MET-VET

Metacognition for Environmental Thinking in VET

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Metacognition for Environmental Thinking Competence Framework

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Background

This framework has been developed as the first project result of the Metacognition for Environmental Thinking in VET project. Within the wider scope and objectives of the MET-VET project, this project result aims to combine metacognitive competences and environmental awareness, approach, and action within the context of European vocational education and training. This will provide a reference point for learners to understand the core metacognitive competences needed to develop broad environment focused knowledge, skills, and behaviour, regardless of the specific industry they are training to enter.

What is Metacognition?

Metacognition is the process involved when learners plan, monitor, evaluate and make changes to their own learning behaviours. Metacognitive awareness gives learners deeper knowledge of planning, monitoring and reflectively evaluating their own performance which creates higher levels of self-efficacy.

The below table summarises the levels of metacognitive ability, as described by Perkins, 1992.

Level	Definition
Tacit	no awareness of learning
Aware	aware learning is taking place but no active impact on own learning
Strategic	actively guiding and instilling your values and beliefs in your own learning
Reflective	learning from your own learning process and improving your learning strategy

Table 1: Adapted from 'four levels of metacognitive learners: tacit; aware; strategic; reflective'; Perkins (1992).

Metacognition is a proven tool for integrating positive behaviours into a person's approach, used in all levels and forms of education, and learners who apply more metacognitive strategies are more autonomous and self-motivated students.

Methodology

The framework was developed through a systematic review of existing metacognitive competencies in each partner country, in which the partnership conducted research of literature focusing on the topic of metacognitive skills providing results finally summarised into 8 metacognitive competences. Cuiablue OÜ provided a research template and set out the guidelines of the desk research to gather the state of the art in metacognitive competences.

Cuiablue OÜ carried out an analysis of metacognitive competences gathered by partners and grouped them together to arrive at 8 metacognitive competences, broadly covering all current metacognitive competences assessed by partners. These are:

1. **Planning**

2. **Reflection**
3. **Critical Thinking**
4. **Holistic View**
5. **Defining and Solving Problems**
6. **Mental Scripting**
7. **Active Involvement**
8. **Behaviour Change**

Following these first steps towards the development of the framework, partners collaboratively carried out a mapping of the meta competencies against GreenComp competences by

1. adapting the descriptors to complete the MET-VET competence framework
2. providing hypothetical policy recommendations related to each competence
3. including practical examples for learners to complement the basic descriptions of each competence and provide some context and real world understanding of how a competence could be implemented

As there are hundreds of definitions of metacognition aimed at users (academic, pedagogical, theoretical, etc.) and intended for different purposes the next step was, for the purpose of the project and considering the target groups and MET-VET end users, to explain in layman terms what metacognition is and the different levels of metacognition which can be achieved.

Firstly, a set of questionnaires for the stakeholder consultation meetings and template for the desk research was developed, tweaked, and amended accordingly so that partners were able to begin gathering information in the state of the art on current metacognitive skills, advice, guidance, and policy at national level in each represented country. While the consortium undertook desk research, the initial draft of the framework was developed. After summarising and analysing the results of the desk research and taking into consideration the feedback received from the stakeholder consultation meetings, the second iteration of the framework was developed for comments and feedback by the consortium. After comments and input have been incorporated, the finalised version of the framework was translated and piloted with wider stakeholder groups and end users.

The Competence Framework

The framework is presented below and has been structured to ensure clarity and to take into consideration the requirements of the intended users.

1. **Competence**: the name of the metacognitive competence.
2. **Metacognitive Competence Descriptor**: descriptor explaining what the competence means - these descriptors provide detail to be useful for users to understand the nuances of each competence and how it relates to their context.

3. **Linked GreenComp Competences**: alignment between the metacognitive competence and the sustainability competences within the GreenComp framework.
4. **Environmental Thinking Competence Descriptor:** descriptor summarising a single environmental thinking competence based on the mapped metacognitive and GreenComp competencies
5. **Examples of Use**: practical, relatable examples of the competence being applied in a real-world scenario.

The below proficiency levels loosely describe the extent to which the competences within the framework can be adopted.

- **Awareness**: The individual is aware of the competence but does not implement it fully due to a lack of skills and/or knowledge.
- **Action**: The individual undertakes actions relating to the competence.
- **Approach**: The individual understands the purpose and function of the competence and proactively plans actions relating to the competence into their lifestyle and choices.
- **Behaviour**: The individual can adapt their mindset to maximise their competency in this area and influence their own lifestyle and choices.

Competence	Metacognitive Competence Descriptor	Linked GreenComp Competences	Environmental Thinking Competence Descriptor	Example of Use
Planning	consider how external and internal elements interact when planning	Systems Thinking Critical Thinking Problem Framing Adaptability	consider external and internal environmental elements when planning related to the environment	When planning your learning and work take into consideration sustainable options, for travelling use public transport as much as possible; when planning for cooking at home, make a list of things you want to cook to avoid surplus of food that can spoil.
The ability to determine one's own direction, the setting of goals and objectives, prediction, organisation of the task, the allocation of times for the execution plan and planning of hypotheses.	assess information and consider the social and cultural aspects of the scenario when planning		take into account the social and cultural aspects of environmental problems, challenges and possible solutions when planning for them	
	plan to incorporate approaches which anticipate and prevent problems and mitigate and adapt to existing problems		build sustainability into planning process	
	ensure any planning approach has a level of flexibility to account for changing scenarios or evolving situations		ensure sustainability plans have best and worst-case scenarios	
Reflection	reflect on personal values	Valuing Sustainability Systems Thinking Futures Literacy	reflect on how your personal values align with environmental goals	Reflect on past solutions, analyse your behaviour; track how much plastic you produce and adapt more sustainable options; measure your energy consumption.
The ability to think in a structured and holistic way that provides the opportunity to delve into analysis and understand the relationship between the actual situation and theory. This includes evaluating their own effort and identifying which strategy they applied helped them learn and which did not.	consider how the time, location and context affected how elements interacted with each other		consider the specific time, location, and context nuances of each environmental issue	
	reflect on how past decisions have impacted the future and how your decisions impact the future		learn from past environmental success stories and lessons learned	
Critical Thinking	analyse current or potential problems based on available evidence and arrive at a course of action	Problem Framing Futures Literacy Exploratory Thinking	analyse environmental problems based on accurate evidence before looking for a solution	Think about how you can reduce your consumption of the resources you need (food, energy, water) and whether you currently overuse or waste resources.
An individual's capability to identify central issues and	assess and evaluate decisions based on their impact on the future		consider sustainability and environmental impact in all actions	

