulled, (2023) notes that while many workers possess transferable skills applicable to green jobs, there remains a substantial mismatch between current educational outputs and the specific skill requirements of green industries. Similarly, Ibrahim et al., (2020) points out that many graduates lack the green skills required by employers, further exacerbating the skills gap. Nikolajenko-Skarbalė et al., (2021) identifies the skills mismatch as a critical challenge for the labor market and emphasizes that developing targeted competency standards could significantly ease the transition to green economies.

Develop competency standards specifically tailored for Green Citizen Skills. Address skill gaps in the transition to green jobs. Integrate Green Citizen Skills into existing educational and vocational frameworks to enhance employability.

According to Tricarico et al. (2024), green jobs are central to driving social and technological innovation, particularly in the energy sector, by transforming how services are produced and managed. These jobs not only enhance sustainability but also catalyze

significant economic changes through the adoption of eco-friendly practices. Similarly, Gulled (2023) emphasizes that the rapid decarbonization of economies has created a pressing need to reallocate workers from traditional "brown" jobs to more sustainable "green" jobs, illustrating the growing demand for specialized green skills in the labor market.

The urgency of this research arises from the increasing global need for green jobs and a workforce capable of meeting the demands of the green economy. As industries worldwide transition toward sustainability, the requirement for skilled labor in green jobs is rapidly growing. However, there remains a significant gap between the competencies available in the current educational systems and those needed by employers in the green sector. This study is critical in addressing this gap by developing clear and actionable competency standards for Green Citizen Skills that enhance employability and support the green transition.

While several studies have explored the importance of green jobs and sustainability competencies, there is limited research focused on developing specific, actionable competency standards for Green Citizen Skills. Furthermore, there is a lack of integration between these competencies and existing vocational education frameworks. Most research tends to focus on theoretical aspects or general green skills without providing concrete standards for training and education, which are essential for preparing a workforce capable of thriving in green job markets.

This study is novel in its development of competency standards specifically tailored to Green Citizen Skills, integrating sustainability principles and practices into vocational education systems. The use of a mixed-methods approach, including Delphi validation, allows for a comprehensive framework that links green competencies with industry needs and educational outputs. This research uniquely connects performance criteria, sustainability principles, and community engagement to provide a practical guide for enhancing employability in green sectors.

The primary objective of this research is to establish competency standards for Green Citizen Skills, bridging the gap between educational systems and the labor market's demands for green jobs. By integrating these competencies into vocational education frameworks, the study aims to enhance employability and contribute to the workforce transition toward sustainability. The benefits of this research include providing actionable guidelines for curriculum developers and policymakers, improving the relevance of vocational education, and empowering individuals with the necessary skills to support sustainable development goals. Additionally, it supports the creation of a more competitive, sustainable workforce capable of addressing global environmental challenges.

Research Methods

The study employs a mixed-methods approach (Gall et al., 2003): Qualitative: Literature review, focus groups, and expert consultations. Quantitative: Surveys and competency validation through the Delphi method (Skulmoski et al., 2007).

Results and Discussions

This section presents the findings of the study on establishing competency standards specifically tailored for Green Citizen Skills to strengthen employability in green jobs. The analysis focuses on addressing skill gaps in the transition to green jobs and integrating Green Citizen Skills into existing educational and vocational frameworks.

These results are aligned with the research objectives, which aim to develop actionable frameworks that enhance employability by equipping individuals with competencies required in sustainable job markets. Furthermore, the discussion contextualizes these findings within the broader framework of sustainable development, emphasizing the critical role of Green Citizen Skills in meeting the evolving demands of green industries while supporting economic, social, and environmental goals.

Develop competency standards specifically tailored for Green Citizen Skills.

The development of competency standards specifically tailored for Green Citizen Skills is a critical step in addressing the skill gaps identified in the transition to green jobs. These standards serve as clear, measurable benchmarks to guide individuals in acquiring the necessary knowledge, skills, and attitudes for contributing to sustainable practices. This section outlines the proposed competency framework, focusing on principles of sustainability, environmental management, resource efficiency, and active participation in green initiatives. By aligning these standards with industry needs and global sustainability goals, the framework aims to enhance employability and support the growth of a skilled workforce capable of driving the green economy forward. Below are the results of the formulation of competency units with the format of the RMCS Model.

