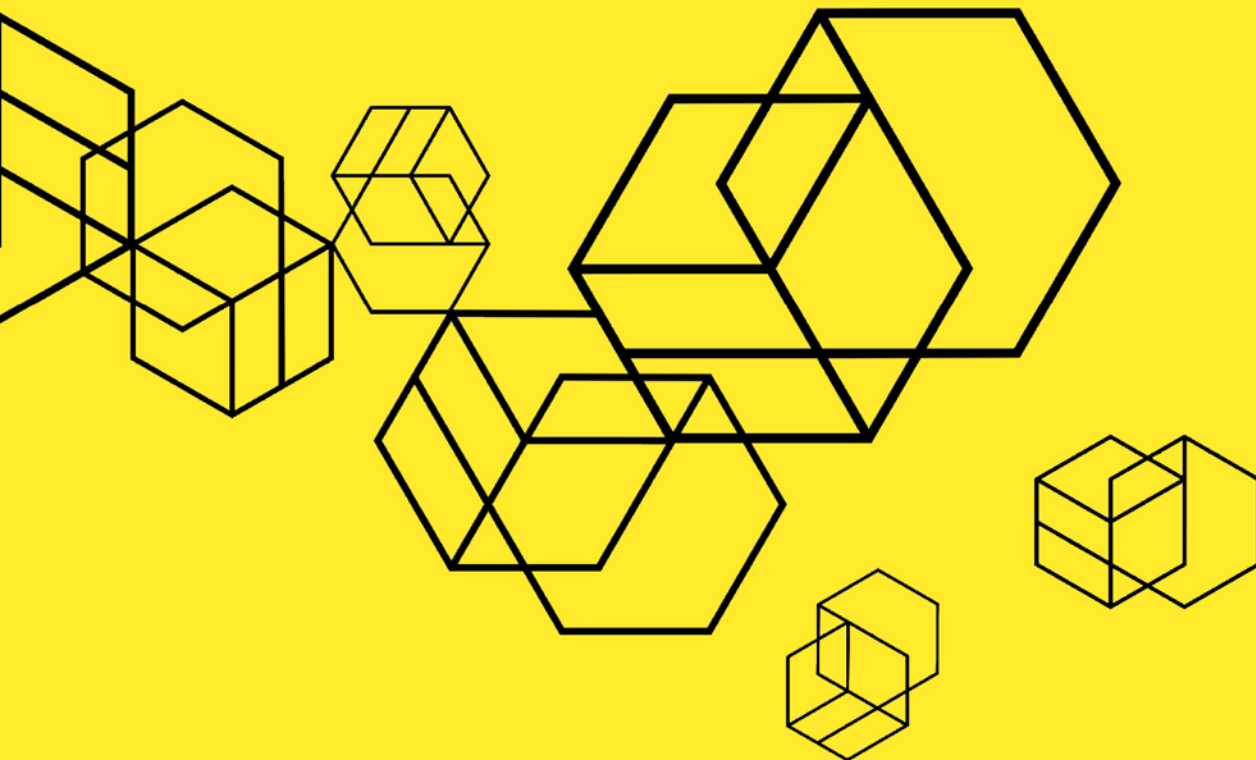




**SOCIAL
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Greening Technical VET - Sustainable Training Modules for the European Steel Industry

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ABSTRACT



In the project “Greening Technical Vocational Education and Training” (GT VET) a pilot training module on green skills has been developed which is supposed to accelerate the implementation of industry-relevant qualifications in company related training and national VET systems continuously. It contains four elaborated sub-modules on topics directly relevant for green skills and ecological awareness: Energy, Waste, Noise, and Raw Materials. This European training module helps to obtain comparable European learning outcomes in the field of green skills and sustainable awareness within technical VET (focusing on preventing pollution and securing occupational health and safety). The module was adapted and tested by four steel companies (ThyssenKruppSteel, TataSteel, ArcelorMittal Poland and AcciaiSpeciali Terni) in four member states (Germany, United Kingdom, Poland, and Italy). All steel companies were GT-VET project partners, along with research institutes in the respective countries (“tandem approach”).

