Education for Sustainable Development in the Vocational Education and Training System Facilitated by the European Sustainability Competence Framework. Case Study on Sustainability Competences Integration in Technician in Agriculture Professional Training Standard

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Abstract

The purpose of this paper is to create a methodology for identifying the gap between the sustainability competences (knowledge, skills, and attitudes) and professional training standards from Romania. The authors develop a tool for crosschecking professional training standards with the competences of GreenComp: The Sustainability competence framework. For testing and validating the methodology, the authors used the Professional Training Standard for Technician in agriculture qualification. The methodology can be used by the Romanian authorities to identify what sustainability competences are missing from all the other professional training standards, so the paper may have impact in the VET curriculum redesign in Romania and, subsequently, on the development of the new generation of skilled workers.

Keywords

Vocational Education and Training, Education for Sustainable Development, Technician in Agriculture, The European sustainability competence framework

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Introduction

The Brundtland Report of 1987 introduced the concept of sustainability to the world. It had three dimensions at first: environmental, social, and economic. Sustainability became a global necessity over time, resulting in the establishment of the 17 Sustainable Development Goals (SDGs) in 2015, making it a public policy of severe urgency. Thirty-five years later, there is a pressing need to broaden the original concept, not as a governmental policy, but as a competency that graduates of any level of education learn, regardless of the program they studied. Several studies and curriculum redesign initiatives have shown that sustainability is a transversal skill that must be integrated in curriculum at all levels. (Membrillo-Hernández et al, 2021)

Societies in the twenty-first century face the difficult task of swiftly transforming towards sustainability while balancing the complicated trade-offs between ecological, social, and economic factors (Raworth, 2012). Deeply rooted learning processes with regard to abilities, knowledge, and values are essential to reconcile human well-being and the integrity of geo-bio-chemical processes necessary for all life on Earth (Sterling, 2016). Education for Sustainable Development (ESD), as defined by UNESCO (2014), advocates for a holistic transformation of education systems in order to support such learning processes. ESD focuses

on "learning content and outcomes, pedagogy, and the learning environment" in order to provide individuals with the skills they need to co-create a sustainable future for all (Burlacu et al., 2018). It accomplishes its goal by changing society." ESD strives to improve reflexivity and critical systemic thinking, participation and cooperation, and a sense of responsibility, among other core competences, enabling individual and team action towards sustainability. (De Haan, 2010)

In early 2000s, most of the Vocational Education and Training Systems in Europe made a major shift towards competencies-based curriculum (Profiroiu et al., 2020). Even if there has been no consensus about this, most of the VET systems have integrated transversal skills in the technical curriculum to different extents (Burlacu et al., 2021). In the professional training standards across Europe, we can find communication skills, teamwork skills, digital skills, entrepreneurial skills, and many others on top of the technical skills that are at the core of the professional training standards (Androniceanu & Burlacu, 2017) (Sarbu et al., 2021).

Recent developments in EDS allow VET systems to harmonize with regards to the sustainability competences that can or must be integrated in the curriculum. The most recent development in EDS in Europe is GreenComp – The European sustainability competence framework (Androniceanu & Burlacu, 2017). GreenComp outlines a collection of sustainability competencies that may be included into educational programs to help students develop knowledge, skills, and attitudes that encourage empathy, accountability, and concern for our planet and public health (European Commission, 2022).

This paper aims at creating a methodology for identifying the gap between the sustainability competences (knowledge, skills, and attitudes) and professional training standards from Romania. For testing the methodology, we will use the professional training standard for Technician in agriculture qualification.

The methodology ca further be used for updating all the current professional training standards from Romania, aligning them to the sustainability competences.

1. Review of the scientific literature

As a result of the focus on abilities for solving problems in a specific context in competency-based education (Lambrechts et al. 2013), key competences have become central to the conceptualization of sustainability education. They conceive education as a reaction to a need for long-term transformation, and as such, they control the whole educational process, including its manner and goal (Lozano et al. 2015). Sustainability education innovations have ramifications for all elements of education, not just for future professionals in school (Radulescu et al., 2021), but also for teacher education and the societal subsectors where companies are situated and where new talent is practiced (Vincent and Mulkey 2015).