Table 1. Competency Unit Implementing Green Citizen Skills.

UNIT TITLE	**: IMPLEMENTING GREEN CITIZEN SKILLS**	
UNIT DESCRIPTION: This competency unit includes the ability to understand, practice, and promote Green Citizen Skills which include the principles of sustainability, environmental management, resource efficiency, and involvement in green community initiatives.		
ELEMENT	**PERFORMANCE CRITERIA**	**VARIABLE CONTEXT**
1. Understand the concept of Green Citizen Skills	1.1. Sustainability principles are explained in accordance with the green community guidelines.	Sustainability principles, may include: • waste reduction, • energy efficiency, • biodiversity protection.
	1.2. The impact of human activities on the environment is analyzed systematically.	Impacts analyzed, may include: • carbon emissions, • water pollution, • resource usage, • land degradation.
	1.3. Global initiatives related to the environment are described (e.g. SDGs, Paris Agreement).	Global initiatives include: • SDGs 12 (Sustainable Consumption and Production), • Paris Agreement, or • other programs related to sustainability.
2. Implement environmentally friendly practices	2.1. Waste separation is carried out according to categories (organic, inorganic, hazardous).	Waste categories, may include: • organic (food waste), • inorganic (plastic, metal), • B3 (battery, electronics).

		2.2. Energy consumption is reduced through the use of energy-saving devices.	Energy-saving tools include: • LED lights, • electronic devices with energy-saving certification.
		2.3. Natural resources are used efficiently in daily activities.	Natural resources, may include: • using enough water, • switch off the power tool when not in use. • Other
3.	Participate in green community activities	3.1. Community activities that support sustainability are identified and selected for participation.	Community activities include: • recycling program, • plant trees, • environmental education in schools or local communities.
		3.2. The role in community activities is explained and carried out according to responsibility.	The role of community activities includes: • educator, • facilitator • logistics coordinator.
		3.3. Documentation of participation in community activities is carried out for evaluation and reporting.	Documentation, may include: • activity report, • photo, or • testimonials from participants.
4.	Educate others about Green Citizen Skills	4.1. Information on the importance of Green Citizen Skills is conveyed effectively to individuals or groups.	Delivery media, may include: • presentation • group discussion, • digital platforms (social media, webinars).
		4.2. Educational materials are prepared based on the needs and level of understanding of the audience.	Materials include: • educational modules, • infographic, • short videos.
		4.3. 4.3 The impact of education is evaluated through feedback and audience participation levels.	Impact evaluation, may include: • feedback surveys, • Implementation level reports by audiences.

RANGE OF VARIABLE

1. **General Context Variables**
   - This unit applies to individuals in a variety of contexts, such as educational settings, local communities, or sustainability-focused organizations.
   - Focus on individual or group practices in adopting Green Citizen Skills that align with sustainability principles.

- Activities include waste management, resource efficiency, and active involvement in environmental initiatives.

2. **Equipment and Tools**
   - **Equipment and Tools for Waste Management**, may include:
     - Separate bins with category labels (organic, inorganic, B3).
     - Gloves and personal protective equipment (PPE) for waste management.
     - Compaction tools or simple recycling tools (e.g., composters).
   - **Equipment and Tools for Energy and Resource Efficiency**, may include:
     - Energy-saving lights (LEDs).
     - Portable energy meter for measuring electricity consumption.
     - Automatic timer for electronic devices.
     - Water-saving devices (e.g., tap aerators).
   - **Equipment and Tools for Education and Documentation**, may include:
     - Laptop or computer to create and deliver educational materials.
     - Projector or presentation screen to support the delivery of material.
     - Camera or smartphone to document the activity.
     - Survey software or applications for evaluation and reporting.
   - **Equipment and Tools for Community Activities**, may include:
     - Equipment for planting trees (hoes, shovels, plant seedlings).
     - Promotional and educational materials (organic materials) such as posters, pamphlets, or banners.
     - Stationery and flipcharts (organic materials) for group discussions.
3. **Required Regulations**
   - Law on Environmental Protection and Management (Law No. 32 of 2009 in Indonesia).
   - Domestic waste management regulations (example: Government Regulation No. 81 of 2012 concerning the Management of Household Waste and Similar Waste).
   - Global standards such as the Sustainable Development Goals (SDGs) and guidance from the United Nations Environment Programme (UNEP)

