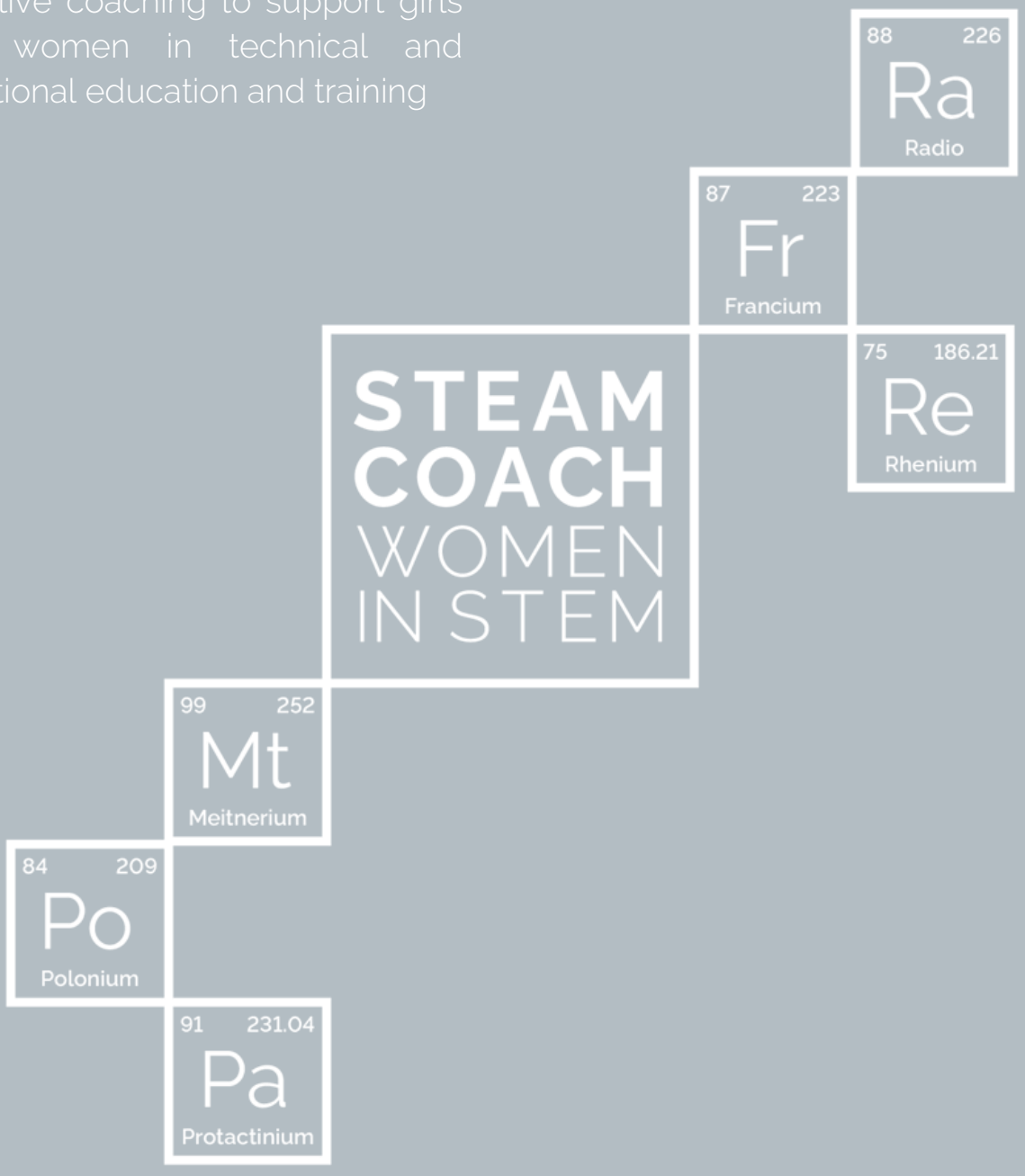
STEAM Coach Methodology: Coaching for Gender Equity in STEM-TVET

A European framework for gender-sensitive coaching to support girls and women in technical and vocational education and training



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Opening note

> Coaching is a term used to describe an effective methodology for facilitating ourselves and others to grow and develop into the more complete human being that we are capable of being - if only we believe it. Global coaching may help us to shed some of our self-limiting beliefs in favour of these inspiring, motivating ones.
>
> Jonh Whitmore

The STEAM Coach methodology has been developed as a structured, evidence-informed response to this challenge. It proposes a novel, gender-sensitive coaching model that supports both individual empowerment and systemic change. Rather than focusing solely on career guidance or awareness raising, the methodology centres on coaching as a transformative, human-centred practice—grounded in dialogue, reflection, and connection.

The purpose of the methodology is fourfold:

- To empower girls and women in STEM-TVET pathways by fostering self-efficacy, confidence, and future-oriented thinking;
- To challenge internalised stereotypes and social expectations through personalised engagement and reflection;
- To support institutions in embedding inclusive, gender-aware practices in guidance, recruitment, and training strategies;
- To contribute to the retention and progression of female learners and professionals in STEM-related TVET fields.

These aims align closely with broader European frameworks. The EU Gender Equality Strategy 2020–2025 calls for increased participation of women in male-dominated sectors, including engineering and ICT (European Commission, 2020). The Digital Education Action Plan 2021–2027 underscores the importance of equitable access to digital skills and personalised learning experiences (European Commission, 2021). Moreover, the European Skills Agenda advocates for upskilling and reskilling approaches that promote inclusion, especially in the context of green and digital transitions (European Commission, 2020b).

The STEAM Coach methodology is designed to serve multiple stakeholder groups:

- Women and girls, in VET and HE;
- STEM professionals, who are equipped to act as STEAM Coaches and relatable role models;
- TVET and VET providers, seeking to foster inclusive career orientation and reduce gendered dropout rates;

- Ecosystem actors - such as municipalities, companies, libraries, and non-formal education partners - who play a role in facilitating accessible learning opportunities.

Recognising the diversity of educational systems and cultural contexts across Europe, the methodology is designed as a modular and adaptable framework. It can be applied in various formal and non-formal environments—such as classrooms, workshops, extracurricular programmes, and community centres—depending on the needs of each region.

To support its implementation, the methodology will be delivered with:

- A formal competence profile for STEAM Coaches, outlining the required knowledge, skills, and attitudes;
- A series of coaching journeys, tailored to different learner profiles and learning stages;
- A resource kit offering ready-to-use materials, formats, tools, and good practices to support coaches and institutions.

Together, these components constitute a practical, evidence-informed package that can be used by educators, professionals, and institutions to foster inclusive participation in STEM, particularly for girls and women in TVET.

Section 1. Introducing the STEAM Coach methodology: a gender-sensitive coaching approach for STEM equity

1.1. The importance of addressing gender inequality in STEM-TEVET

Across Europe, girls and women remain significantly underrepresented in Science, Technology, Engineering and Mathematics (STEM) education and careers - particularly within Technical and Vocational Education and Training (TVET). This persistent imbalance not only limits the personal and professional opportunities of women and girls but also constrains the innovative and inclusive potential of Europe's labour markets and knowledge economies. While statistics point to persistent disparities, a deeper examination reveals systemic societal norms reinforcing gender roles. In 2024, a referendum in Ireland upheld constitutional language relegating women to the domestic sphere, showing how deeply these stereotypes are entrenched. UNESCO-UNEVOC (2020) highlights the family's role in discouraging girls from choosing STEM. These socio-cultural messages make the case for equity-focused coaching not just timely but urgent.

Girls and women in STEM-TVET in Europe

Over the past two decades, the gender gap in STEM education and careers has received substantial attention from European institutions, national governments, and academic researchers. Yet despite a wide array of policy initiatives and outreach efforts, gender inequality remains a persistent and systemic issue—particularly TVET pathways. Women and girls continue to be significantly underrepresented in STEM fields across Europe, both in education and in the labour market.

According to Eurostat (2024), women represent 52% of the general population and 57.7% of tertiary graduates in the European Union, yet account for only 32.8% of STEM graduates and just 19% of ICT professionals. These disparities are further exacerbated within vocational and technical education, where female participation in STEM-related programmes is consistently lower than that of their male peers (CEDEFOP, 2025). The implications are far-reaching: gender imbalance not only limits individual career opportunities but also hinders Europe's capacity to deliver on its ambitions for green and digital innovation, inclusion, and competitiveness.