When an innovation, such as sustainability competences framework, is spread throughout a social system like VET, it is called diffusion (Rogers, 1962). The adoption or rejection of an innovation is determined by diffusion (Spence, 1994).

Adopters are classified as "innovators," "early adopters," "early majority," "late majority," and "laggards" in the diffusion of innovation (Rogers, 1962). The phrase "laggards" has been replaced with "conservatives" in the curricula since this term better represents the level of engagement or contribution to sustainability (Lozano, 2010). According to Lozano (2006), innovators get the gratification of being the creators of the idea, but they must suffer the burden of early blunders and test-trial concerns. Early adopters, in conjunction with innovators, can act as sustainability multipliers by persuading other adopter groups. The late majority and conservatives are the most resistant to change, yet they may finally adopt the innovation (Lozano et al, 2021).

In general, the individual has been used as the unit of analysis in the diffusion of innovation models (Bodislav et al., 2020). The RAPID model. The RAPID model was created as a result of a sustainability assessment of one HEI's curricula and has the following steps (Lozano, 2010) that can be also transferred to VET:

1. Recognition: The course's aims and objectives expressly include sustainability or some of its topics.

2. Addition: Sustainability is mentioned explicitly in the objectives and is covered in one or more lessons; however, it is treated as an afterthought.

3. Pedagogy: The course goals make sustainability obvious, and its teaching is a key component.

4. Intertwine: Sustainability is stated explicitly in the objectives and is incorporated into teaching and grading.

5. Cross-discipline: The teaching subject connects with other disciplines in addition to the Intertwine step's activities, becoming more inter-disciplinary and trans-disciplinary.

The implementation of ESD is a complicated enterprise that transcends all system layers, from (inter)national governance for ESD across state politics, regional educational landscapes, particular institutions and instructors, and individual moments of transformational learning. As a result, effective diffusion necessitates the availability of both system- and process-specific information among all stakeholders.

Attempts to study or systematically monitor associated educational processes and policy activities have therefore become a critical component of (inter)national ESD implementation progress. (Tilbury et al, 2006)

However, the evidence produced frequently lacks critical preconditions for an unbiased and thorough, yet differentiated and supporting, evaluation of ESD implementation (Radulescu et al., 2020).

GreenComp is a paradigm for analyzing sustainability skills. It gives learners with a common ground and educators with direction, as well as a consensus understanding of what sustainability as a competency comprises. It is intended to assist lifelong learning education and training programs. It is written for all learners, regardless of age or educational level, and it may be used in any learning context – formal, non-formal, or informal. Sustainability competencies may help students become more systemic and critical thinkers, as well as build agency, and provide a knowledge base for everyone concerned about the current and future status of our world. (European Commission, 2022)

2. Research methodology

Considering the purpose of this paper, the authors developed a tool that allows professionals in education, teachers, companies interested in VET and others to analyze any professional training standard from Romania through the perspective of GreenComp, identifying which sustainability competences already exist in the training standard and which don’t exist.

For testing the tool, the authors took the Professional Training Standard (PTS) for Technicians in Agriculture Specialization as a case study. The National Center for TVET Development, which is part of the Ministry of National Education and Scientific Research, established the Professional Training Standard for Technicians in Agriculture Specialization as part of a European Social Fund Project named "Revised Curriculum in TVET." The Standard was developed by a working group of 12 agriculture VET teachers, with the help of two curriculum specialists. OMENCS nr. 4121/13.06.2016 authorized the Professional Training Standard, which has been in effect since 2016 (Dumitrache et al, 2020).

The following are the characteristics of an agricultural technician as defined by the Standard: Under the supervision of an agronomist engineer, the agricultural technician is responsible for planning, organizing, and carrying out the agricultural work required for the growth and harvesting of various types of field crops for the purpose of selling or delivering them on a regular basis to buyers or specialized organizations, or in markets.

