

QUALITY GUIDELINES FOR SCALABLE ECO SKILLS IN VET DELIVERY

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Abstract

In a sustainable economy the assessment of Eco skills provided in a Vocational Education and Training (VET) course is performed by the amount of knowledge applied on the job a period after the course ends. To this end VET providers have a current need of quality guidelines for scalable Eco skills and sustainable training evaluation. The purpose of the paper is to present some results of the project entitled “European Quality Assurance in VET towards new Eco Skills and Environmentally Sustainable Economy”, as regards Eco skills categorisation and elaboration of a scale to be used in the green methodology for learning assessment. In the research methodology, the Eco skills are categorised and exemplified for jobs at different levels into generic skills and specific skills evidenced from relevant publications in the field. Then the new Eco skills scale is developed which is organized into six steps: from “Level 1 - Introductory” up to “Level 6 - Expert”. The Eco skills scale is a useful input in the learning assessment process.

Key words: Eco skills, quality guidelines, vocational education and training, quality assurance, sustainable development, green methodology, learning assessment

1. Introduction

In order to provide Eco skills to the employees, Vocational Education and Training (VET) providers have a current need of quality guidelines for scalable Eco skills and sustainable training evaluation [11]. The short time that is available for the actual interaction between the trainer and the trainees makes it challenging for the instructor to assess trainee's level of knowledge related to the course material [8] and the prerequisite knowledge required about sustainable economy [2] and almost impossible the amount of knowledge used in the job, after the training is ended. But the training has to be assessed through performance: what trainees can do with their training [18].

The assessments and Eco skills validation usually targets the amount of knowledge retained by the trainees immediately after the course rather than the amount of knowledge applied on the job a period after the course [9], while the need is for the last one. In this way the Return of Investment in VET programs could be determined, which means efficiency of the program as a quality indicator of the VET provider [4, 15].

A lot of effort has been done for development of innovative models [7] and tools for VET [5], development of new learning environments [10] and

practical oriented training methods [6], by employment of mobile learning [1]. In this context, the project “European Quality Assurance in VET towards new Eco Skills and Environmentally Sustainable Economy” (acronym eQvet-us) [23] financed by European Commission, is developing an innovative training outcome evaluation model [14], for evaluation of trainees and VET professional programs quality, as part of the sustainable development, that provides: reaction evaluation, learning evaluation, behavior evaluation, result evaluation. It investigates the effects on the business or environment resulting from the trainee's performance, and tries to assess and validate the Return of Investment in VET programs by using the innovative four levels extensive evaluation model. For this purpose in the first stage, as input in the evaluation model, it is to investigate the Eco skills required by the VET programs [12].

The purpose of the paper is to present the results of investigations in the eQvet-us project as regards Eco skills definition and elaboration of a scale for evaluation with the green methodology for learning assessment [13].

The research methodology in this paper started with explore of the relevant publications about Eco skills, in order to collect examples of Eco skills in jobs at different levels: high-skilled occupations and

low-skilled occupations and then to evidence the required skills that are supporting resource efficiency, low carbon industry, climate resilience, natural assets. Finally a synthesis of the two skills categories, generic and specific, is presented, that can be used for extension and explanation in any VET course provided. It supports development of the new Eco skills scale on 6 levels.

2. Current status

There is no internationally agreed definition of green economy and separate definitions can be identified in recent publications [3]. Most of them are defining green economy as an economy that aims at reducing environmental risks and ecological scarcities, and that aims for sustainable development without degrading the environment [22].

Unfortunately, little is known on the skills base of the green economy for two reasons: a) the green economy is not well defined as a sector of activity; b) environmental skills are not necessarily considered to differ from general traditional labour skills.

According to the Organization for Economic Cooperation and Development [21], the main characteristic of environmental job qualifications and skills is that they are traditional qualifications and skills applied to environmental issues. Green jobs consist of a wide range of skills and educational backgrounds and parts of the environmental sector consist of highly educated and skilled workers.

Eco skills or skills for sustainability, also known as green skills, are the knowledge, abilities, values and attitudes needed to live in, develop and support a society which reduces the impact of human activity on the environment [17].

A review of all economic sectors indicates that there is a growing demand for skills in the context of the green economy.

The skills associated with the emerging green economy can be categorised into generic skills and specific skills. These skills are at all levels and of many types.

There is evidence of demand for a workforce with generic green skills or light skills across all types of firms and sectors.