The persistence of these gaps, despite clear labour market demands for more diverse talent in digital, green, and technical sectors, points to deeper structural causes. Research from sociology, psychology, and gender studies identifies a complex interplay of cultural, institutional, and psychological barriers that shape gendered educational and professional outcomes. For example, stereotypes around who "belongs" in STEM continue to shape young people's aspirations from an early age. Girls are often less likely than boys to assess their own abilities in science and mathematics positively, even when academic performance is equal or better (European Commission, 2024b). These internalised perceptions are reinforced by societal cues, biased expectations from teachers or parents, and the lack of visible female role models in technical professions.

Structural factors within educational institutions also play a role. The NESET analytical network (2024) notes that hidden curricula, a male-dominated classroom culture, and the absence of inclusive pedagogical strategies contribute to a sense of non-belonging among girls in technical

education settings. In addition, intersectional barriers—such as socioeconomic status, rural location, or migration background—compound existing inequalities and make STEM-TVET careers even less accessible for many learners.

In the labour market, women in STEM-related occupations continue to face challenges such as gender stereotyping, limited access to leadership roles, and workplace discrimination. The European Parliament (2021) has explicitly called attention to these obstacles, acknowledging that gender inequality in STEM is both a cultural and a systemic problem that requires long-term structural reform.

In response, several key EU policy frameworks have emphasised the importance of addressing these disparities. The EU Gender Equality Strategy 2020–2025 calls for the dismantling of gender stereotypes and the promotion of female participation in male-dominated sectors, including engineering and ICT (European Commission, 2020). The Digital Education Action Plan (2021-2027) stresses the need for inclusive digital education and the development of digital competences for all learners. Meanwhile, the European Skills Agenda highlights the need for reskilling and upskilling in support of Europe's green and digital transitions, particularly through more inclusive access to technical education and training.

Despite these commitments, the implementation of gender-sensitive strategies remains fragmented, especially within regional and vocational education systems. Addressing gender inequality in STEM-TVET requires a systemic response that brings together educational institutions, industry actors, and civil society through locally rooted, ecosystem-based solutions.

The STEAM Coach methodology responds to this call by placing coaching at the centre of a new approach to gender equity in STEM. By focusing on personal interaction, empowerment, and flexible implementation, the methodology offers a scalable, evidence-informed strategy to address both the informational and emotional barriers that continue to prevent girls and women from entering and thriving in technical fields.

1.2. The role of coaching in promoting equity in technical education

Coaching is increasingly recognised not only as a tool for individual development but also as a strategic instrument for addressing systemic inequities in education and the labour market. In the context of the STEAM Coach project, coaching is applied as both a philosophical approach and a practical methodology aimed at dismantling the cultural, institutional, and psychological barriers that limit girls' and women's participation in STEM-related TVET pathways.

As opposed to traditional guidance or mentoring, coaching in this context emphasises empowerment through dialogue, reflection, and relational learning. It engages learners in an open, curiosity-driven process that supports the development of agency, confidence, and identity in relation to STEM. This is particularly relevant for female learners who may not initially see themselves reflected in STEM environments due to persistent stereotypes, lack of representation, or internalised doubt (Steele, 1997; European Commission, 2024b).

The STEAM Coach methodology operationalises coaching through a combination of four interrelated coaching models, each contributing to the broader goal of gender equity in STEM fields:

Behavioural coaching focusing on recognising and reshaping patterns in personal and professional behaviour. In the STEAM-TVET context, this model addresses how girls and young women may unconsciously adopt or be subjected to gendered expectations - for instance, being less likely to speak up in technical settings or avoiding perceived 'masculine' tasks (Archer et al., 2013). Coaches help learners identify these patterns and experiment with new, more empowering behaviours.

Cognitive coaching aiming to uncover and transform internalised beliefs, assumptions, and mental models. Female learners often carry limiting beliefs about their own competence in science and technology, even when their academic performance is strong (European Commission, 2024b). Cognitive coaching supports learners in challenging these narratives, developing growth mindsets, and increasing self-efficacy (Bandura, 1997).

Systemic coaching bringing attention to the broader contexts - family, school, peer groups, cultural norms - that shape a learner's experience and aspirations. Girls may be discouraged from pursuing technical education not only by school culture but also by societal expectations or lack of support at home. Coaches using a systemic lens explore how these external influences affect choices and confidence, and work with learners to navigate and sometimes resist them (Bronfenbrenner, 1979; NESET, 2024).

Transformational coaching supporting deep personal change - at the level of identity, values, and emotional resilience. This model is particularly powerful in helping learners envision themselves differently, beyond inherited narratives or externally imposed limitations. It creates space for reimagining one's role in the world of STEM and for building the emotional strength to persist in male-dominated environments (Mezirow, 1997).

Together, these coaching approaches form a comprehensive and flexible framework that is adaptable to different learner profiles and institutional settings. They enable coaches to respond to individual needs while contributing to a broader agenda of cultural change within TVET. By applying these models within local learning ecosystems - schools, businesses, libraries, training centres, community spaces - the STEAM Coach methodology ensures that the coaching process is not isolated, but rather embedded within the environments where girls and young women live and learn. In doing so, it creates relational pathways to inclusion, rather than relying solely on structural reforms or awareness campaigns. Coaching, in this framework, is not simply a support tool; it is a strategic intervention that operates across cognitive, emotional, social, and institutional domains. It acknowledges that transformation requires more than opportunity. It requires connection, recognition, and guided reflection.

1.3. Embedding gender sensitivity in coaching practices

Gendered dynamics in TVET have historically reinforced occupational segregation, with women being underrepresented in technical and digital fields and overrepresented in care-related sectors (CEDEFOP, 2025). Despite increasing efforts to promote inclusion, many TVET environments remain shaped by implicit gender norms, exclusive cultures, and curricula that fail to reflect the realities and aspirations of all learners (European Commission, 2024a). These conditions have led to lower enrolment, weaker retention, and reduced progression of women in STEM-TVET pathways, particularly in fields such as engineering, manufacturing, and ICT.

Gender stereotyping in STEM-TVET operates across three interrelated levels:

- Personal: these include biological myths and internalised beliefs (e.g., "boys are naturally better at maths", or "women aren't technical"), often learned early through family and socialisation. Girls frequently receive subtle messages that technical fields are not for them.
- Institutional: organisational norms, classroom dynamics and male-dominated academic cultures often present STEM-TVET environments as misaligned with traditional femininity. This leads to unconscious exclusion and reinforces disengagement.
- Social: at a wider cultural level, social norms and even legislation continue to reflect outdated roles. For instance, in 2024, over 70% of Irish voters rejected a constitutional amendment proposing more inclusive language on the role of women in society - a stark reminder of how entrenched social scripts remain.

Gender-sensitive coaching addresses these disparities not only at the individual level, but also as part of a broader effort to reshape the institutional and cultural structures that limit participation and progression. Grounded in both psychological and social theory, gender-sensitive coaching recognises that confidence, self-efficacy, and a sense of belonging are not innate characteristics, but the outcomes of learners' interactions with their environments (Bandura, 1997; Wenger, 1998). Coaching provides the space and support for learners - especially girls - to navigate, reinterpret, and reimagine their place in the world of STEM.

Enhancing self-efficacy and motivation

Self-efficacy is a crucial determinant of educational and career decision-making. Research shows that girls are less likely to view themselves as competent in mathematics, science, or technical subjects, even when their academic performance is comparable or superior to that of boys (OECD, 2021; European Commission, 2024b). These confidence gaps are reinforced by the lack of female role models and societal expectations that frame technical careers as "masculine." Gender-sensitive coaching responds to this by offering learners a safe, dialogic space in which to reflect on their interests, articulate goals, and receive validation from someone who understands the challenges of navigating underrepresentation. This approach helps increase internal motivation and career ambition - two elements strongly associated with persistence in STEM pathways (Lent et al., 2000).

Promoting inclusive recruitment and retention strategies

Beyond its effect on individual learners, gender-sensitive coaching can contribute to the development of more inclusive organisational cultures. TVET institutions and training providers often struggle with high dropout rates among female students in technical tracks. These are rarely due to a lack of academic ability, but rather to feelings of exclusion, lack of connection, or hostile environments (NESET, 2024; Archer et al., 2013). By embedding coaching into institutional practice, providers can offer tailored, ongoing support that reinforces the learner's agency, normalises emotional resilience, and encourages re-engagement at critical transition points. Moreover, coaching can serve as a diagnostic mechanism, allowing institutions to identify and respond to systemic issues affecting participation and retention.

Challenging bias and institutional culture

One of the most significant advantages of gender-sensitive coaching is its ability to operate at the level of belief systems and organisational mindsets. While gender mainstreaming policies may formally exist, actual practices often fall short due to unconscious bias or resistance to change (European Parliament, 2021). Coaches can act as change agents within these systems - not only supporting learners but also modelling inclusive communication and promoting critical reflection among staff and stakeholders. When applied across an ecosystem, gender-sensitive coaching supports the development of what Wenger (1998) calls "communities of practice" that are inclusive, reflexive, and committed to equity. In this way, coaching reinforces - not replaces other structural and policy-driven interventions.