The standard establishes a framework within which students may get technical and specialized knowledge about plant cultivation methods, production and work planning and organization abilities, activity coordination, and quality control of works and products on agricultural farms.

The following are the 12 Learning Outcomes Units: 1) Using agropedological features, 2) Animal husbandry, 3) Agricultural and livestock machinery, 4) The farm and the market, 5) Farm management, 6) Protection of the environment, 7) Driving tractor and car, 8) Protection of the plants, 9) Organizing field plant cultivation works, 10) Organizing horticulture plant works, 11) Animal husbandry and feed production, 12) Organizing mechanization works from agricultural exploitation.

Each learning outcome is assigned a three-digit code, as follows: x.y.z, where x is the learning results unit number, y is the type of result (1 is for knowledge, 2 is for abilities, 3 is for attitudes), and z is the number of outcomes of a kind under a certain learning results unit. For example, 2.2.10 Daily control of animal health is the tenth ability listed under learning outcomes unit number 2, Animal husbandry, while 11.3.3 Daily control of animal health is the eleventh ability listed under learning results unit number 2, Animal husbandry. The third attitude in the list of attitudes under the learning results unit number 11, Animal husbandry and feed production, is collaborating with team members for proper animal breeding planning.

In order to conduct the analysis, only the codes were used as in column 4 of table no. 1 were used.

3. Results and discussion

Synthetic description of the Table no. 1:

- 1st column – area of the GreenComp Framework
- 2nd column – competence as in GreenComp Framework
- 3rd column – short description of the competence as in EntreComp Framework
- 4th column – correspondence between competences from the Professional Training Standard and competences from the Sustainability Competences expressed in knowledge, skills and attitudes.

We can assess the extent to which the Professional Training Standard addresses each of the 12 sustainability competencies by looking at column 4. Marked with Kx, Sx and Ax we can observe the sustainability knowledge, skills and attitudes (as can be found in GreenComp) that have a corresponding knowledge, skill or attitude in the Professional Training Standard.

Table no. 1. Professional Training Standard Analysis

GreenComp area	GreenComp competence	Short description	GreenComp KSA and corresponding PTS learning outcomes
1. Embodying sustainability values	1.1 Valuing sustainability	Reflect on personal values; identify and describe how values change over time and across individuals, as well as critically evaluate how they connect with sustainability ideals.	n/a
	1.2 Supporting fairness	Promote equality and justice for current and future generations, as well as to learn from past generations in order to ensure long-term sustainability.	n/a
	1.3 Promoting nature	Recognize that people are a part of nature, and to respect the needs and rights of other species, as well as the needs and rights of nature itself, in order to repair and regenerate healthy and resilient ecosystems.	K1 – 6.2.3; 6.2.5 K4 – 6.1.10; S1 – 6.2.6 – 6.2.24; A1 – 6.3.14
2. Embracing complexity in sustainability	2.1 Systems thinking	Takes a holistic approach to a sustainability issue, taking into account time, geography, and context in order to comprehend how elements interact within and across systems.	S1 – 5.2.5; 5.2.12;
	2.2 Critical thinking	Evaluates information and arguments*, identify assumptions, challenge the current quo, and consider how one's personal, social, and cultural origins impact one's thinking and conclusions.	S2 – 6.3.13
	2.3 Problem framing	Formalize present or projected obstacles as a sustainability problem in terms of complexity, people involved, time, and geographic extent, in order to find appropriate techniques for forecasting and preventing problems, as well as reducing and adapting to problems that have already occurred.	n/a
3. Envisioning sustainable futures	3.1 Futures literacy	To imagine alternative sustainable futures through imagining and designing alternative scenarios, as well as determining the procedures necessary to reach a desired sustainable future.	n/a
	3.2 Adaptability	In complicated sustainability scenarios, handle transitions and difficulties, and make future decisions in the face of uncertainty, ambiguity, and risk.	n/a
	3.3 Exploratory thinking	Exploring and connecting diverse fields, employing imagination and experimenting with innovative ideas or methodologies to adopt a relational way of thinking.	n/a
4. Acting for sustainability	4.1 Political agency	Negotiates the political system, recognize political responsibility and accountability for unsustainable behavior, and demand sustainable policy.	n/a
	4.2 Collective action	Acting together with others for change	S4 – 1.3.2; 1.3.5; 1.3.14; 1.3.20; 1.3.22; 1.3.25; 2.3.5; 4.3.1; 4.3.9; 5.3.2; 5.3.5;
	4.3 Individual initiative	Recognize one's own capacity for sustainability and to actively contribute to bettering the community's and planet's prospects.	S2 – 1.1.3; 5.3.7