In GT-VET, a **sectoral learning ecosystem** has been initiated. While the implementation of learning in this case takes place on the regional and local level in the four participating steel companies’ countries, GT-VET has implemented a cascading learning approach for promoting green skills:

- On the European level, the relevance of green skills was discussed and the concept of local partnerships was agreed with European employers and employees associations. Associated regulatory frameworks were analyzed and provided to the actors on the local level. These frameworks comprise the general European framework for greening technical skills, the EU VET strategy and green skills policy, and current sectoral strategies for the European Steel Industry.
- On the national level, company related legislation and directives were analysed. Furthermore, in interviews and workshops with company and VET system representatives the national industry demands for green skills were discussed in correspondence with the existing vocational education and training systems of the involved countries.
- On the sectoral level, the green skills strategies, policies and practices of central sectoral bodies were reviewed. These bodies were the European Metalworkers’ Federation (now industriALL), the European Steel Association (EUROFER) and the European Steel Technology Platform (ESTEP), aimed at maintaining the global competitiveness and sustainable future of the European steel industry.
- On a regional and local level, all results obtained before were used to develop and implement the four training modules and develop cross-sectoral partnerships which are highly sensitive towards changing training needs regarding green skills.

As a result, different nationally adapted training modules for strengthening green skills during apprenticeship and beyond are now implemented in local and regional learning ecosystems in which the companies, VET institutions and social partners are playing key roles.

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1. DESCRIPTION OF THE CASE

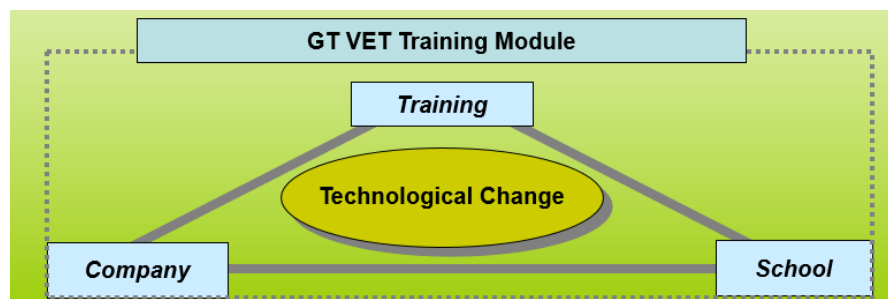
The context

For global competitiveness of European industries, a short term implementation of new mandatory skills within VET systems (national and industry related) is crucial. The training module “Greening Technical VET (GT VET)” has been developed within a two-year project funded within the Leonardo da Vinci programme of the European Union. It has helped to accelerate the implementation of industry-relevant qualifications in national VET systems and continues to do so. This European training module helps to obtain identical European learning outcomes in the field of green skills and sustainable awareness within technical VET (focusing on preventing pollution and securing occupational health and safety). It was adapted and tested within four steel companies in four EU member states (United Kingdom, Poland, Italy and Germany). All steel companies were active GT VET project partners, along with research institutes in the respective countries (“tandem approach”). GT-VET has helped to investigate systematic ongoing and short termed training pathways by focusing on skills for ecological sustainability, which are a key for the global competitiveness of all European industries.

The case

Greening Technical Vocational Education and Training is a short-termed demand of the industry related to quickly changing (production) technology. Therefore, an industry driven European sustainable training module was developed within the European Steel Technology Platform ESTEP: Greening Technical Vocational Education and Training GT VET. The main objective of the project was to develop a sustainable industry-driven European VET module for an ongoing and short termed introduction of environmental or “green” skills. The goal was to create a flexible module which could be adapted every time new technological developments emerged and affected environmental regulations. These changes would then have an effect on (1) company directives and strategies, (2) on-site training and (3) learning content in schools.

Figure 1: The training module responding to technological change.