EVIDENCE GUIDE

1. **Assessment Context**
   - It is done in real or simulated situations.
   - Use projects, case studies, or field activities.
2. **Competencies that support the demonstration of this unit**
   - Understand and apply Green Citizen Skills.
   - Involve yourself in green community activities.
   - Educate and document sustainability activities.
3. **Required Knowledge that support the demonstration of this unit**
   - Principles of sustainability and environmental management.
   - Regulations related to waste and sustainability.
   - SDGs concepts and waste management techniques.
4. **Required Skills that support the demonstration of this unit**
   - Waste separation and use of energy-saving devices.
   - Preparation and delivery of educational materials.
   - Documentation and teamwork.
5. **Expected Attitude that support the demonstration of this unit**
   - Commitment and concern for sustainability.
   - Collaborative and proactive in environmental solutions.
   - Be open to learning and sharing.

CRITICAL ASPECTS

- Ability to integrate Green Citizen Skills into daily activities.

- An in-depth understanding of sustainability principles and their impact on the environment.
- Ability to motivate others through education and active participation in the community.
- Accuracy in documenting activities for program success evaluation.

Based on triangulated findings from a literature review, expert consultations, and validation processes, this competency standard provides practical guidance for enhancing sustainability skills. By incorporating diverse perspectives, it equips the workforce to address environmental challenges and contribute to sustainable development goals (SDGs). Sianes et al., (2022) emphasizes that these standards serve as a roadmap for systematically transferring knowledge to build resilience and achieve SDGs. Similarly, Ferraz & Pyka, (2023) highlights the role of tailored skills and competencies in advancing resource efficiency through the bioeconomy. Ferraz & Pyka, (2023) underscores the importance of transdisciplinary approaches and international collaborations for integrating sustainability into practice. Additionally, Campillo-Sánchez et al., (2025) notes that sustainability in sports demonstrates the need for skills that promote sustainable practices across economic, environmental, and social domains.

Competency standards are formulated by clearly identifying and defining context variables to ensure their relevance, flexibility, and effectiveness across various settings, while enhancing evaluation accuracy and practical application. Oroszi, (2020) emphasizes that tailored evaluation methods, such as pretests and posttests, align competencies with individual learning needs, ensuring adaptability across contexts and consistency in assessment outcomes. Similarly, the ILO, (2016) highlights the systematic alignment of functional areas, roles, and tasks with workplace requirements to maintain practicality and relevance in diverse settings. Açıkgöz & Babadoğan, (2021) further underscore the integration of learning outcomes into competency frameworks, promoting flexibility and adaptability in professional roles across varied contexts.

Address skill gaps in the transition to green jobs.

Derived from the triangulation of findings through literature review, expert consultations, and validation processes, this standard addresses industry needs by defining specific skills essential for green jobs. These include resource efficiency, environmental management, and active community participation. By aligning with diverse perspectives, the standard enhances workforce readiness and competitiveness in the evolving green economy. Here are Alignment between Unit of Competency and Workplace Standard Operating Procedures (SOP).

Table 2. Alignment between Unit of Competency and Workplace Standard Operating Procedures (SOP)

UNIT OF COMPETENCY	**	WORKPLACE SOP
Unit title	**	SOP Title
Decription	**	Scope of SOP
Element	**	Main steps of Procedure
Performance Criteria	**	Work Instruction
Range of Variable	**	Workplace Context
Evidence Guide	**	Quality Assurance/Quality Control
Critical Aspect	**	Critical Control Point

The findings of the comparative analysis between competency units and workplace Standard Operating Procedures (SOPs) reveal a significant alignment between the elements of the Unit of Competency, such as Unit Title, Description, and Performance Criteria—and the elements of Workplace SOPs, including SOP Title, Scope of SOP, and Work Instructions. This alignment underscores the critical role of harmonizing competency standards with workplace operational procedures in addressing skills gaps. Moreover, this integration has proven effective in facilitating the workforce's transition toward environmentally sustainable practices through the implementation of competency standards aligned with industry demands.

