



Planting the Seeds of Agility: Adapting the Entrepreneurial Leadership Bridge Model (ELBM) for European K-12 Education

Domagoj Hruška¹, Delia Elena Mateias² and Oliver Christ^{3*}

¹ The University of Zagreb, HR-10000 Zagreb, Croatia

² (a) The Research Institute of the University of Bucharest (ICUB), Bucharest 50567, Romania

(b) The Ionian University, Corfu 49100, Greece,

³ The Eastern Switzerland University of Applied Sciences (OST), 9471 Buchs SG, Switzerland
dhruska@net.efzg.hr*

Abstract. This chapter adapts the Entrepreneurial Leadership Bridge Model (ELBM), originally designed for higher education, to the developmental realities of European primary and secondary (K-12) schooling. The adaptation responds to a growing recognition that current K-12 systems across the European Union remain anchored in a managerial-transmissive paradigm that privileges procedural compliance and standardised recall over the adaptive, opportunity-oriented competencies that contemporary economies demand. Drawing on developmental psychology, the European EntreComp framework, and the UNESCO AI Competency Framework for Students, the chapter reconceptualises the four ELBM competence domains, entrepreneurial cognition and value creation, self-leadership and emotional resilience, relational and team leadership, and intercultural and ethical leadership, for learners aged approximately six to eighteen. The staged-authenticity architecture of the original model is reframed as a three-level progression: micro-practice through classroom simulations and gamified learning; applied projects through service learning and cross-border virtual collaborations; and ecosystem immersion through school cooperatives and engagement with local innovation hubs. A dedicated analysis examines how artificial intelligence can function as a cognitive scaffold within each domain and level, supporting personalised feedback, scenario generation, and critical evaluation skills, whilst preserving the primacy of human judgement and ethical reasoning. The chapter proposes a K-12 competence rubric mapping all four domains against the three bridge levels, and aligns the framework explicitly with the European Skills Agenda. The contribution moves the discourse from education about entrepreneurship to education for entrepreneurial leadership, arguing that the formation of adaptive, ethically grounded agency must begin well before tertiary enrolment.

Keywords: Entrepreneurial Leadership, K-12 Education, ELBM, Entrecomp, Emotional Intelligence, AI In Education, Service Learning, Psychological Safety, European Skills Agenda.

1 Introduction: The Crisis of Relevance in European K-12 Education

European primary and secondary school systems are caught in a structural paradox. They have never been more broadly accessible, more thoroughly standardised, or more extensively assessed, yet employers, policymakers, and increasingly families report a widening gap between what schools certify and what young people actually need to navigate an economy defined by volatility, technological disruption, and radical uncertainty. The European Commission's Skills Agenda for Sustainable Competitiveness (2020) identifies this misalignment explicitly, calling for educational approaches that develop not only foundational literacy and numeracy but also transversal competencies: critical thinking, creativity, collaboration, adaptability, and the capacity to take initiative in conditions of incomplete information.

The roots of this misalignment lie in the institutional architecture inherited from the industrial era. The prevailing K-12 model was designed to produce predictable outputs: compliant workers equipped with domain-specific knowledge, trained to follow procedures, and assessed on their capacity to reproduce correct answers under timed conditions. This paradigm serves a managerial conception of competence, the capacity to administer established routines within stable systems. It was never intended to cultivate what this chapter terms an entrepreneurial leadership orientation: the disposition and capability to identify emergent opportunities, mobilise resources under constraint, tolerate ambiguity, exercise ethical judgement, and inspire collective action towards goals that do not yet have predetermined solutions.

The distinction between a managerial mindset and an entrepreneurial leadership mindset is not merely semantic; it is architecturally consequential for curriculum design, pedagogy, and assessment. A managerial orientation asks: 'What is the correct procedure?' An entrepreneurial leadership orientation asks: 'What is possible, what is needed, and how might we act responsibly despite not knowing the full picture?' When K-12 systems operate exclusively within the former register, they produce young people who are well-trained for a world of predictable problems but inadequately prepared for one characterised by emergent, ill-structured challenges, precisely the world they will inhabit.