First, the consortium has analysed how environmental legislation determines the everyday work of skilled workers



(the main target users of the GT VET product) today and in the future using the example of the steel industry (as the community with primary interest in the success and outcomes of the project).

Research and reporting on the impact of European directives and the reflection of green issues within four European Steel companies and national VET Systems was also realised. After developing a European Training Module of greening technical VET, an adaption and pilot testing process has taken place in the four steel companies involved and embedded in four different national VET systems, but in each case with respect to the defined European learning outcomes. The activity oriented training module was structured in such a way that it can be integrated into each national system of VET or used in addition to the existing system of VET (by matching the demands of industry with the VET system).

A secondary objective of the project was to inform and motivate neighbouring industries to make use of the GT VET outcomes (the module itself as well as the supporting products and process recommendations) to develop the green skills of their respective skilled workers staff. In order to achieve this, representatives of neighbouring process industries like the automotive, cement, glass, or chemical industry were invited to GT-VET conferences and workshops and asked to participate in discussion fora. What the stakeholders had to keep in mind is that a mere copying of the GT-VET approach would not be sufficient, but a reflective adaptation of the GT-VET approach was needed for transfer. This has successfully been implemented: The training module for electrical and mechanical technicians as a blueprint for other industries and technical professions has been developed further continuously. At the moment, the adaptation and modification to the small and medium sized enterprises of the automotive sector is tested in the automotive suppliers Cluster.

GT-VET was carried out by research institutions and with a strong involvement of steel companies, accompanied by the European social partners and the involvement of VET system relevant associated partners. The tasks were organised on a decentralised and work sharing basis, with main responsibilities attributed to organisations best suitable and with the expertise to undertake specific pieces of work. Research institutions were responsible for the research driven tasks, assisted and supported by the practical knowledge of the steel companies. The training departments of the steel companies developed and tested the training modules, assisted by the research institutions. The social partners were sharing the responsibility of valorisation (dissemination and exploitation), supported by the steel companies and research institutions.

Surveys have played an essential role especially during the early phases of GT-VET: The research institutes and training departments of the steel partners have conducted interviews and workshops with the environmental and health and safety departments of the steel companies. Objectives were the identification of current and future job requirements for skilled workers, respectively working conditions, critical situations and appropriated acting and behaviour on the one hand and - based on these results - the definition of qualification requirements for skilled workers concerning green awareness and skills (including health and safety). The research has been a coordinated effort of the whole consortium, including research questions definition, methodological discussions, analysis and reporting.



Additionally, each national VET system of the participating member states has been analysed, asking how it meets the previously identified future industry needs. Each involved VET system has different regulations and institutional frameworks (e.g. Germany: dual system, Italy: regional authority responsibility of vocational training, UK: “voluntary” system and regulation through different laws and responsibilities, Poland: national responsibility by the ministry of national education).

Using the example of two main apprenticeships and regulated professions (industrial mechanics and electrical technicians) in every represented member state, an analysis of the existing curricula and its implementation possibilities for the identified skills was done. As green issues are usually a minor topic of VET practice, the concrete realization of VET in the different training venues was evaluated (company, vocational school) through interviews and workshops at regional level, with support of the training departments of steel companies, environment and other technical departments (primarily health and safety), recently graduated apprentices, vocational schools (target group: teachers), and the chambers of industry.