The specific skills or technical skills are particularly relevant for the green economy, which creates a new skills paradigm that, in general, is more holistic in approach than the traditional one. It is generally agreed that the specific skills associated with the merging green economy are not entirely new skills; they are either an add-on or an amalgamation of existing skills.

The complexity of these skills increases with the complexity of the jobs, from the medium - and low-skilled occupations to the high-skilled occupations, which is exemplified below.

● High-skilled occupations (nanotechnologist, environmental engineer) [19] require the following categories:

Generic skills are:

- handling publicity and media communication,
- persuasion skills in justification of product/process safety,
- commercialisation skills to secure funding and sales skills to 'pitch' new products/services,
- commercial awareness,
- leadership, negotiation and people management,
- marketing, especially in SMEs to promote and sell services to consumers,
- team work,
- client and customer service,
- communication and documenting skills.

Specific skills are:

- knowledge of energy consumption, costs and consequences of use,
- regulatory awareness,
- knowledge of environmental issues,
- lifecycle analysis,
- management of health and safety risks and security,
- ability to integrate and apply different scientific disciplines,
- skills in identifying/understanding applications of new particles and materials,
- development of products using common materials to mimic properties of rare ones,
- design and planning,
- knowledge of new technologies and machinery when assessing compliance of commercial production facilities with environmental regulation.

● Medium - and low - skilled occupations (Energy auditor, Solar photovoltaic installer, Transport inspector, Electrician, Insulation worker, Sheet-metal worker, Refuse collector) [19] require the following categories:

Generic skills are:

- sales and persuasion skills to make customer act on results of energy assessments,
- sales and marketing skills to persuade consumers to make changes to save energy,
- customer service,
- commercial awareness,
- information and technology skills,
- entrepreneurship,
- self-management and team work,
- written/oral communication,
- foreign language (English).

Specific skills are:

- knowledge of new technology,
- design and planning,
- understanding of energy use across different industrial sectors,
- installation of new energy monitoring and management systems, especially in domestic sector,
- numerical skills to calculate system performance,

- financing and auditing of energy consumption,
- using more complex energy assessment equipment,
- application of lean manufacturing principles to reduce energy consumption and improve production quality,
- efficiency rating systems and suitable alternative power sources,
- ability to work with composite material in long term,
- multifunctional installation of energy/roofing systems and use of electronic quality assurance systems,
- assessment and operation of thermal imaging equipment,
- knowledge of construction and energy management solutions systems,
- regulatory awareness and awareness of changing regulation,
- regulatory awareness of anticipated legislation limiting emissions from older commercial vehicles,
- practical skills in using technology,
- inspection and monitoring,
- communicating and documenting,
- analysis and decision-making,
- maintenance and repair skills,
- communications and producing documentation,
- power consumption in range of electric appliances,
- solar photovoltaic system design and safety,
- choice of material and solar photovoltaic system for each context,
- technical understanding for installing integrated roofing / solar photovoltaic systems,
- understanding properties of raw materials and quality improvement in production processes,
- firm specific practical skills, due to wide variety of metal working roles which are usually product and firm specific.

Skills and education needs should be examined across all business and jobs sectors but also wider in society.

In the VET programs it is important that curriculum to provide, in terms of science and technology, the necessary knowledge of mitigation technologies. All lifelong programmes should provide appropriate skills updates to ease transition to low-carbon business. It is important to provide both specific technological skills and generic training related to carbon auditing and management.

From another perspective the summary of skills needs for a green economy [20] is:

The generic or light green skills that are supporting resource efficiency:

- strategic business management to build resource-efficient business models leading to bottom line benefits and in preparation for new regulations,
- business/financial accounting services around carbon and natural environment accounting,
- skills to design and adopt technologies, products and processes increasing resource efficiency, including lean manufacturing,
- project management skills with clear understanding of resource efficiency,
- development of operator level actions skills to maximise resource efficiency (e.g. reducing waste in production).

The specific skills that are supporting low carbon industry:

- transferable knowledge for nuclear and renewable energy (including wind and marine),
- transferable knowledge to install energy efficiency measures and retrofit at a household and business premises level,
- skills to design and adopt technologies, products and processes to minimise carbon emissions,
- development of operator level actions skills in order to minimise carbon emissions (e.g. driving in a fuel efficient manner).

The specific skills that are supporting climate resilience:

- scientific and technical skills such as modelling and interpreting climate change projections,
- risk management such as assessments of future resource availability,
- skills to design and adopt technologies, products and processes to improve climate resilience,
- development of operator level actions skills to improve climate resilience (e.g. retrofitting water efficient technologies in households and business premises).