This chapter addresses that deficit by adapting the Entrepreneurial Leadership Bridge Model (ELBM), a framework originally developed for European higher education (Hruška, Mateias, Seitz, and Christ, *in press*), to the developmental stages and institutional realities of K-12 schooling. The ELBM provides a structured architecture for competence formation across four interconnected domains and three progressively authentic levels of practice. Its core premise, that entrepreneurial leadership is not a genetic endowment but a developable capacity requiring deliberate pedagogical scaffolding, applies with at least equal force to younger learners, provided the model is recalibrated for cognitive, emotional, and social developmental trajectories.

The chapter proceeds as follows. Section 2 establishes the theoretical and policy foundations, linking the adaptation to the EntreComp framework and the European Skills Agenda. Section 3 reconceptualises each of the four ELBM domains for K-12 learners, with attention to developmental appropriateness. Section 4 presents the

staged-authenticity framework adapted for school environments. Section 5 critically examines how artificial intelligence can serve as a cognitive scaffold across domains and levels. Section 6 proposes a K-12 competence rubric. Section 7 discusses implementation considerations and limitations. The conclusion reflects on the broader significance of beginning entrepreneurial leadership formation in childhood rather than deferring it to post-secondary education.

2 Theoretical and Policy Foundations

2.1 From Education About Entrepreneurship to Education For Entrepreneurial Leadership

The distinction articulated by Lackéus (2015) between education about entrepreneurship and education for entrepreneurship has become a foundational reference point in the field. Education about entrepreneurship transmits declarative knowledge, definitions of business models, descriptions of market structures, narratives of celebrated founders. Education for entrepreneurship, by contrast, engages learners in the experiential processes of value creation: identifying needs, generating and testing ideas, mobilising resources, navigating setbacks, and reflecting on outcomes (e.g. Renko et al. 2015; Northouse, 2019; Schoemaker et al. 2018; Nabi et al. 2017; Kuratko, 2005). This chapter extends the distinction one step further, arguing for education for entrepreneurial leadership: pedagogical designs that deliberately integrate opportunity-oriented action with the relational, emotional, and ethical competencies required to lead others through uncertainty.

In the K-12 context, this reframing carries particular significance. Young learners are not miniature MBA candidates. The objective is not a venture creation in its commercial sense but rather the systematic cultivation of agency, the capacity to perceive one's environment as containing possibilities for constructive action, and the confidence and skill to pursue those possibilities collaboratively. Community problem-solving, classroom social enterprises, school cooperative projects, and cross-border virtual collaborations all constitute legitimate arenas for this formation, provided they are designed with appropriate developmental scaffolding and genuine psychological safety.

2.2 The EntreComp Framework and the European Skills Agenda

The European Entrepreneurship Competence Framework (EntreComp), published by the Joint Research Centre, provides an explicit policy architecture for embedding entrepreneurial competencies across all levels of education. EntreComp defines entrepreneurship broadly as the capacity to act upon opportunities and ideas and to transform them into value, social, cultural, or commercial, for others. It organises fifteen competencies across three areas: 'Ideas and Opportunities', 'Resources', and 'Into Action', each with an eight-level progression from foundation to expert.

The ELBM's four-domain structure maps productively onto EntreComp whilst addressing its acknowledged limitation: EntreComp is primarily a competency taxonomy rather than a pedagogical model. It specifies what learners should be able to do but is deliberately agnostic about how they should learn to do it. The K-12 ELBM adaptation fills this gap by providing both a developmental sequence (the three bridge levels) and a pedagogical logic (staged authenticity with embedded emotional and relational scaffolding). The European Skills Agenda's emphasis on transversal competencies, digital readiness, and lifelong learning further reinforces the case for beginning entrepreneurial leadership formation during compulsory schooling rather than reserving it for higher education electives.

2.3 Developmental Considerations: Cognitive, Emotional, and Social Trajectories

Adapting a model designed for university students to learners aged six to eighteen requires careful attention to developmental trajectories. Piaget's constructivist stage theory, Vygotsky's zone of proximal development, and more recent work in developmental cognitive neuroscience converge on several principles relevant to this adaptation. First, younger children operate primarily in concrete-operational modes; abstract reasoning about hypothetical markets or strategic options is developmentally premature before early adolescence. Second, emotional regulation is itself a developmental achievement, not a prerequisite; K-12 pedagogy must teach regulatory strategies rather than presuppose them. Third, social cognition, the capacity to understand others' perspectives, negotiate shared goals, and manage relational complexity, develops progressively and unevenly, requiring carefully graduated collaborative tasks.