Supporting systemic and sustainable change

Gender-sensitive coaching contributes to higher retention rates of girls and women in STEM-TVET careers, bolsters workforce diversity, and supports long-term institutional transformation. Unlike short-term awareness campaigns or one-off mentoring sessions, coaching can be embedded sustainably into the day-to-day operations of training providers, companies, and local ecosystems. It allows institutions to move from compliance-based approaches to equity towards more relational, participatory, and transformative practices (Mezirow, 1997; Tronto, 2013). By integrating gender-sensitive coaching into their professional culture, TVET institutions take a meaningful step towards making STEAM education and careers genuinely accessible to all.

The STEAM Coach methodology offers a strategic, evidence-informed approach to addressing gender inequality in STEM-TVET by embedding coaching as both a relational practice and a transformative intervention. As this section has outlined, the methodology is deeply rooted in theoretical frameworks that acknowledge the structural, psychological, and cultural barriers that girls and women face in pursuing technical education and careers. At the same time, it aligns with key European policy priorities, such as the Gender Equality Strategy, the Digital Education Action Plan, and the European Skills Agenda, and contributes to institutional change across learning ecosystems. By integrating behavioural, cognitive, systemic, and transformational

coaching models, the STEAM Coach approach equips institutions and professionals to act not only as supporters of individual learners but also as agents of cultural and organisational change.

1.4. The structure and purpose of the STEAM Coach methodology

While STEM refers to the academic and professional domains of Science, Technology, Engineering, and Mathematics - fields where gender disparities are particularly pronounced -the STEAM Coaching Model does not seek to expand this disciplinary scope by adding the arts as an additional subject area. Instead, the "A" in STEAM signifies a methodological lens rooted in arts-informed principles such as creativity, reflection, narrative, and identity work. Drawing from coaching psychology and transformative education, the STEAM Coach Model uses this integrative, reflective, and relational framework to support learning and personal development within STEM contexts, rather than to shift focus toward the arts as a discipline.

Figure 1 - The STEAM Coach model scheme

The STEAM Coach model is a developmental and identity-based methodology designed to support girls and women as they navigate technical education and careers in STEM-related fields. Rooted in humanistic, constructivist, and intersectional pedagogy, the model addresses the psychological, cognitive, and emotional dimensions of learning that are often overlooked in curriculum-based STEM interventions. Drawing from coaching psychology, transformative learning theory, and equity-centred approaches, the STEAM Coaching Model integrates creative, reflective, and relational strategies that honour the diverse social identities and lived experiences of learners. These tools help rehumanise the learning process, challenge dominant

norms—particularly those rooted in gender, race, class, and ability—and support the emergence of inclusive learner identities within STEM-TVET systems.

The identity-focused coaching embedded in the STEAM model must be understood through a cultural systems lens. As the dissertation outlines, identity formation is not neutral — it is deeply shaped by the cultural values, beliefs, and behavioural expectations we inherit. Authors such as Spencer-Oatey (2012), Hofstede (1994), and Schwartz (1992) offer foundational perspectives on culture that inform coaching for identity development:

- Hofstede defines culture as *"the collective programming of the mind"*, influencing how people think, act, and perceive others.
- Schwartz frames it as a system of values that are internalised through experience and shape what is seen as acceptable or aspirational.
- Spencer-Oatey describes culture as *"a fuzzy set of attitudes, beliefs and conventions that influence but do not determine behaviour."*

In practice, this means a coachee's doubts, self-perceptions, or disidentification with STEM are often rooted in cultural narratives — not individual lack. The STEAM Coach must engage these underlying scripts with sensitivity and critical inquiry, helping learners reconstruct self-image in ways that affirm agency and challenge normativity.

Rather than expanding STEM into the arts as a disciplinary focus, the "A" in STEAM represents a methodological lens. It signifies the integration of creativity, reflection, narrative, and identity work - principles drawn from coaching psychology, transformative learning theory, and intersectional pedagogy. These tools help rehumanise teaching and learning processes, challenging dominant masculine norms, and supporting the emergence of inclusive learner identities within STEM-TVET systems. In contrast to traditional interventions that prioritise technical proficiency and rational detachment, the STEAM Coaching Model values lived experience, meaning-making, and relational engagement. It fosters a holistic and empowering coaching relationship through four core pillars:

1. Relational learning

A psychologically safe space is co-created between coach and coachee grounded in trust, empathy, and authenticity (Rogers, 1951; Bachkirova et al., 2018). This relationship becomes a foundation for developmental risk-taking and growth.

2. Reflective practice

Through guided self-inquiry and dialogue, coachees explore their identities, internalised beliefs, and value systems. Reflective methods such as journaling, narrative coaching, and re-authoring support critical self-awareness (Schön, 1983; Drake, 2015).

3. Agency activation

Inspired by transformative learning theory (Mezirow, 1991), the model supports learners in moving from insight to action. Coaching encourages goal-setting, decision-making, and resilience-building within the learner's unique STEM journey (Whitmore, 2002).

4. Creative exploration

Coachees are encouraged to explore interdisciplinary and personalised pathways using creative modalities such as design thinking, storytelling, and aesthetic judgement. These approaches open new forms of engagement and legitimacy for diverse ways of knowing (Craft, 2002; Eisner, 2002).

This methodology is implemented through a **five-phase developmental route**:

1. **S**tart with self,
2. **T**race strengths,
3. **E**xplore STEM,
4. **A**ctivate agency
5. **M**ove forward.

Though non-linear, this arc mirrors the process of transformative learning, where shifts in perspective are catalysed through emotional engagement, critical reflection, and conscious action. By foregrounding voice, context, and relational safety, the STEAM Coach model empowers learners to overcome internalised barriers such as stereotype threat (Steele, 1997) and imposter syndrome (Clance & Imes, 1978). It doesn't simply aim to close gaps in representation - it transforms how success is defined and experienced in STEM.

Rather than offering prescriptive guidance, **this model invites coaches to walk alongside coachees**, asking meaningful questions, reflecting back their strengths, and enabling them to act with agency. It unfolds **across two developmental zones**:

1. The enablement zone (**S**-**T**-**E**) focused on reflection, identity and potential and discover.
2. The engagement zone (**A**-**M**) focused on goals, decision-making, action and reflection.

Each phase of the STEAM Coach model is informed by coaching theory and grounded in the realities of gender dynamics in STEM-TVET environments.

Figure 2 - The STEAM Coach model five phases for inclusive STEM growth

"The curious paradox is that when I accept myself just as I am, then I can change" Carl Rogers

01 START WITH SELF

At this foundational stage, the STEAM Coach works with the coachee to explore their sense of identity, particularly how they see themselves in relation to learning, confidence, gender, and participation in STEM fields. The coach's role is not to instruct or advise, but to create a reflective space where the learner can express, examine and expand their self-concept. This is especially important for girls and young women who have internalised cultural narratives suggesting that STEM is "not for them." This initial approach is grounded in humanistic, narrative and relational coaching approaches, which emphasise self-awareness, psychological safety and identity reconstruction as essential preconditions for meaningful engagement.

- ☑ Humanistic coaching, rooted in Rogers' concept of "unconditional positive regard" - reinforces the idea that the coachee thrive when they are accepted, listened to, and understood without judgement. Following this theory, the coach is not an authority figure, but a facilitator of growth who holds a non-directive, empathetic presence.
- ☑ Narrative coaching (Drake, 2015) builds on the premise that people make sense of their lives through stories - about who they are, what they're capable of, and where they belong. These stories are shaped by experience, culture, and social feedback - and in many cases, they carry restrictive or limiting scripts (e.g., "I'm not good at maths," or "Girls don't become engineers"). The coach helps the coachee externalise these narratives, examine them critically, and explore alternative ways of understanding themselves in relation to STEM.
- ☑ Although often applied at the team or organisational level, psychological safety (Edmondson, 1999) is equally vital in one-to-one coaching. It refers to the learner's ability to express thoughts, fears, or mistakes without fear of ridicule or dismissal. For learners in male-dominated or technical spaces, creating this safety is essential — as many girls have learned to mask their doubt or stay silent in environments where they feel like they don't belong.

Coaching goals at this level:

- ☑ To help the coachee gain distance from limiting beliefs and reshape their internal dialogue toward one of possibility and potential.
- ☑ To reduce emotional risk, so the learner can experiment, ask questions, and confront internal fears without self-censorship.
- ☑ To reduce emotional risk, so the learner can experiment, ask questions, and confront internal fears without self-censorship.