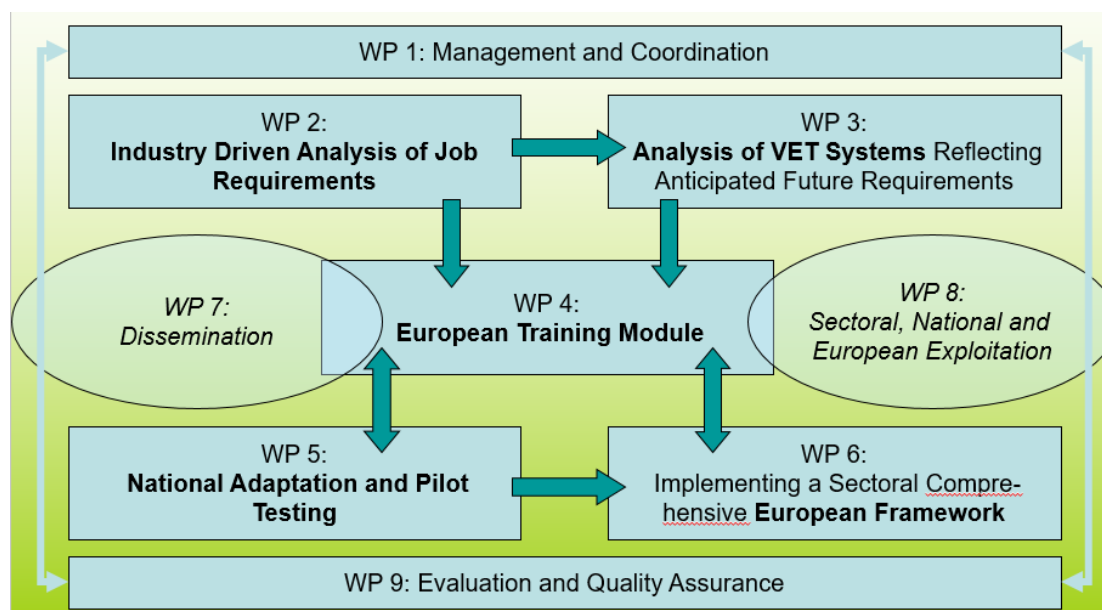
The objective was to learn about concrete training practice in the member states concerning green awareness and green skills development in relation to the identified future job requirements and to propose or identify first outlines of a training module to bridge the identified gap between future job requirements and current education and training practice.

Quality assurance and evaluation were key pillars of the GT-VET. There was a process evaluation as well as a product evaluation, related to the content and quality of GT- VET project outcomes. The evaluation was based on qualitative and quantitative data which acquired from monitoring data, questionnaires and interviews / group discussions. Results have shown a high level of satisfaction of the partners involved, strong points being a highly productive working atmosphere, an interesting and unusual consortium (collaboration of normally competing industry partners), the effectiveness of work done, a strong commitment of the partners and the openness of the product both for further refinement and transfer to neighbouring industries.

The following figure shows the work plan implemented by the consortium. Work packages (WP) 2 and 3 stand initial analyses conducted, WP5 and 6 show the piloting of the module and feedback received by sectoral bodies. These central work packages are framed by coordination, dissemination, and evaluation activities.



Figure 2: GT-VET work plan.



Short term target groups during project lifetime were the participating steel companies and their environmental, health and safety and training managers and the respective departments. The steel companies (and mainly their training departments) have been directly involved in the research, development and testing process of the project; being represented in the project partnership, participating on workshops and interviews, feedback and pilot testing of the module. They directly benefited from the research activities (by reflecting their recent activities and awareness on green skills) and the developed training module: managers and trainers of training departments, managers of technical, safety and health departments, apprentices and workers (industrial mechanics and electronic technicians). The participating steel companies became more aware of future requirements in green issues and the necessity of and possibility of short term implementation of new skills. This is why the participating steel companies do not only want to use the module continuously, they want to see it evolve and will contribute to its further development after the project lifetime.

Furthermore, European representatives of other steel companies and social partners were regularly informed about the project approach and its results / products through the regular meetings of ESTEP and SSDSC right from the beginning of the project. Representatives of European (e.g. CEDEFOP) and national (e.g. BIBB Germany) VET agencies as well as national steel industry associations have been informed about the project results through the European workshops and conferences. National VET stakeholders were involved in project workshops at regional and European level. The same goes for European stakeholders and social partners within the European Advisory Board (whereas ESTEP, EUROFER and EMF are responsible for an internal feedback and dissemination of the project results) and the regional stakeholders of VET through regional interviews, workshops and networking (chambers of commerce, vocational schools, training department, public administration for VET etc.). National



VET stakeholders have exchanged their practices with comparable institutions from other member states on the European level, working together on a definition of a common European standard of learning outcomes concerning green issues in technical VET.