These developmental realities do not preclude entrepreneurial leadership formation; they structure its sequencing. A six-year-old who identifies a problem in the school playground and proposes a solution to classmates is exercising proto-entrepreneurial cognition. A twelve-year-old who mediates a disagreement within a project team is practising relational leadership. A sixteen-year-old who evaluates the ethical implications of a school cooperative's sourcing decisions is engaging in the intercultural and ethical reasoning that the ELBM's Domain D targets. The key is to design each domain's learning activities at the appropriate level of abstraction, emotional demand, and relational complexity for the learner's developmental stage.

3 Reconceptualising the Four ELBM Domains for K-12 Learners

3.1 Domain A: Entrepreneurial Cognition and Value Creation

In the higher education ELBM, Domain A centres on opportunity recognition, business model logic, validation through experiments, and decision-making under uncertainty. For K-12 learners, these capacities are reconceptualised as community problem-identi-

fication, creative solution design, iterative prototyping, and structured reflection on outcomes. The commercial framing is replaced by a value-creation logic that encompasses social, environmental, and civic dimensions. A primary-school child who designs a system for reducing food waste in the school canteen is engaging in opportunity recognition and value creation no less authentically than a university student developing a minimum viable product, provided the pedagogical architecture ensures genuine agency rather than performative compliance.

Central to this reconceptualization is the replacement of the term ‘venture creation’ with ‘community problem-solving’ for younger age groups, transitioning to ‘social enterprise design’ and ‘school cooperative management’ in secondary education. This terminological shift is not cosmetic; it reflects a substantive reorientation towards forms of value creation that are immediately meaningful to young people and directly connected to their lived environments. The cognitive operations, divergent thinking, hypothesis formation, evidence-gathering, iterative refinement, remain structurally equivalent to those demanded in higher education, but their objects and contexts are recalibrated.

3.1.1 Classroom Illustrations: Domain A Across Age Groups

To render the reconceptualised Domain A concrete, consider the following classroom scenarios, each designed to activate entrepreneurial cognition and value creation at a developmentally appropriate level. These are not ornamental additions; they represent the specific pedagogical moves through which the abstract competency targets of the ELBM become observable, practicable, and assessable in K-12 settings.

Primary school (ages 6–10): The Schoolyard Audit

A class of eight-year-olds conducts a structured ‘problem walk’ through the school building and grounds, each child carrying a clipboard with three columns: ‘What I noticed’, ‘Who is affected’, and ‘My idea to make it better’. The exercise is deliberately open-ended: some children identify broken playground equipment, others notice that the library has no books in certain languages spoken by their classmates, and one group discovers that rainwater collects uselessly in the courtyard while the school garden lacks irrigation. Back in the classroom, the teacher facilitates a structured convergence process: children cluster their observations into themes, vote on which problem they find most compelling, and form small teams to develop ‘solution sketches’ using drawings, building blocks, and brief oral presentations. The critical pedagogical distinction from a conventional lesson is that the teacher does not specify the problem in advance. The children exercise genuine agency in defining what counts as a problem worth solving, the foundational act of opportunity recognition. The managerial alternative, ‘here is the problem; find the correct answer’, would produce compliance, not cognition.

Lower secondary school (ages 11–14): The Community Needs Mapping Sprint

A Year 7 class (age 12–13) in a medium-sized European city undertakes a three-week ‘Community Needs Mapping Sprint’. In the first week, student teams of four conduct semi-structured interviews with five community stakeholders each, a local shopkeeper, a retired resident, a parent of a young child, a municipal worker, and a fellow student from a different year group, using a simple interview protocol that asks: ‘What is one thing in this neighbourhood that could work better?’ and ‘If you could

change one thing, what would it be?’ In the second week, teams synthesise their findings using an adapted affinity-mapping technique: interview responses are transcribed onto sticky notes, clustered by theme, and prioritised using a two-axis matrix (‘How many people does this affect?’ versus ‘Could students realistically do something about this?’). In the third week, each team presents a one-page ‘Opportunity Brief’, a structured document identifying the need, the proposed value proposition, three assumptions that would need to be tested, and a simple plan for a first experiment. The teacher’s role shifts from content delivery to coaching: asking probing questions about the evidence behind each team’s claims, challenging assumptions, and modelling the iterative reasoning that distinguishes entrepreneurial cognition from linear problem-solving.