"Strengths-based coaching focused developmental process aimed at harnessing the inner potential of a client in order to optimize his/her performance and to actualize his/her potential."
Linley & Harrington

02 TRACE STRENGHTS

In this phase, the focus shifts to the coachees existing strengths — both recognised and hidden — and how these can be harnessed to build confidence and a sense of capability in STEM. For many girls and women, experiences of underrepresentation and stereotype threat have eroded their self-belief, even when their actual ability is high. The coach's role is to uncover, name, and validate what the learner can already do — academically, socially, creatively or practically. This phase is grounded in strengths-based and self-efficacy coaching theories, which emphasise affirmation, validation, and capability building.

- ☑ Strengths-based coaching (Linley & Harrington, 2006) focuses on enhancing what is already present and working well in the learner's mindset, behaviours, and experiences. The coach assumes that every learner possesses a unique combination of strengths that, when acknowledged and developed, can act as a springboard into more challenging STEM environments.
- ☑ Positive psychology coaching (Kauffman, 206) emphasises optimism, resilience, and personal growth. It encourages learners to identify past successes — even small or informal ones — and to draw motivation and meaning from them.
- ☑ Self-efficacy (Bandura, 1997) is the belief in one's ability to achieve specific goals. According to Bandura, learners build this belief through four sources: mastery experiences, vicarious learning, social persuasion, and emotional regulation. Coaches help learners tap into all four.

Coaching goals at this level:

- ☑ To shift the coachees focus from what they lack to what they already possess, building confidence and readiness for further STEM engagement.
- ☑ To create a mindset of growth and capability by reinforcing successful experiences and helping the learner generalise them to future opportunities.
- ☑ To strengthen the learner's internal belief system and prepare them to take on more complex challenges with increased resilience.

"Possibility thinking is thinking that moves beyond the given, or 'what is', to the possible, or to 'what could be?'" Anna Craft

03 EXPLORE STEAM

This phase invites the coachee to engage in open-ended exploration of STEM fields, with an emphasis on discovering relevance, breaking stereotypes, and building imaginative connections between their interests and technical domains. The coach facilitates curiosity-driven engagement with real-world STEM possibilities, especially those that integrate creativity, social relevance, or unconventional pathways. The phase draws from constructivist, interdisciplinary, and creativity-focused coaching and learning theories to support this wide-ranging discovery process.

- ☑ Constructivist coaching (Stober & Grant, 2006) positions the learner as the agent of their own knowledge construction. Rather than transmitting information, the coach co-creates meaning with the learner, helping them develop insights through questions, reflection, and contextually grounded exploration.
- ☑ STEM engagement improves when learners/coachees see connections to other fields they enjoy — including the arts, humanities, or social causes. Interdisciplinary coaching/learning (Beers et al., 2008) validates blended identities and supports learners in seeing STEM as broader and more inclusive. It encourages learners/coachees to navigate across knowledge domains and build cognitive bridges between seemingly unrelated interests, reinforcing the value of holistic thinking and creative integration in technical contexts.
- ☑ Possibility thinking (Craft, 2002) encourages learners to shift from "What is?" to "What if?" This creative mindset expands perceived options and builds imagination as a cognitive skill — which is particularly empowering for underrepresented learners.

Coaching goals at this level:

- ☑ To enable the learner to construct a personal and meaningful understanding of what STEM can be and how they might see themselves within it.
- ☑ To disrupt narrow stereotypes about STEM and show how diverse talents and passions can be integrated into technical futures.
- ☑ To expand the learner's sense of what is possible in STEM, unlocking motivation and breaking internalised barriers.

Coaching is unlocking people's potential to maximize their own performance. It is helping them to learn rather than teaching them. Sir John Whitmore

04 ACTIVATE AGENCY

In this phase, the focus shifts from reflection to forward motion. The coach supports the coachee in articulating goals, clarifying direction, and planning actionable steps. It marks the transition from possibility to purpose — enabling coachees to take ownership of their development in STEM and commit to next steps. The emphasis is on agency, decision-making, and empowerment. This phase draws from transformative learning, structured goal-setting frameworks, and motivational psychology.

- ☑ Transformative learning (Mezirow, 1991) occurs when individuals critically reflect on their assumptions and beliefs, often triggered by disorienting dilemmas or new insights. In coaching, this reflection opens the door for a coachee to reconstruct their sense of purpose or potential.
- ☑ The GROW model (Whitmore, 2002) provides a structured and accessible process for coaching conversations, helping the learner go from vision to plan.
    - Goal: What do you want to achieve?
    - Reality: Where are you now?
    - Options: What could you do?
    - Will: What will you commit to doing?
- ☑ Clear, specific, and challenging goals (goal -setting theory, Locke & Lathan) are more motivating and more likely to be achieved than vague or easy ones. Coaching supports learners to articulate these goals in achievable steps, and to monitor their own progress.

Coaching goals at this level:

- ☑ To help the learner move beyond externally imposed limits and begin acting with clarity, autonomy and intentionality.
- ☑ To transform interest into focused, time-bound action by aligning the learner's goals with her values and circumstances.
- ☑ To increase the learner's confidence and follow-through by helping her set and move towards well-defined goals.

"Transformative learning develops autonomous thinking." Jack Mezirow

05 Move forward

In the final phase of the STEAM Coaching Model, the focus shifts to action, persistence, and consolidation. This is the stage where the learner begins to apply their skills and plans in real-world contexts — whether through projects, placements, applications, or outreach. It's also a critical period for coaching support, as coachees encounter obstacles, self-doubt, or unexpected challenges. This phase is grounded in theories of intentional change, growth mindset, and reflective practice, all of which emphasise sustained development and adaptive learning.

- ☑ Intentional change theory (Boyatzis, 2006) suggests that transformation happens when learners align their behaviours with a vision of their "ideal self." Coaching at this stage supports the learner to monitor progress, adjust when needed, and stay connected to a meaningful long-term goal.
- ☑ Coachees with a growth mindset (Carol Dweck, 2006) see challenges and failures as opportunities to improve rather than signs of inadequacy. In STEM — where perfectionism and stereotype threat can be especially acute — this mindset is essential.
- ☑ Reflection is essential to consolidate learning and guide future action. At this stage, coaching focuses on helping the learner internalise lessons, integrate their new identity, and sustain motivation (reflective practice, Donald Schön, 1983).

Coaching goals at this level:

- ☑ To maintain coachee momentum by keeping their long-term goals in view while offering tools to process and learn from immediate experiences.
- ☑ To build resilience by helping the learner interpret challenges as growth experiences, not as fixed limitations.
- ☑ To support the learner in anchoring their STEM identity, recognising their transformation, and preparing for sustained engagement or independence.

Section 2. Conceptual framework and terminologies

2.1 Key coaching concepts

The STEAM Coach methodology integrates four coaching paradigms:

Behavioural coaching focuses on observable actions, promoting accountability and performance improvements through goal-setting and reinforcement strategies.

Cognitive coaching works with mental models, beliefs, and thought patterns, helping individuals reframe limiting beliefs and build confidence in their ability to succeed.

Systemic coaching addresses the learner within a larger network (e.g., family, institution, culture), identifying how relational dynamics influence motivation and choices.

Transformational coaching fosters deep personal growth and identity shifts, supporting long-term engagement and resilience in STEM paths.

These approaches are not mutually exclusive and can be used flexibly within the STEAM Coach framework depending on the needs of the coachee.

To distinguish how coaching methodologies align with systemic change in gender equity, the following table compares two core approaches referenced in the STEAM model: Transformational Coaching and Lambent Coaching.

Coach approach	Core focus	Pedagogical roots	Relevance to gender equity in STEM-TVET
Transformational coaching	Identity, beliefs, emotions	Humanistic + Constructivist	Addresses internalised bias, fosters resilience and agency
Lambent coaching	Self-reflection, language, adult learning	Psychology + Linguistics + PNL	Helps deconstruct stereotypes, promotes inclusive language and leadership

Table 1 - Comparative overview: coaching approaches for the STEAM Coaching model

Transformational Coaching (Aguilar, 2020) targets not only behaviours but also beliefs and ways of being. It is especially suited for addressing internalised gender norms and identity shifts. Lambent Coaching, developed within the International Coaching Community, integrates neuroscience, andragogy, and systems thinking — and is effective for exploring social conditioning, power dynamics, and reframing through language. By comparing these approaches, STEAM Coaches can choose the most appropriate method to support coachees' developmental needs while remaining grounded in systemic impact.

2.3. National adaptations

In the context of cross-national collaboration and transdisciplinary learning, acknowledging cultural diversity is not merely advisable—it is essential. While the methodology, resource kit, and CPDP have been designed with a shared European framework in mind, their practical effectiveness depends greatly on how they align with local cultural norms, values, and professional expectations.