For example, K4, an element of knowledge from *Promotig nature* is described as following: "(the learner) knows that humans shape ecosystems and that human activities can rapidly and irreversibly damage ecosystems". This element of knowledge corresponds with 6.1.10 from the Professional Training Standard, which is: knowing the effects of pollutants on the ecologic equilibrium.

Analyzing table 1 we can observe that the Professional Training Standard for Technician in Agriculture specialization covers to some extent only 5 of the 12 sustainability competences defined by the GreenComp.

Considering the purpose of the article, we can say that table 1 is an effective tool to assess the inclusion of sustainability competences in the professional training standards in Romania.

The tool helps professionals in education, teachers, company representatives and other interested stakeholders to identifying which sustainability competences already exist in the training standard and which don't exist.

Conclusions

The authors developed a tool for crosschecking professional training standards with the competences of GreenComp: The Sustainability competence framework. For testing and validating the methodology, the authors used the Professional Training Standard for Technician in agriculture qualification.

The methodology can be used by the Romanian authorities to identify what sustainability competences are missing from all the other professional training standards, so the paper may have impact in the VET curriculum redesign in Romania and, subsequently, on the development of the new generation of skilled workers.

Further research can focus on the analysis of the sustainability competences that are missing from the Professional Training Standard for Technicians in Agriculture and on solutions on how to integrate them in the standard.

References

Andronicеanu, A., & Burlacu, S. (2017). Integration of educational technologies in universities and students'perception thereof. In *The International Scientific Conference eLearning and Software for Education*(Vol. 2, p. 26). " Carol I" National Defence University.

Andronicеanu, A., & Burlacu, S. (2017). Intelligent system for assessment and grading based on docimologic tests. *eLearning & Software for Education*, *2*.

Brent Edwards, D., Jr.; Sustarsic, M.; Chiba, M.; McCormick, M.; Goo, M.; Perriton, S. Achieving and Monitoring Education for Sustainable Development and Global Citizenship: A Systematic Review of the Literature. Sustainability 2020, 12, 1383.

Burlacu, S., Angheluță, S.P., Oancea Negescu, M.D. and Platagea Gombos, S., 2021. Level of Adult Education in the European Union. In: R. Pamfilie, V. Dinu, L. Tăchiciu, D. Pleșea, C. Vasiliu eds. 2021. 7th BASIQ International Conference on New Trends in Sustainable Business and Consumption. Foggia, Italy, 3-5 June 2021. Bucharest: ASE, pp. 43-51 DOI: 10.24818/BASIQ/2021/07/005

Burlacu, S., Rădulescu, C. V., & Bălu, O. F. (2018). Forms of Electronic Training. Principles of Educational Games. In PROCEEDINGS OF THE INTERNATIONAL CONFERENCE ON ECONOMICS AND SOCIAL SCIENCES (Vol. 1, pp. 36-41). *Bucharest University of Economic Studies, Romania*.

De Haan, G. The development of ESD-related competencies in supportive institutional frameworks. Int. Rev. Educ. 2010, 56, 315–328.