Upper secondary school (ages 15–18): The Constraint-Based Innovation Challenge

A class of sixteen-year-olds receives a deliberately constrained design brief: ‘Design a product or service that addresses social isolation among elderly residents in the school’s neighbourhood. Your total budget is €50. Your timeline is six weeks. You must involve at least one elderly person as a co-designer.’ The constraints are pedagogically intentional: they force students to engage with resource mobilisation under scarcity (a core entrepreneurial competency), stakeholder engagement (Domain C), and ethical considerations around working with vulnerable populations (Domain D). Teams progress through a structured cycle of problem definition, ideation, rapid prototyping (using low-cost materials or digital tools), user testing with actual elderly residents, and iterative refinement. The culminating assessment is not a written report but a ‘demo day’ presentation to a panel comprising the class teacher, a local social worker, and an elderly co-designer, who evaluate the solution’s feasibility, desirability, and social impact. This format mirrors the higher education ELBM’s emphasis on artefact-based assessment and external stakeholder feedback, but the problem domain, social isolation rather than market opportunity, reflects the civic and relational framing appropriate to K-12 entrepreneurial leadership.

3.2 Domain B: Self-Leadership and Emotional Resilience

Domain B is arguably the most consequential for K-12 adaptation. Emotional intelligence and self-regulation are not merely instrumental competencies that support entrepreneurial action; in childhood and adolescence, they are foundational developmental achievements that condition the possibility of all other learning. The higher education ELBM treats emotional self-awareness, resilience, and stress management as competencies to be developed alongside entrepreneurial cognition. In the K-12 version, these capacities must be foregrounded as pedagogical preconditions.

Psychological safety, the shared belief within a group that interpersonal risk-taking is safe (Edmondson et al. 2023; Edmondson, 1999), is not an optional enhancement in K-12 entrepreneurial leadership education; it is an architectural requirement. Children and adolescents cannot practise creative risk-taking, honest feedback, or productive failure in environments characterised by fear of ridicule, social exclusion, or punitive assessment. This means that building psychologically safe classroom cultures is itself a first-order pedagogical task, prerequisite to any meaningful work in Domains A, C, or D. Teachers must be trained not merely in facilitation techniques but in the relational

and emotional labour of creating and sustaining safe learning environments (e.g. Mateias et al., 2024; Mayer and Salovey, 1997; Goleman, 1998).

The developmental trajectory for Domain B moves from basic emotional vocabulary and simple regulation strategies (primary school), through self-monitoring and goal-directed persistence (lower secondary), to the capacity for sustained self-regulation under genuine ambiguity and the ability to model resilience for others (upper secondary). At each stage, the pedagogical emphasis is on normalising difficulty and setback as inherent to entrepreneurial processes rather than as evidence of failure.

3.2.1 Classroom Illustrations: Domain B Across Age Groups

Emotional resilience and self-leadership are not competencies that can be lectured into existence. They require repeated, low-stakes practice in environments where vulnerability is met with respect rather than ridicule. The following illustrations show how Domain B can be embedded in classroom routines at each developmental stage.

Primary school (ages 6–10): The Emotions Weather Station

Each morning, children in a primary classroom begin the day with a two-minute ‘Emotions Weather Station’ routine. A large poster on the wall displays four weather icons, sunny, partly cloudy, rainy, and stormy, each associated with a brief descriptor (‘I feel ready and calm’; ‘I feel okay but a bit unsure’; ‘Something is bothering me’; ‘I feel upset or frustrated’). Children place a clothespin with their name on the icon that matches their current state. The teacher does the same, modelling emotional self-disclosure. There is no requirement to explain; the act of noticing and labelling is the competency being practised. Later, during a problem-solving activity (Domain A), if a child becomes frustrated when their idea is not selected by the group, the teacher refers back to the Weather Station language: ‘It sounds like your weather has shifted to rainy. What do we know about what helps when it’s rainy?’ The child might choose a pre-agreed regulation strategy, taking three slow breaths, drawing for two minutes, or asking a ‘buddy’ to listen. The pedagogical point is that emotional regulation is treated as a learnable skill, practised daily, rather than as a character trait that children either possess or lack.