The inclusion of this 'National Adaptation' section serves to highlight the need for culturally informed implementation strategies. By explicitly addressing how key cultural dimensions influence communication, leadership, learning preferences, and decision-making processes in each participating country, this section ensures that the tools developed are not only universally accessible, but also locally relevant.

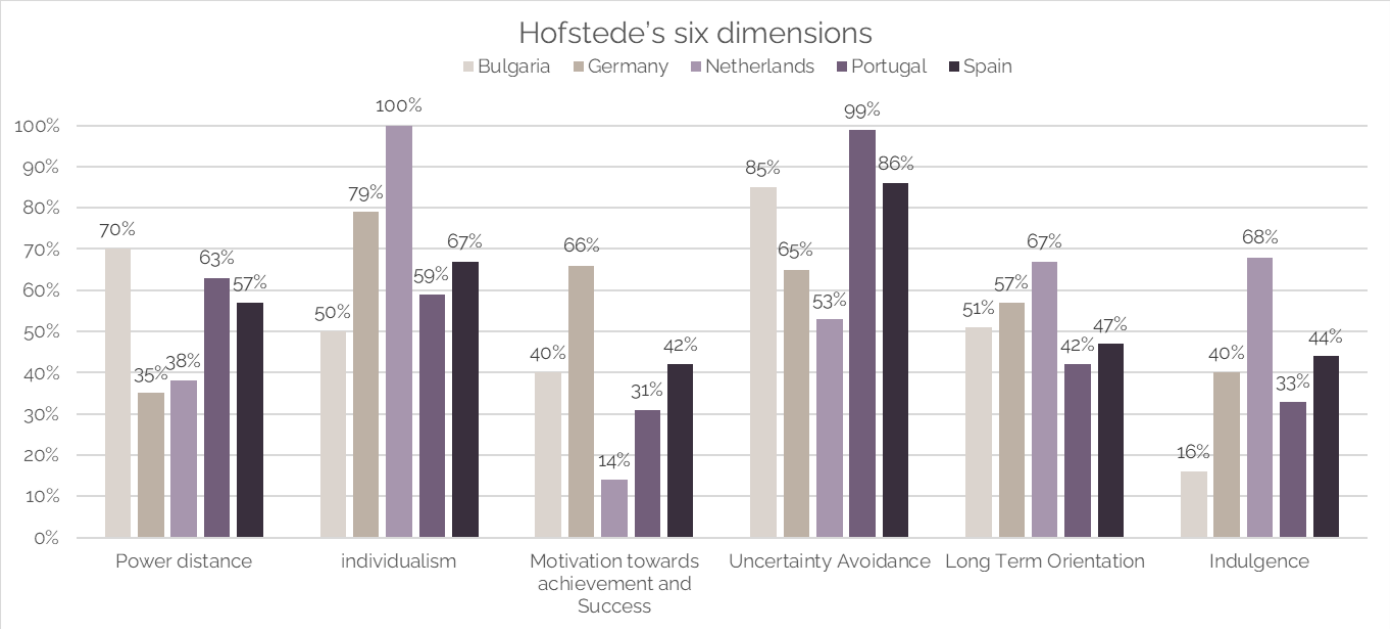
This tailored approach acknowledges that concepts such as collaboration, authority, and motivation are interpreted differently across cultural contexts. It allows project partners and stakeholders to apply the programme content with greater sensitivity, leading to increased engagement, ownership, and ultimately, more sustainable impact.

Geert Hofstede's cultural dimensions theory[1] provides a comprehensive framework for understanding how values in the workplace are influenced by national culture. It identifies six dimensions that capture fundamental aspects of a society's culture: Power Distance, Individualism versus Collectivism, Masculinity versus Femininity (also referred to as Motivation towards Achievement and Success), Uncertainty Avoidance, Long-Term Orientation versus Short-Term Normative Orientation, and Indulgence versus Restraint. Each dimension represents a spectrum along which national cultures can be evaluated, helping to clarify the underlying cultural patterns that shape behaviour, communication, and organizational practices. By analysing and comparing these dimensions across countries, it becomes possible to better understand potential intercultural dynamics, anticipate workplace behaviour, and enhance cross-border collaboration.

[1] Hofstede, G., Hofstede, G. J., & Minkov, M. (2010). *Cultures and organizations: Software of the mind* (3rd ed.). McGraw-Hill.

Comparison of the 5 Countries[2]

The comparative analysis of Hofstede's six dimensions reveals both convergences and divergences among the five countries. Germany and the Netherlands show notable similarities—especially in low power distance, high individualism, and pragmatic orientation—characteristic of Northern European cultures. Portugal, Spain, and Bulgaria, meanwhile, share higher power distance, stronger uncertainty avoidance, and lower indulgence, aligning with more hierarchical and traditional cultural models. Understanding these patterns is crucial for effective intercultural collaboration, especially in multinational environments where these cultural nuances significantly influence management styles, communication practices, and decision-making processes.



1. Power Distance

Germany (35) and the Netherlands (38) score low on this dimension, indicating a preference for decentralised power structures, participative leadership, and informal workplace relations. In contrast, Portugal (63), Spain (57), and Bulgaria (70) exhibit higher power distance. These societies are more accepting of hierarchical structures, with centralized authority and an expectation that leaders exercise control. The primary contrast lies in the acceptance of inequality and the

[2] Hofstede Insights. (n.d.). *Country comparison tool*. Retrieved May 9, 2025, from https://www.hofstede-insights.com

perceived role of leadership: egalitarian in Germany and the Netherlands, authoritative in the other three.

2. Individualism

The Netherlands (100) and Germany (79) strongly reflect individualist cultures, where personal autonomy, merit-based employment, and self-actualization are emphasized. Spain (67) and Portugal (59) also lean towards individualism but with less intensity, suggesting some balance between individual and collective considerations. Bulgaria, however, does not exhibit a strong preference, suggesting a more neutral stance or a blend of collectivist and individualist values. A key similarity among the four Western European countries is the general trend toward individualism, though with varying degrees.

3. Motivation towards Achievement and Success (Masculinity vs Femininity)

Germany scores relatively high (66), classifying it as a performance-oriented society that values achievement and assertiveness. On the other hand, the Netherlands (14), Portugal (31), Spain (42), and Bulgaria (40) score significantly lower, identifying them as consensus-oriented societies. These cultures emphasize quality of life, work-life balance, and collaborative decision-making. The sharp contrast lies in the German preference for competition and status, versus the others' focus on solidarity and collective harmony.

4. Uncertainty Avoidance

All five countries show a tendency towards avoiding uncertainty, but to different extents. Portugal (99), Spain (86), and Bulgaria (85) exhibit very high levels, demonstrating a strong reliance on rules, aversion to ambiguity, and desire for structured environments. Germany (65) and the Netherlands (53) also show moderate preference for certainty but are more tolerant of ambiguity compared to the Southern and Eastern European nations. The shared high scores suggest a common discomfort with unpredictability, although the Northern European countries manage it with more flexibility.

5. Long-Term Orientation

The Netherlands (67) and Germany (57) score high on this dimension, indicating a pragmatic and future-oriented outlook. These societies value perseverance, adaptability, and a long-term view of success. Portugal (42) and Spain (47), in contrast, tend to favour normative approaches, emphasizing tradition, quick results, and established truths. Bulgaria (51) sits near the midpoint, showing no strong preference. The main divergence lies in the approach to planning and tradition: future-oriented pragmatism versus present-focused traditionalism.

6. Indulgence

Only the Netherlands (68) qualifies as an Indulgent society, where personal enjoyment, optimism, and leisure are highly valued. Germany (40), Spain (44), Portugal (33), and especially Bulgaria (16) are classified as Restrained societies. In these cultures, gratification is controlled by

social norms, and leisure is often undervalued. This dimension presents a marked cultural divide, with the Dutch society prioritizing personal freedom, while others emphasize restraint and duty.

2.4. STEAM vs STEM Clarification

STEM as a Field of Intervention

STEM - Science, Technology, Engineering, and Mathematics - is an umbrella term for a group of technical and scientific disciplines that are central to global innovation and economic development. STEM-related TVET (Technical and Vocational Education and Training) prepares learners for specific, often high-demand careers in areas like engineering, software development, robotics, electronics, and applied sciences. Despite the increasing demand for STEM professionals, women remain underrepresented in these fields due to gender stereotypes, structural barriers, and lack of visible female role models.