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assumptions in an argument, recognize important relationships, make correct inferences from data, deduce conclusions from information or data provided, interpret whether conclusions are warranted based on the data given, and evaluate evidence or authority.	link different fields, disciplines through creative and innovative thinking when critically analysing evidence		think about how different sectors and experts can collaborate to solve environmental problems	
Holistic View	ensure personal, social, and cultural context inform conclusions from critical analysis	Critical Thinking Exploratory Thinking Collective Action Systems Thinking	consider the personal, social, and cultural context of environmental issues	Consider the "circle of plastic": you should recycle plastic bags rather than throw them away in nature. Plastic bags affect sea pollution negatively, choke turtles to death, enter the food chain and can be transferred into birds' bodies.
The ability to describe the process through which multiple layers of thinking processes overlap presenting facets of knowledge, skills, and attitudes, and describe the interactions of multiple areas and factors in a way that is consistent with the goals and aims both on a practical and on a value note.	use exploratory thinking to gather wider viewpoints and perspectives		ensure a range of perspectives when assessing environmental issues	
	engage collaboratively with other stakeholders to gather broad viewpoints and act collectively		consult a broad range of impacted communities and find inclusive solutions to environmental problems	
Problem Solving	define challenges in terms of difficulty, time, geography, and scope	Problem Framing Collective Action Individual Initiative	consider all elements of environmental challenges and apply appropriate solutions	when you must throw rubbish away but there are no bins, you can take it home to recycle, rather than throw it away
The ability to classify a problem, formulate the goal of the problem solution, list the available information, select relevant information; check whether a similar problem has already been solved, collect possible solutions, systematic analysis of the collection, test best approaches,	anticipate problems before they occur and present rationale solutions to prevent or mitigate against them		understand how environmental problems develop and how to address them early	
	collaborate with other stakeholders and experts to frame and solve problems		get expertise and advice from sectors to fully understand environmental problems	
	recognise your ability and potential to identify issues and act to address them		identify environmental issues which are specific to you and that you have good knowledge of	

evaluate results and refine the solution approach.				
Mental Scripting	adopt and live by your values in everything you do	Valuing Sustainability Individual Initiative	embed sustainability into your daily life	to take your own bag for shopping and to have it on hand all the time; always have two bags along so if you leave one filled with groceries at home you are able to have the other one with you; and avoid single use plastic or paper bags
The technique of planning and practicing a way of thinking, usually when having to deal with a more complex task. This involves the ability to mentally design the plan they will follow to complete a given task to be prepared for when the real event or situation occurs, to manage the situation more effectively. To train your own mindset to include green thinking including rethinking one's own actions in a green way.	think critically about how your mindset and unconscious preconceptions affect your actions		analyse your own mindset and how that forms your approach to sustainability	
	visualise the positive contributions you will make when you change your actions and behaviour		understand the positive impact of your behaviour no matter how small	
Active Involvement	engage in activities to demand effective policies	Political Agency Collective Action Individual Initiative	support environmental policies and act to encourage them	Greta Thunberg represents one of the most important examples of environmental active involvement in recent years. Think about how she has lead by example and engaged in high profile events and consider you could take to replicate this at your local level.
The involvement, either by an individual or a group of individuals, in their own governance or other activities, with the purpose of exerting influence, ensuring the individual/group is not merely a receptacle of knowledge, but rather creates their own learning actively and uniquely.	take collective initiative by acting with other stakeholders to positively impact governance processes		apply critical analysis skills to environmental governance	
	take individual initiative to contribute to positive actions on a personal level		lead by example by carrying out environmental actions you want to see	
Behaviour Change: The ability of the individual to change behaviour and habits after self-reflection and	ensure your actions value your metacognitive skills and knowledge	Valuing Sustainability Supporting	apply your metacognitive skills to your day-to-day actions to assess your environmental thinking	Food waste: buy only necessary amounts of food, reuse leftovers, give excess to people in need of food, create

self-regulation. The ability to detect wrong patterns in behaviour and attitude and proceed with changes. Ability to adapt behaviours and patterns to be more adaptable to current environments. Action knowledge is a person's awareness of the methods they will activate and the actions they will perform in the task of solving the problem.	adapt your behaviour to remain in line with your values as they evolve	Fairness Promoting Nature Adaptability	recognise and assess your own changes in behaviour in relation to sustainability	compost using organic waste instead of disposing of it

Conclusions

To conclude, the framework above outlines how key metacognitive competences and environmental competences are merged to create environmental thinking competences. The competence descriptors represent unique combination of metacognitive and environmental competences and detailed competence descriptors for where these overlap and support the same objectives. These facilitate a new approach to environmental thinking and engagement by intertwining them with the core competences of self-directed learning techniques and methods.