Supporting this perspective, Bohlouli et al., (2017) emphasize the importance of accurate competency assessment in human resource management to ensure optimal job placement and effective vocational training, which directly relates to the alignment of competency standards with operational procedures in the workplace. Similarly, Dzhengiz & Niesten, (2020) discusses how environmental competences (knowledge, skills, and attitudes for solving environmental problems) are interlinked with organizational capabilities, emphasizing the critical role of aligning individual competencies with organizational processes. Additionally, Siva et al., (2018) emphasizes that integrating sustainability competencies into existing structures, such as Quality Management (QM), enhances operational sustainability. This reflects the alignment of individual competencies with workplace SOPs.

Integrate Green Citizen Skills into existing educational and vocational frameworks to enhance employability.

Based on triangulation discussions that combine insights from literature reviews, expert consultations, and validation processes, this standard is effectively integrated into vocational education and training curricula. It equips learners with practical, industry-relevant skills that facilitate the transition to a green economy and prepare them to thrive in a sustainability-focused job market. Here are alignment between Unit of Competency and Vocational Framework in Vocational Education and Training.

Table 3. Alignment between Unit of Competency and Vocational Framework in Vocational Education and Training

UNIT OF COMPETENCY	**	VOCATIONAL FRAMEWORK
Unit title	**	Learning Topics/ Instructional Goal
Decription	**	Scope of Curriculum
Element	**	Learning Objective/ Learning experiences/ Activities
Performance Criteria	**	Criteria to perform
Range of Variable	**	Contexts of Learning
Evidence Guide	**	Assessment of learning experiences
Critical Aspect	**	Critical Aspect in Learning Experiences

The research findings demonstrate that integrating Green Citizen skills into the vocational education and training (VET) framework can significantly enhance workforce competitiveness by adopting a link-and-match approach. This approach ensures alignment between the elements of the Unit of Competency and the Vocational Framework. Specifically, Unit Titles are harmonized with learning objectives, Descriptions align with the curriculum scope, and Performance Criteria reflect expected performance standards. Additionally, competency elements such as the Range of Variables and Critical Aspects are connected to the learning context and critical aspects

of experiential learning, ensuring that skills remain relevant and sustainable in addressing the demands of environmentally friendly jobs. Supporting this integration, the ILO, (2020) provides guidance on designing competency standards and curricula for green jobs, emphasizing the inclusion of green skills in vocational education. Similarly, the European Union, (2024) highlights over 70 best practices showcasing how VET contributes to the green transition, underscoring the importance of aligning learning objectives with industry needs. Furthermore, the ETF, (2006) explores strategies for embedding green skills into VET, emphasizing the necessity of aligning competency standards with vocational frameworks. The ILO, (2024) further underscores this perspective by identifying global green job skill requirements and reinforcing the role of vocational education in fostering competencies that align with environmental sustainability. These insights collectively illustrate the pivotal role of structured integration in equipping the workforce for the green transition. These findings collectively underscore the importance of integrating green competencies into vocational education to address skills gaps, enhance workforce adaptability, and meet the evolving needs of environmentally sustainable industries.

Conclusion

This study successfully establishes competency standards for Green Citizen Skills, addressing the critical need for workforce adaptability in the transition toward green jobs. By aligning the elements of the Unit of Competency with workplace SOPs and vocational frameworks, the proposed standards provide clear, actionable benchmarks to bridge the skills gap in green industries. These standards incorporate principles of sustainability, environmental management, resource efficiency, and community involvement, ensuring the workforce is equipped with industry-relevant skills.

The integration of Green Citizen Skills into vocational education and training frameworks enhances employability and supports the green transition by aligning learning objectives with industry needs and sustainable development goals. This approach not only fosters adaptability but also ensures the sustainability of workforce competencies in meeting the demands of environmentally friendly industries. The findings affirm the pivotal role of harmonized competency standards in driving economic, social, and environmental sustainability, emphasizing the importance of embedding green skills in education and vocational training systems.

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