STEAM as a Methodology

STEAM—Science, Technology, Engineering, Arts, and Mathematics—emerges as an inclusive, interdisciplinary methodology that embeds creativity, critical thinking, and social relevance into the technical learning process. The addition of the "A" (Arts) broadens the educational scope by integrating design, humanities, and emotional intelligence into the rigid STEM framework. This pedagogical evolution supports a more diverse range of learners and makes technical fields more attractive to groups traditionally excluded from them.

STEAM in the Context of the Project

Within the STEAM Coach project, STEM represents the **domain** or **field** in which barriers to participation exist, particularly for women and girls in TVET systems. STEAM represents the **methodology** through which these barriers can be addressed. By merging artistic creativity, identity development, and values-based coaching with technical training, the STEAM methodology humanises learning. It becomes a lever for transformation, not only equipping women with hard skills, but also helping them explore and articulate their place in these fields.

In essence, the STEAM Coach methodology does not aim to alter STEM itself, but rather to enhance access, engagement, and retention through a more holistic, personalised, and gender-sensitive approach.

Section 3. The benefits of coaching as a strategy

3.1. Coaching for empowerment and identity

Coaching can serve as a vital tool for the empowerment and identity development of girls and women in STEM-related TVET programmes, especially when they navigate environments where their presence is marginalised or questioned.

Drawing on Elena Aguilar's concept of transformational coaching, empowerment is not just about learning how to perform better but about developing emotional resilience, self-awareness, and purpose. Aguilar suggests that coaching can be a practice that builds capacity for systemic thinking and self-advocacy. It supports women in reflecting critically on their environments and internalised messages, and in cultivating new narratives about what is possible.

Albert Bandura's theory of self-efficacy complements this view. His work underscores the importance of belief in one's own capabilities as a key factor in motivation and perseverance. Coaching grounded in self-efficacy principles encourages learners to celebrate small wins, seek mastery experiences, and model positive behaviours—thereby reinforcing their belief that they can succeed in STEM domains.

Susan Drake adds a valuable perspective on identity formation within interdisciplinary learning. She argues that learners need to see connections between what they study and who they are. In STEAM coaching, this insight is applied by helping learners craft coherent personal stories that integrate their technical skills with their values, interests, and sense of self.

Carl Rogers' humanistic theory provides the relational foundation for coaching. His principles of empathy, unconditional positive regard, and genuineness are essential in establishing trust. Rogers emphasised the role of supportive relationships in personal growth, which is particularly relevant when working with individuals navigating identity-based challenges. When learners feel truly heard and seen, they are more likely to take risks, express themselves authentically, and grow.

By combining these theoretical foundations, the STEAM Coach model supports a robust framework for identity development and empowerment, particularly for those facing systemic exclusion or cultural barriers in STEM.

One of the most powerful psychological tools for empowerment in coaching is the **"3Bs" model** from *Transformational Coaching* (Aguilar, 2020). This model identifies three domains where change is activated:

- **Behaviours**: the visible actions and skillsets a person can perform or develop.
- **Beliefs**: the internal narratives, assumptions, and inherited truths that shape how someone views themselves and their capacity.
- **Being**: the deep emotional and identity-based core of the person: how they relate to others, their sense of worth, and their motivation.

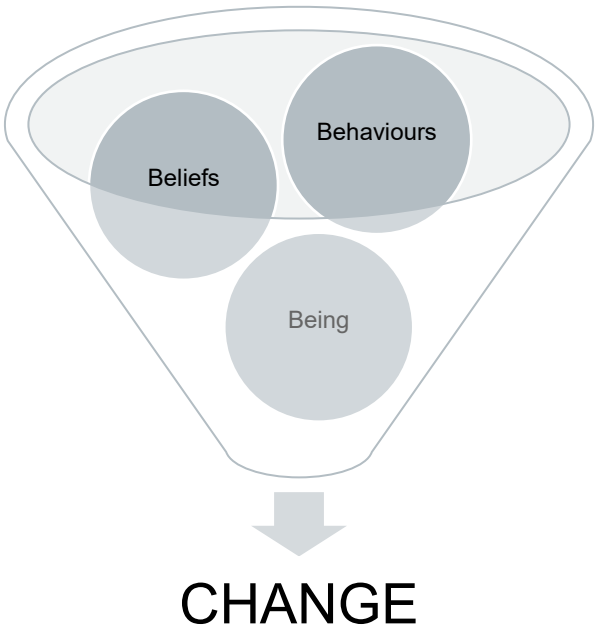


Figure 3 - The "3Bs" Model of Transformational Coaching

Empowerment arises when all three domains are addressed — not just performance or knowledge. For many girls and women in STEM-TVET, belief systems formed through cultural messages, familial roles, or prior experiences with exclusion require active reflection. Coaches using the 3Bs framework can help surface these layers, creating safer pathways to self-authorship and agency. This model reinforces the STEAM Coach methodology's commitment to **identity-centred development**, which acknowledges that visible confidence is often rooted in invisible transformation.

3.2. Coaching for progression and retention

Progression and retention are central goals of gender-sensitive coaching in STEM-related TVET. While many interventions focus on initial enrolment, the STEAM Coach methodology also addresses what happens after women enter these fields—how they stay, thrive, and advance.

Lent, Brown, and Hackett's Social Cognitive Career Theory (SCCT) provides a valuable lens for understanding how individuals choose, persist in, and succeed in careers. According to SCCT, three elements are critical: self-efficacy beliefs, outcome expectations, and personal goals. STEAM Coaches can use this model to identify where a learner may be blocked—perhaps they lack confidence, cannot envision positive outcomes in STEM careers, or feel unsure about goal-setting. Through targeted coaching, learners can unpack these challenges and build stronger pathways to long-term engagement.

Jack Mezirow's theory of transformative learning highlights the importance of critical reflection in shifting one's frame of reference. Women and girls in STEM often navigate unspoken rules, microaggressions, and doubts about belonging. Coaching sessions that foster critical reflection can help reframe these experiences, turning disempowering narratives into empowering learning moments. This cognitive reframing supports learners not only to survive in difficult environments but to reimagine their role in them.

Etienne Wenger's concept of communities of practice reinforces the idea that learning and identity are socially situated. Belonging to a community of learners or professionals who share experiences, aspirations, and knowledge is vital for retention. Coaches can help create or link learners to such communities—whether they are peer-led STEM circles, alumni networks, or online mentorship platforms. These communities support learners beyond individual coaching, reinforcing a sense of purpose and belonging.

Through these combined theoretical models, STEAM coaching becomes a structured, evidence-based method for improving retention and progression, especially for underrepresented groups. It creates a safety net around learners and empowers them to persist in the face of systemic and psychological challenges.

3.3. Organisational and cultural change

While coaching often focuses on individual development, the STEAM Coach model recognises the necessity of institutional and cultural transformation. Without changes at the organisational level, even the most empowered learners may struggle to remain in STEM fields. Coaching, therefore, is also positioned as a tool for influencing systems.

Etienne Wenger's work on communities of practice shows how collective learning occurs within institutions. By creating dedicated coaching spaces and peer mentoring groups within schools, VET institutions, or companies, the STEAM Coach model helps shift organisational cultures. These spaces allow new norms, practices, and identities to emerge—norms that value collaboration, equity, and inclusion. Organisational learning begins when coaching becomes embedded in everyday professional life.

Joan Tronto's ethics of care provides a powerful framework for understanding what supportive institutions look like. Tronto identifies care as comprising attentiveness, responsibility, competence, and responsiveness. When applied to educational and workplace settings, this implies that institutions must actively notice who is excluded, take responsibility for change, and provide appropriate responses. STEAM Coaches can act as facilitators of this care culture—raising awareness of exclusion, advocating for equitable practices, and modelling inclusive dialogue.

Additionally, cultural change occurs when institutional leadership is engaged. The STEAM Coach methodology includes leadership development components, such as CPDPs (Continuous Professional Development Programmes) tailored for directors and decision-makers. These sessions build understanding of gender-sensitive pedagogy, coach-supported environments, and the long-term value of diversity in technical fields.

Ultimately, coaching becomes a form of institutional leverage—not only transforming individual learners but realigning organisations around equity and inclusion in STEM education.

3.4. Examples in practice

To illustrate how the STEAM Coach methodology functions in practice, the following vignettes present real-world inspired examples of coaching applications.

Scenario 1 – Empowering through self-belief

Fatima, a 17-year-old student in an electronics VET programme, is the only girl in her cohort. She frequently doubts her abilities and feels isolated. Her STEAM Coach uses cognitive coaching techniques, such as identifying negative thought patterns and challenging self-limiting beliefs. Over several sessions, Fatima's confidence grows. She presents a project at a school fair and later joins a regional girls-in-tech group, where she becomes a peer mentor.