The specific skills to manage natural assets:

- accounting services for the natural environment,
- understanding of environmental impact assessments,
- understanding and interpretation of environmental legislation targets, ecosystem services design and management and land use planning,
- skills to design and adopt technologies, products and processes to manage natural assets.

In synthesis, from the above examples [16] one may conclude that:

- The generic skills needed for the green economy are:
 - strategic/leadership skills,
 - adaptability/transferability skills,
 - systems analysis (primacy of design),
 - holistic approach,
 - risk analysis,
 - co-ordination skills, and
 - entrepreneurship.

• The specific skills needed in the green economy are:

- knowledge of sustainable materials,
- relevant traditional skills,
- ‘carbon foot printing’ skills,
- environmental impact assessment skills (flora, fauna), and
- good understanding of the ‘sound’ sciences.

As a conclusion, this synthesis can be used by VET providers for particular extension and explanation of the Eco skills in any provided course. Measurement of the Eco skills needs elaboration of a scale, which is deduced in the following paragraph.

3. Scale for Eco skills

The Eco skills Scale is an instrument designed to measure the trainee ability to demonstrate a competency on the job. The scale captures a wide range of ability levels and organizes them into six steps: from “Level 1 - Introductory” to “Level 6 - Expert”.

The Eco skill levels are related to competencies, as described in table 1, in which is evidenced the focus on each level.

Table 1: Eco skills scale

Skill levels	Description
Level 1 – Introductory	Has awareness of the subject area but may not have either the generic/specific Eco skills or practical experience in the subject area of green economy to perform at a staff level within as organization; <i>Focus is on learning.</i>
Level 2 – Basic	Has a common knowledge or an understanding of basic techniques and concepts supporting Eco skills allowing to discuss terminology, concepts, principles, and issues related to this competency; <i>Focus is to move from learning to practice.</i>
Level 3- Novice	Has the level of experience gained in a classroom and/or as a trainee on-the-job related to green economy, but needs help when performing this skill; <i>Focus is to develop through on-the-job experience.</i>
Level 4 – Intermediate	Is able independently to complete successfully the requested tasks in this competency and only from time to time

	needs help from an expert; <i>Focus is to apply and enhance knowledge and Eco skill.</i>
Level 5 – Advanced	Can perform the actions associated with the Eco skill without assistance and can offer guidance to other people when difficult questions arise regarding this Eco skill; <i>Focus is on advanced level professional issues.</i>
Level 6 – Expert	Can provide guidance, troubleshoot and answer questions related to this area of expertise and the field where the Eco skill is used; <i>Focus is on strategic professional issues.</i>

Competences achievement is a result of vocational education and training that can be measured on the Eco skills scale, as presented in figure 1.

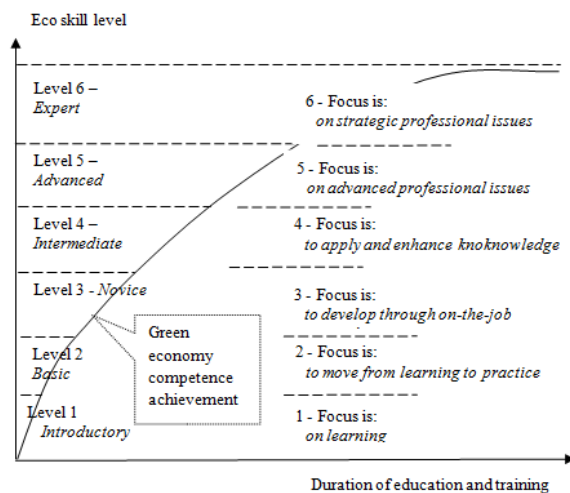


Fig. 1: Competence achievement on Eco skills scale

The identified Eco skills in VET course delivered by a provider can be evaluated on the Eco skills scale by employment of the green methodology for learning assessment [13].

4. Conclusion

VET providers have a current need of guidelines for scalable Eco skills and sustainable training evaluation because the assessment of a VET course needs to be performed by the amount of knowledge applied on the job a period after the course ends.

In this paper Eco skills are categorized into generic skills and specific skills and then exemplified for jobs at different levels. Finally a synthesis of the two skills categories is presented, that can be used for

extension and explanation in any VET course provided.

Then the new eco skills scale is developed, which is organized into six steps: from “Level 1 - Introductory” to “Level 6 - Expert”.

The Eco skills scale is an instrument designed to measure the trainee ability, to demonstrate a competency on the job, by employment of the green methodology for learning assessment.

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