Lower secondary school (ages 11–14): The Setback Protocol

During a six-week project-based learning unit (linked to Domain A), the teacher introduces a structured ‘Setback Protocol’ at the start of the second week. Students are told that each team will inevitably encounter obstacles, a prototype that fails to work, a stakeholder who declines to participate, a team disagreement about direction, and that these setbacks are not evidence of poor performance but constitute the raw material of entrepreneurial learning. When a setback occurs, the team completes a structured ‘Setback Card’: ‘What happened?’, ‘How did it feel?’, ‘What did we try?’, ‘What will we do differently?’. Cards are shared during weekly whole-class ‘Setback Circles’ in which teams briefly present their most productive failure. The teacher facilitates using appreciative framing: the focus is on what was learned and how the team adapted, not on what went wrong. Over time, the protocol normalises difficulty as intrinsic to value creation and builds the reflective habit that connects experienced frustration to deliberate strategic adjustment, the behavioural core of resilience.

Upper secondary school (ages 15–18): The Leadership Narrative Portfolio

Students in their final two years of secondary school maintain a cumulative ‘Leadership Narrative Portfolio’ that tracks their self-leadership development across multiple projects and experiences. The portfolio requires three types of entry: Critical Incident Reflections (structured analyses of moments where the student faced ambiguity, pressure, or failure and had to choose how to respond), Goal-Setting and Review Cycles (quarterly self-assessments against personally set development targets with evidence of adjustment), and Peer Perspective Entries (written feedback from teammates on the student’s self-regulation, reliability, and emotional presence under pressure). The portfolio is assessed not on the absence of difficulty but on the quality of the student’s reflection and the evidence of developmental trajectory over time. A student who documents three consecutive projects in which they struggled with receiving critical feedback, describes the strategies they tried, and provides peer evidence that their responsiveness improved demonstrates higher competence than one who simply reports that everything went smoothly. This assessment logic deliberately inverts the managerial paradigm in which difficulty is penalised and smooth execution is rewarded.

3.3 Domain C: Relational and Team Leadership

The relational competencies targeted by Domain C, motivating and coordinating teams, conflict handling, feedback practices, and influence without formal authority, are deeply relevant to K-12 contexts but must be graduated to reflect social-cognitive development. Primary-school learners can practise structured turn-taking, active listening, and simple feedback protocols. Lower-secondary students can take on rotating leadership roles within project teams and begin to negotiate conflicting priorities. Upper-secondary students can lead sustained collaborative ventures involving external stakeholders, managing the relational complexity this entails.

A critical distinction from the higher education model is the explicit embedding of peer mentoring and cross-age leadership. In K-12 settings, older students mentoring younger ones creates a natural ‘leadership laboratory’ that is both developmentally appropriate and intrinsically motivating. A fourteen-year-old who coaches a group of ten-year-olds through a design challenge is practising precisely the relational leadership competencies that Domain C targets, in a context far more authentic than a simulated boardroom scenario.

3.3.1 Classroom Illustrations: Domain C Across Age Groups

Relational and team leadership competencies are developed through structured social practice, not through instruction about leadership theories. The following scenarios demonstrate how collaborative competencies can be made visible, practicable, and assessable at each developmental stage.

Primary school (ages 6–10): The Rotating Facilitator

In a primary classroom, group work sessions of twenty minutes are structured so that one child in each group of four serves as the ‘Facilitator’ for that session, identified by a coloured lanyard. The Facilitator’s role is defined by three concrete tasks printed on

a card: ‘Make sure everyone speaks’, ‘Ask the quiet person what they think’, and ‘Summarise what the group decided’. Roles rotate with every session so that each child practises facilitation approximately once per week. After each session, the teacher leads a brief debrief: ‘Facilitators, what was the hardest part of your job today?’ Children typically report that getting a dominant peer to share speaking time was difficult, or that summarising was harder than expected. These reflections make the relational work of leadership visible and discussable. Over a school year, children accumulate substantial practice in the micro-behaviours that constitute collaborative leadership: turn-allocation, perspective-solicitation, synthesis, and the management of asymmetric participation.