Scenario 2 – Overcoming systemic barriers

Maria, a 25-year-old mechanical engineer and migrant, works in a factory setting where her skills are underutilised. A systemic coaching approach helps her map institutional hierarchies, identify allies, and develop a strategy for upskilling and promotion. The coach also facilitates conversations with HR to review recognition of foreign qualifications. Maria is later assigned to a cross-functional team where her contributions are acknowledged.

Scenario 3 – Building peer-led networks

A group of six female learners in a robotics programme feel discouraged by lack of role models. Their STEAM Coach introduces the concept of a peer coaching circle, inspired by Wenger's communities of practice. They meet biweekly to discuss challenges, goals, and learning strategies. Over time, the group grows and mentors younger cohorts, embedding a culture of mutual support.

Scenario 4 – Promoting institutional change

A vocational school introduces a CPDP for its leadership team, led by STEAM Coaches. After reflective coaching and action planning, the school commits to inclusive recruitment strategies, gender-sensitive curriculum audits, and a student advisory board with gender parity. A year later, female participation in STEM-related courses has doubled, and retention rates have improved.

These examples reflect how coaching can be used across different levels—from individual empowerment to systemic change—and how it adapts to diverse contexts and learner needs.

Section 4. The STEAM Coach competence profile

4.1. Purpose and audience of the profile

The STEAM Coach Competence Profile **defines the essential capabilities** required for professionals who actively **support, mentor, and empower individuals and groups** navigating STEAM (Science, Technology, Engineering, Arts, and Mathematics) learning pathways. These professionals not only convey subject-specific knowledge but also serve as role models, facilitators, and change agents fostering innovation, equity, and inclusion in education.

This Competence Profile is developed within the framework of the STEAM Coach project, which aims to advance a pioneering coaching model designed to overcome persistent barriers and enhance the participation, performance, and retention of women and girls in STEM-related Technical and Vocational Education and Training (TVET). The project further aspires to promote gender-inclusive career paths and establish a European network for skills development and sustainable engagement in STEAM fields.

The profile is grounded in a holistic, learner-centered, and interdisciplinary vision of STEAM learning. It promotes the integration of scientific and creative disciplines, highlights the importance of social and cultural dimensions in STEM, and strengthens the link between STEAM education and real-world challenges. Furthermore, it ensures that gender equality, cultural sensitivity, and diversity are embedded across all coaching practices and learning interactions.

The aim is to establish a shared European reference standard that defines what effective, inclusive, and future-ready STEAM coaching looks like. This common framework ensures coherence across different educational levels and sectors, supports the recognition of diverse coaching roles, and contributes to improved quality, accessibility, and sustainability of STEAM learning ecosystems.

The profile serves a wide variety of target groups:

- **Education professionals** such as teachers, trainers, and facilitators, who seek to strengthen interdisciplinary pedagogies and bring inclusive and gender-sensitive perspectives into their classrooms and learning settings.
- **Career and learning coaches**, who help guide individuals—particularly women, girls, minorities, and disadvantaged learners—into and through STEAM education and employment pathways, overcoming systemic barriers and stereotypes.
- **Community actors and peer mentors**, who engage in formal, non-formal, and informal educational spaces, often providing grassroots-level support, inspiration, and advocacy for learners entering or advancing in STEAM fields.

- Policy makers, educational institutions, and training providers, who design curricula, shape accreditation standards, and create frameworks for initial and continuous professional development in STEAM education.

The Competence Profile is not just a standalone tool—it is a cornerstone for developing the Continuous Professional Development Programme (CPDP), as well as associated training modules, self-assessment instruments, mentoring schemes, and recognition mechanisms. These tools will ensure that current and future STEAM Coaches can develop, validate, and continuously enhance their professional capabilities within a structured and supportive European learning framework.

4.2. Competency framework structure

The STEAM Coach Competency Framework is explicitly aligned with the European Qualifications Framework (EQF) at levels 5 to 7, ensuring compatibility with European standards for lifelong learning. EQF level 5 typically corresponds to advanced vocational training, level 6 to Bachelor-level qualifications, and level 7 to Master's-level qualifications. This alignment allows for flexibility in addressing different learner profiles—from early-career coaches and community mentors to experienced professionals—while ensuring a coherent and progressive structure for knowledge, skills, and responsibility. The profile supports the recognition and comparability of competences across countries and learning systems, thus facilitating transparency, mobility, and professional validation within the European education and training area.

The framework structures each competence area around three core dimensions:

Knowledge: Theoretical and factual understanding required to perform coaching tasks within STEAM education.

Skills: The ability to apply knowledge in practice through problem-solving, communication, facilitation, and use of relevant tools and methods.

Autonomy and Responsibility: The degree of independence and accountability expected in delivering inclusive and impactful STEAM coaching, especially in gender-sensitive and culturally diverse environments.

This structured approach ensures consistency with European educational standards, supports transferability across national contexts, and enables clear progression routes for professional development. It also fosters transparency for recognition of prior learning, whether acquired through formal qualifications or non-formal experiences.

The framework is composed of eight core competence areas that together define the professional profile of the STEAM Coach: Each area is described below in a structured format.

Competence Area 1: STEAM Expertise

Knowledge: Comprehensive and up-to-date knowledge of core STEAM subjects; understanding of interdisciplinary linkages.

Skills: Apply STEAM knowledge to real-world contexts; connect scientific concepts to innovation and society.

Autonomy/Responsibility: Act as a reference point for STEAM content; reflect on one's discipline in relation to societal challenges.

Competence Area 2: Teaching and Communication

Knowledge: Learning styles, pedagogical models, communication theory.

Skills: Translate complex STEAM topics into accessible formats; adapt delivery to learner diversity.

Autonomy/Responsibility: Engage and motivate learners; reflect on impact and adjust communication strategies.

Competence Area 3: Inclusivity and Gender Sensitivity

Knowledge: Gender-related barriers in STEAM; principles of inclusive education.

Skills: Design learning experiences that reduce bias and foster equity.

Autonomy/Responsibility: Actively challenge stereotypes; promote inclusive leadership and empowerment.

Competence Area 4: Cultural Competence

Knowledge: Cultural dimensions of learning and interaction.

Skills: Adjust strategies to learners' cultural contexts; facilitate intercultural dialogue.

Autonomy/Responsibility: Respect diversity and foster belonging; act as a cultural mediator in learning environments.

Competence Area 5: Problem Solving and Critical Thinking

Knowledge: Scientific methods, design thinking, logical reasoning.

Skills: Guide learners through open-ended problems and STEAM challenges.

Autonomy/Responsibility: Foster independent inquiry and evidence-based reasoning.

Competence Area 6: Creativity and Innovation

Knowledge: Creative learning methodologies, innovation processes.

Skills: Integrate the arts and promote divergent thinking in STEAM.

Autonomy/Responsibility: Encourage experimentation, originality, and creative confidence.

Competence Area 7: Collaboration and Facilitation

Knowledge: Group dynamics, collaborative learning models.

Skills: Lead interdisciplinary teams and learning groups; facilitate co-creation.

Autonomy/Responsibility: Foster respectful teamwork; mediate conflict and promote shared ownership.

Competence Area 8: Technology and Assessment

Knowledge: Digital tools, e-learning platforms, assessment theory.

Skills: Use technologies to support STEAM learning and deliver constructive feedback.

Autonomy/Responsibility: Continuously evaluate learning outcomes and adapt tools effectively.

Competence Area 1: STEAM Expertise		
Knowledge	Skills	Responsibility and Autonomy
✓ Comprehensive and up-to-date understanding of STEAM fields. ✓ Awareness of interdisciplinary links between science, technology, engineering, arts, and mathematics.	✓ Apply core STEAM knowledge to real-life and cross-disciplinary challenges. ✓ Connect concepts to societal contexts and innovation. ✓ Facilitate understanding of complex ideas through interdisciplinary integration.	✓ Serve as a point of reference for STEAM topics in coaching contexts. ✓ Guide others in reflecting on the relevance of STEAM disciplines to societal needs. ✓ Support inclusive and responsible STEAM practice in learning environments.

Competence Area 2: Teaching and Communication		
Knowledge	**Skills**	**Responsibility and Autonomy**
✓ Understanding of diverse learning styles and pedagogical approaches. ✓ Knowledge of communication strategies for engaging varied audiences in STEAM.	✓ Translate complex STEAM topics into accessible content. ✓ Adapt teaching methods to suit diverse learning preferences and needs. ✓ Use verbal and non-verbal communication effectively in coaching.	✓ Engage and motivate learners from diverse backgrounds. ✓ Evaluate and improve one's own teaching and communication practices. ✓ Foster a positive, open, and respectful learning environment.