On a regional level, stakeholders of VET (vocational schools, chambers of industry and training departments of steel companies) were involved in the VET system related research and dissemination activities as well. The regional VET partners (steel company and VET institutions) worked closely together. The VET stakeholders, e.g. the chamber of commerce or the vocational schools, obtained an evaluation about the existing training practices in VET concerning green issues.

All in all, the impact of the learning materials and all accompanying activities was stronger originally expected, especially because of the differentiation of the module in its four distinct sub-modules, which has proven to be a product all steel companies and VET actors can link to, apprentices can make use of and actors on the European level (especially ESTEP Working Group 5 “People”) consider important enough to develop it further in the future.

The developed module is being run and updated continuously by the European steel industry beyond the project. The intensive involvement of four international steel companies, the European (ESTEP, Sectoral Social Dialogue Committee Steel SSDCS) and national steel sector platforms and the social partners (EUROFER, EMF) has secured an orientation on industry requirements not only for the whole innovation process but for the sustainable exploitation of the produced European training module. Integrating also national legislative of VET in the member states, they played a proactive role to improve the development of innovation with their perspective, the implementation and exploitation of the new VET modules and the short term implementation process right from the beginning of GT-VET.

2. DESCRIPTION OF THE LEARNING PROCESS

Four adapted national training modules with reference to cultural differences, including policy guidance to implement the training modules in the different VET systems of the member states, are the result of the cascading process described above. In order to fully understand the learning process, the following has to be taken into account: All steel companies are embedded and engaged in European environmental legislation activities via contact points and networking in Brussels. European directives are transferred and “translated” into company directives and strict corporate targets (often going beyond formal European directives and national legislation), ensuring a high influence of environmental related instructions on everyday work and every maintenance routine of the electrical and mechanical technicians (the chosen pilot training target group).

In order not to work against this sectoral logic but to make use of it in a productive way, the learning process was conceptualized and can be described as follows:

The first stage was an **industry driven analysis of job requirements**, which researched relevant national laws as well as company-specific regulations of ‘green’ industry driven job requirements. Next, the **company guidelines**



and business needs were further researched in workshops and interviews with business/industry professionals in the fields of climate and environmental protection, occupational safety and education and training. These workshops with the participating companies were also conducted in order to discuss and describe industry driven job requirements with regard to “green skills” referring to knowledge, abilities, values and attitudes of skilled workers (industrial mechanics and electrical technicians as the two main occupations, including varieties in the participating countries). **Concrete ideas and requirements for a training module** were formulated by all partners responding to prospective (vocational) training demands of the steel industry concerning environment, climate and occupational safety. The industry driven analysis shows the ambition to learn as much as possible about necessary green skills and the corresponding learning content for skilled workers from an industrial perspective.

In parallel, an **analysis of national VET systems** of the participating member states was done, with special emphasis on future industry needs identified before. With each VET system having different regulations and institutional frameworks, an **analysis of the existing curricula** of two main apprenticeships and regulated professions (industrial mechanics and electrical technicians) and its implementation possibilities for the identified skills was completed. The concrete realization of VET in the different training venues has also been investigated – interviews and workshops with the training department in steel companies (target group: trainers), environment and other technical departments, e.g. health and safety (target group: managers), recently graduated apprentices, vocational schools (target group: teachers), the chambers of industry (representatives of VET), other VET relevant institutions at regional level provided this information.

The main results of these initial steps showed a varied set of curricula, policies and practices, which is indicative of different levels of skills, competence and knowledge across the case study countries. Within the companies, varied practice was evident and, given the lack of centralised guidance and policy, it can be concluded that the significance according to environmental topics differs greatly, mainly based on the importance given to such issues by section managers. **A closer cooperation between VET institutions and the companies was recommended.**

The next key step of the project was the **development of the European training module for “greening” technical professions of the steel industry**. This European training module has been developed as a comprehensive “continuous progressing training module” of all participating and further interested steel companies. It helps to keep the qualification of the (future) technicians up-to-date and up-to-future and to stimulate the short term implementation in the national VET systems. The module addressed four different levels of complexity the learners had to go through. Specific process knowledge needed for everyday work on the shop-floor was included as well as generic information on production cycles, raising awareness for the bigger picture of green skills needs.