Dumitrache V.M., Gole, I. and Bălu P.E. 2020. Entrepreneurial Competences in Training Future Romanian Farmers. Innovative Models to Revive the Global Economy. Sciendo, pp. 227-235. https://doi.org/10.2478/9788395815072-024

Gladysz, B. (2021). Adopting sustainability competence-based education in academic disciplines: Insights from 13 higher education institutions. Sustainable Development, 1–16. https://doi.org/10.1002/sd.2253

Lambrechts W, Mulà I, Ceulemans K, Molderez I, Gaeremynck V (2013) The integration of competences for sustainable development in higher education: an analysis of bachelor programs in management. J Clean Prod 48:65–73. https ://doi.org/10.1016/j.jclep ro.2011.12.034

Lozano R, Ceulemans K, Alonso-Almeida M, Huisingh D, Lozano F, Waas T, Lambrechts W, Lukman R, Hugé J (2015) A review of commitment and implementation of sustainable development in higher

education: results from a worldwide survey. J Clean Prod 108:1–18. https ://doi.org/10.1016/j.jclepro.2014.09.048

Lozano, R. (2010). Diffusion of sustainable development in universities' curricula: An empirical example from Cardiff University. Journal of Cleaner Production, 18(7), 637–644. https://doi.org/10.1016/j.jclepro. 2009.07.005

Lozano, R., Barreiro-Gen, M., Pietikäinen, J., Gago-Cortes, C., Favi, C., Jimenez Munguia, M. T., Monus, F., Sim~ao, J., Benayas, J., Desha, C., Bostanci, S., Djekic, I., Moneva, J. M., Sáenz, O., Awuzie, B., &

Membrillo-Hernández, J., Lara-Prieto, V. and Caratozzolo, P., 2021. Sustainability: A Public Policy, a Concept, or a Competence? Efforts on the Implementation of Sustainability as a Transversal Competence throughout Higher Education Programs. Sustainability, [online] 13(24), p.13989. https://doi.org/10.3390/su132413989.

Profiroiu, C. M., Bodislav, D. A., Burlacu, S., & Rădulescu, C. V. (2020). Challenges of Sustainable Urban Development in the Context of Population Growth. European Journal of Sustainable Development, 9(3), 51-51.

Rădulescu, C. V., Burlacu, S., Bodislav, D. A., & Bran, F. (2020). Entrepreneurial Education in the Context of the Imperative Development of Sustainable Business. *European Journal of Sustainable Development*, 9(4), 93-93.

Radulescu, C.V.; Ladaru, G.-R.; Burlacu, S.; Constantin, F.; Ioanăș, C.; Petre, I.L. (2021) Impact of the COVID-19 Pandemic on the Romanian Labor Market. *Sustainability 2021*, 13, 271. https://doi.org/10.3390/su13010271

Raworth, K. A Safe and just Space for Humanity. Can We Live within the Doughnut; Oxfam: Oxford, UK, 2012.

Sarbu, R., Alpopi, C., Burlacu, S., & Diaconu, S. (2021). Sustainable urban development in the context of globalization and the health crisis caused by the covid-19 pandemic. *Les Ulis: EDP Sciences.* doi:http://dx.doi.org/10.1051/shsconf/20219201043

Spence, W. R. (1994). Innovation: The communication of change in ideas, practices, and products. Chapman & Hall.

Sterling, S. A Commentary on Education and Sustainable Development Goals. J. Educ. Sustain. Dev. 2016, 10, 208–213.

Tilbury, D.; Janousek, S. Development of a National Approach to Monitoring, Assessment and Reporting on the Decade of Education for Sustainable Development: Summarising Documented Experiences on the Development of ESD Indicators and Networking with Expert Groups on ESD Indicators; Australian Research Institute of Education for Sustainability and Australian Government Department of the Environment andWater Resources: Sydney, Australia, 2006.

UNESCO. UNESCO Roadmap for Implementing the Global Action Programme on Education for Sustainable Development; UNESCO: Paris, France, 2014.

Vincent S, Mulkey S (2015) Transforming US higher education to support sustainability science for a resilient future: the influence of institutional administrative organization. Environ Dev Sustain 17(2):341–363. https ://doi.org/10.1007/s1066 8-015-9623-4