Competence Area 3: Inclusivity and Gender Sensitivity		
Knowledge	**Skills**	**Responsibility and Autonomy**
✓Knowledge of gender barriers and disparities in STEAM fields. ✓Awareness of inclusive education principles and equity frameworks.	✓Design and deliver inclusive learning experiences. ✓ Address bias and promote equitable participation in STEAM. ✓Use gender-sensitive language and examples.	✓ Actively challenge stereotypes and microaggressions. ✓ Serve as a role model for equity and inclusion. ✓ Implement gender-responsive strategies in all coaching practices.

Competence Area 4: Cultural Competence		
Knowledge	Skills	Responsibility and Autonomy
✓ Understanding of cultural influences on learning and communication. ✓ Awareness of global perspectives in STEAM education.	✓ Adapt coaching strategies to different cultural contexts. ✓ Encourage intercultural dialogue and collaboration. ✓ Recognize and respect learners' cultural identities.	✓ Foster cultural sensitivity in group learning. ✓ Support inclusion of underrepresented cultural perspectives in STEAM. ✓ Act as a cultural mediator in diverse educational settings.

Competence Area 5: Problem Solving and Critical Thinking		
Knowledge	Skills	Responsibility and Autonomy
✓ Familiarity with scientific inquiry, design thinking, and logic. ✓ Understanding of problem-based and project-based learning methodologies.	✓ Guide learners in formulating and testing hypotheses. ✓ Encourage evidence-based reasoning and reflection. ✓ Support open-ended exploration of real-world STEAM issues.	✓ Promote critical and creative thinking in coaching sessions. ✓ Empower learners to take ownership of problem-solving processes. ✓ Provide constructive feedback on learners' reasoning and decision-making.

Competence Area 6: Creativity and Innovation		
Knowledge	Skills	Responsibility and Autonomy
✓ Knowledge of creative learning methodologies and innovation tools. ✓ Awareness of interdisciplinary approaches that connect art and science.	✓ Stimulate creative thinking and ideation in STEAM projects. ✓ Incorporate artistic elements into technical learning tasks. ✓ Facilitate experimentation and design processes.	✓ Encourage learners to take risks and embrace failure as part of innovation. ✓ Create a safe space for imaginative expression. ✓ Advocate for the value of creativity in STEM-dominated contexts.

Competence Area 7: Collaboration and Facilitation		
Knowledge	Skills	Responsibility and Autonomy
✓ Understanding of group dynamics and team-based learning methods. ✓ Familiarity with collaborative technologies and co-creation strategies.	✓ Facilitate teamwork and joint problem-solving. ✓ Encourage equitable participation and shared decision-making. ✓ Mediate conflicts and promote consensus.	✓ Support interdisciplinary collaboration in STEAM contexts. ✓ Model effective cooperation and leadership skills. ✓ Build inclusive and trusting group learning environments.

Competence Area 8: Technology and Assessment		
Knowledge	**Skills**	**Responsibility and Autonomy**
✓ Familiarity with digital tools for STEAM learning and communication. ✓ Understanding of formative and summative assessment methods.	✓ Integrate technology to enhance coaching and learner engagement. ✓ Design assessments that reflect STEAM learning objectives. ✓ Use digital platforms for feedback and progress tracking.	✓ Ensure ethical and effective use of technology in learning. ✓ Provide ongoing, supportive, and developmental feedback. ✓ Adapt assessment strategies to diverse learner needs.

4.3. Eight core competence areas

Each of the eight core competence areas defines the critical knowledge, practical skills, and professional attitudes expected of a STEAM Coach. These competencies reflect the multifaceted role of the coach as educator, facilitator, mentor, and advocate for inclusion and innovation in STEAM education. They are aligned with the EQF dimensions and tailored to the realities of coaching in diverse educational and cultural settings, particularly to support the participation, performance, and retention of women and girls in STEM-related TVET and career pathways.

1. STEAM Expertise

Possesses advanced, up-to-date knowledge across STEAM disciplines and the ability to apply interdisciplinary thinking to real-world challenges. By confidently guiding learners through complex content, the coach builds trust and relevance for women and girls who may lack role models or prior exposure to these fields.

2. Teaching and Communication

Communicates STEAM concepts effectively to diverse learners by adapting messages, methods, and media. This competency empowers the coach to demystify technical content and create accessible, relatable learning environments where women and girls feel seen, understood, and capable.

3. Inclusivity and Gender Sensitivity

Designs and delivers learning experiences that challenge stereotypes and promote equal participation, particularly of women and underrepresented groups in STEAM. The coach actively addresses gender gaps, nurtures confidence, and provides affirmation through inclusive facilitation and tailored support.

4. Cultural Competence

Shows sensitivity to learners' cultural contexts, values, and identities. This enables the STEAM Coach to support women and girls from diverse backgrounds, addressing intersectional barriers and encouraging full engagement through culturally responsive coaching.

5. Problem Solving and Critical Thinking

Leads learners in applying scientific methods, design thinking, and reasoning frameworks to STEAM challenges. By encouraging independent thinking and inquiry, this competency builds

agency in women and girls, affirming their capacity to lead and contribute meaningfully to innovation.

6. Creativity and Innovation

Facilitates creative expression and experimentation in STEAM learning environments. Encouraging diverse ways of thinking and doing, this competence helps validate the unique perspectives of women and girls, fostering their innovation potential and leadership.

7. Collaboration and Facilitation

Creates conditions for effective group work, interdisciplinary exchange, and shared learning. It supports the development of safe, supportive environments where women and girls are encouraged to voice their ideas and build peer and mentor networks.

8. Technology and Assessment

Harnesses digital tools to enhance learning, coaching, and assessment. By providing clear, constructive feedback and integrating inclusive assessment approaches, the coach helps women and girls track their growth and envision future steps with confidence.

Together, these competencies define a STEAM Coach as a reflective practitioner, inclusive leader, and catalyst for transformation in education and career development—particularly in empowering women and girls to thrive in STEAM domains.

4.4. Who can be a STEAM Coach?

The STEAM Coach profile is purposefully inclusive and flexible, welcoming a wide range of individuals who demonstrate a commitment to equitable, learner-centered, and interdisciplinary STEAM engagement. It is not limited to traditionally certified educators but is open to anyone who can facilitate learning, mentor others, and contribute meaningfully to STEAM development in formal, non-formal, or informal settings.

Potential STEAM Coaches include:

- Educators and trainers with experience in any of the STEAM disciplines who wish to adopt interdisciplinary, inclusive, and gender-sensitive approaches.
- Career counselors and learning coaches working to connect learners—particularly girls and women—with pathways into STEM and related careers.
- Peer mentors and youth leaders, including high-achieving students or early-career professionals who serve as relatable role models, especially for younger learners.
- Young women in STEM, whose lived experiences navigating education and employment in traditionally male-dominated fields provide critical insight and inspiration.
- Community actors and NGO professionals who support learning and empowerment at the grassroots level, including in marginalized or underrepresented communities.
- Industry professionals and experts interested in giving back through mentorship, project-based coaching, or advocacy for inclusive STEAM ecosystems.

This broad and inclusive definition of a STEAM Coach ensures recognition of non-traditional career paths and real-life contributions that enrich STEAM learning. By welcoming diverse voices—especially those of women, girls, and underrepresented individuals—the STEAM Coach model fosters authentic leadership, mentorship, and connection that transcends formal qualifications.

4.5 Pathways to recognition and development

Recognising the diversity of STEAM Coaches' backgrounds and professional contexts, this Competence Profile supports flexible and inclusive pathways for skills development and recognition. These pathways reflect the importance of both formal and non-formal learning, experiential knowledge, and the value of diverse entry points into STEAM coaching roles.

One of the key instruments that will support this development is the Continuous Professional Development Programme (CPDP), designed within the STEAM Coach project. The CPDP will provide training content and a flexible learning structure that supports the acquisition and deepening of competence areas outlined in this profile. It aims to enable individuals to develop their capacities progressively and in alignment with the inclusive, gender-sensitive, and interdisciplinary goals of the STEAM Coach model. The CPDP will serve as a bridge between competence development and practical application in various educational and community contexts.

In addition to the CPDP, other development and recognition pathways may include:

- Participation in relevant training courses and professional workshops.
- Learning-by-doing in community projects, educational initiatives, or mentoring activities.
- Informal learning and self-directed study supported by the Competence Profile framework.
- Validation of prior experience and skills through peer or institutional recognition processes.

This multi-pathway approach ensures that STEAM Coaches can grow professionally in ways that reflect their lived experience, local opportunities, and learning preferences. It supports the overarching aim of the project to strengthen inclusive and gender-responsive STEAM education across Europe, particularly by empowering coaches who support the participation and success of women and girls in STEM-related TVET and beyond.

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