Figure 3: The steel production cycle (www.worldsteel.org).



A training module (consisting of different work related cases or smaller modules and a handbook) has been developed as a **blueprint for each member state**. The training departments of the steel companies have developed the four sub-modules, assisted by the research institutions.

This **training module was piloted** in all participating steel companies and related VET institutions on regional level. In accordance with testing feedback, the product was adapted and modified to fit the requirements of both the companies and member states as well as possible.

A central methodological approach was to discuss the results of the respective steps on a common sectoral and European level, taking feedback from external experts for the project proceeding and product development into account. All in all, four such **sectoral and European workshops** have taken place.

The main result of all these efforts is a **European Framework Module on Green Skills** and its sectoral integration, which will be developed further by ESTEP (the European Steel Technology Platform), with an ECVET approach, as a basis for continuous adjusting of the existing module against the background of new skills demands.

While the primary target audience was and still is the European steel industry, **cross-industrial transfer** has



always been part of the envisioned learning loop. So a secondary audience are neighbouring industries in which the introduction of green skills is also becoming more and more relevant. In the meantime, a transfer project has started which builds upon the GT-VET learning approach and develops green skills in the automotive industry.

3. DISCUSSION

The GT-VET learning process is an example of a **cross-sectoral collaboration** as the backbone in a complex and multi-layered innovation and learning process. Insofar, it is a typical case, taking into account what we know about social innovation, the growing variety of actors within innovation processes, and the growing awareness of the complexity of such processes alongside increasing demands as far as the management and governance of innovation are concerned. A recent analysis of more than 1.000 social innovation initiatives shows the following: “We can see that cross-sectoral cooperation can be called a default setting for social innovation initiatives, no matter which outcome on which societal level is targeted. Obviously, initiatives want to have broad access and reap the innovative potential of multiple sectors in almost all cases.” (Howaldt, Schröder, Kaletka, Rehfeld and Terstriep 2016, p.51).

In the case of GT-VET, the sectoral contributions with regard to the further and continuous implementation of the learning modules can be summarized as follows:

- **Public sector:** Integrating company demands based training modules in the national education systems; increasing flexibility for the short-termed integration of industry demands in the existing Vocational Education and Training VET systems; Gradually opening national VET systems – which are hard to manage – for new curricula.
- **Business sector:** Ownership and main driver of training curricula; employer of the target group of the learning materials; further development and dissemination of the training modules within the European Steel Technology Platform ESTEP Working Group “People”.
- **Civil Society:** Regional dialogue partner on environmental issues (collaboration platform of government, business, education / research and civil society) to embed greening of skills into regional development plans.
- **Research:** Transfer of innovation of the modules to other production industries, modifying and adding content.

These cross-sectoral contributions have to be emphasized, since this is not about an unexpected cooperation between strangers. In the contrary, and specifically in such an industrial context, many actors know each other, but have a rather conflictual relation. This goes especially for the **social partners** involved, both unions and employers / employer associations. By initiating a learning process during the very early stages – regarding legal frameworks, national VET systems and qualification demands - and, furthermore, by making it a common learning process by discussing the results in mixed groups, it was possible both to draw the outline of a common agenda and to create an atmosphere of trust among the partners which helped to speed up decision-making and



openly discuss critical points at later stages.

Additionally, four different and, by default, **competing industrial steel companies** were involved in GT-VET. Again, the interest in a joint learning process with regard to the crucial topic of green skills in a difficult European regulatory setting and the balancing element of research/company “tandems” outweighed the concerns.

The remarkable point here, and the underlying challenge of the GT-VET process, is that the solution to be developed in the end was always supposed to be **sustainable**. The promised outreach beyond the funding period was a main argument for the grant awarded to the consortium. So the learning materials produced were considered preliminary: They should rather function as monitoring instruments for an ongoing observatory by defining the key regulatory documents which change and evolve over time. Significant changes in regulation would then have an impact since the learning materials are supposed to be adapted and respond to such changes.

The need to have an observatory points at the challenge of **institutionalization**, which is both a common result of successful social innovation processes / initiatives, and a central need for maintaining learning ecosystems.

Taking a step back, and considering the diversity of supporting factors and multiple levels GT-VET has worked on, but also considering the high complexity of the process, it becomes clear that there is not one reason why a learning innovation such as this proves to be successful or not. We can better understand and structure supporting factors and impeding factors by drawing a line between different contexts they are working on. Pelka & Markmann (2015) propose four different contexts for such drivers and barriers:

1. The **context of roles**. For GT-VET, this includes individual motivations and competences of process agents such as company and VET institutions representatives, but also the learners themselves. Coming back to the institutionalization aspect, the European Steel Technology Platform (ESTEP) is playing another key actor role by taking responsibility for sustaining the GT-VET learning approach.
2. The **structural context**: Here, already existing services such as learning curricula, resources available (or not) for a further development of the learning modules, and infrastructures like digital media allowing for adequate pedagogic settings come into play. We can say that GT-VET itself operated heavily on the structural level by developing new learning materials.
3. The **functional context**: This is where the process governance approach can be scrutinized by which the new learning opportunities were put into practice. We have described how different actors and stakeholders are related to one another, including the tandems of research institutes and steel companies. These tandems, cooperating with social partners and European policy bodies, helped to create a level of trust which was also very conducive to making green skills training a reality. The transfer strategy of taking these new learning materials to additional countries and neighbouring industries was also a driver of GT-VET – partly because such transfers can help to improve the standing of the traditional steel industry, which was and still is under pressure, and partly because it helped the stakeholders in the steel industry to reflect upon themselves and their shortcomings.



4. And finally, the **normative context**: The volatile regulatory frameworks on emissions, energy consumption and pollution were a main driver for the diverse actors to become involved. The consortium agreed to continuously check and learn about changing requirements on the European level and reflect these in flexible and adaptive learning modules. The norms relevant here also include the different regulations of Vocational and Educational Training on the national and, in some cases, the regional level. On the other hand, rigid VET frameworks also posed significant barriers: While the consortium initially envisaged to integrate the new learning content in mandatory school-based and on-site training of apprentices, it became obvious that such a process would take at least 4-5 years, so the decision was made to analyse the leeway of existing curricula and rely on school/company partnerships to exploit those in order to integrate green skills development as ancillary content.

Finally, the involvement of the apprentices / learners throughout the whole process of GT-VET has to be highlighted. Participatory approaches and user involvement are important factors of many social innovation initiatives (see Howaldt, Schröder, Kaletka, Rehfeld&Terstriep 2016). In this case the learners played an active role at three stages: (1) They were asked about the current state of green skills development in vocational training and expressed their expectations from the future learning module before the curricular development even started. (2) They piloted the module with its four learning levels as a whole. This included traditional learning about energy, noise and waste, but also concrete assignments and applied learning on the shop-floor. On the final level, the apprentices watched out for opportunities to save energy on site, for example in the hot and cold rolling mills. This, according to the industry partners, helped to save several 100.000 EUR of energy costs. (3) And of course, they also played an active role in the evaluation and improvement of the module after the pilot.

As is true for most socially innovative initiatives, this case of GT-VET is very **context-specific**. It cannot simply be copied, but it needs thorough adaptation, depending on the sector, the industry, the concrete target group, the resources available, and many other factors. This sectoral ecosystem is determined by learning in two ways: The improvement of green skills is the main objective of the whole initiative. And to a large extent, this is made possible by collective learning processes – about sectoral, European, national, local, organisational and individual requirements and expectations. What this example impressively shows is that **ambitious learning goals can be met** in transparently organized and clearly structured settings.



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