Lower secondary school (ages 11–14): The Team Charter and Conflict Log

At the outset of any multi-week project (linked to Domain A), student teams of four to five are required to draft a ‘Team Charter’: a one-page agreement specifying how they will make decisions (majority vote, consensus, or delegated authority depending on the issue), how they will distribute and rotate roles (project lead, researcher, communicator, and quality reviewer, rotating fortnightly), what constitutes fair contribution and how they will address perceived imbalance, and how they will handle disagreements (a three-step protocol: direct conversation, mediated conversation with a peer mediator, and escalation to the teacher). Critically, the charter is a living document: teams revisit it at a midpoint check-in and amend any clauses that proved unworkable. Alongside the charter, teams maintain a ‘Conflict Log’, a shared document in which any team member can record a disagreement, the process used to address it, and the outcome. The log is not graded on the absence of conflict but on the quality of resolution processes. A team that records three conflicts, each resolved through progressively more sophisticated negotiation, demonstrates stronger Domain C competence than a team that reports no conflicts (which often indicates suppression rather than absence).

Upper secondary school (ages 15–18): The Cross-Age Coaching Programme

Upper-secondary students are paired with teams of lower-secondary students working on their own Domain A projects. The older student serves not as a team member but as a ‘Leadership Coach’: observing team meetings, providing structured feedback using a simple rubric (covering facilitation quality, participation equity, and conflict-handling), and debriefing with the younger team after each session. The coaching role requires upper-secondary students to exercise influence without positional authority, they cannot direct the younger team’s work, only support their collaborative processes. This asymmetry replicates a core condition of authentic leadership: the need to guide, motivate, and develop others through relational skill rather than hierarchical power. Coaches maintain a reflective journal documenting their observations, the feedback strategies they employed, and their evolving understanding of what helps and hinders team functioning. The journal, combined with feedback from the coached team, constitutes the primary assessment evidence for Domain C, at Bridge Level 3.

3.4 Domain D: Intercultural and Ethical Leadership

Europe’s linguistic, cultural, and institutional diversity provides both the rationale and the resource base for intercultural competence development in K-12 education. The

higher education ELBM targets intercultural collaboration, institutional awareness, ethical reasoning, and sustainability trade-offs. For younger learners, these are reconceptualised as: understanding and appreciating cultural differences; recognising fairness and justice in everyday situations; considering the consequences of one's actions for others; and, progressively, engaging with systemic ethical questions including sustainability, equity, and the responsible use of technology.

European programmes such as eTwinning (now integrated into the European School Education Platform) provide established infrastructure for cross-border virtual collaboration among schools. These platforms enable K-12 learners to work in multinational teams on shared projects, practising intercultural communication, perspective-taking, and collaborative problem-solving in authentic contexts. When integrated into the ELBM's staged-authenticity architecture, such collaborations move beyond cultural exchange towards genuine intercultural co-creation of value.

3.4.1 Classroom Illustrations: Domain D Across Age Groups

Intercultural and ethical leadership competencies require encounters with genuine difference, of perspective, of cultural assumption, of moral reasoning, rather than abstract instruction about diversity. The following scenarios illustrate how such encounters can be structured at each developmental stage within European K-12 settings.

Primary school (ages 6–10): The Fairness Forum

Once per fortnight, a primary classroom holds a fifteen-minute 'Fairness Forum' in which the teacher presents a short scenario involving a distributive or procedural dilemma drawn from school life. For example: 'The class has been given ten extra minutes of outdoor play time, but it is raining. Half the class wants to use the time for indoor games; the other half wants to save the time for a sunny day. What should happen, and why?' Children discuss in pairs, then share their reasoning with the class. The teacher's role is not to adjudicate but to surface the different principles underlying each position: immediate fairness versus deferred benefit, majority preference versus minority consideration, individual wants versus collective welfare. Over the course of a year, children build a working vocabulary for ethical reasoning, 'fair to whom?', 'who decides?', 'what would happen if everyone did this?', that provides the foundation for more complex moral reasoning in later years. Cultural dimensions are introduced through pen-pal exchanges with partner schools in other European countries, where children discover that their peers' Fairness Forum discussions produce different conclusions, prompting reflection on why reasonable people might disagree.

Lower secondary school (ages 11–14): The eTwinning Ethical Dilemma Exchange

Two partner classes, one in, say, Croatia and one in Finland, collaborate on an eTwinning project structured around ethical dilemmas with no single correct resolution. Each fortnight, one class sends the other a contextualised dilemma drawn from their local environment: 'A family-run bakery in our town cannot afford to pay the new minimum wage. Should they reduce staff, raise prices, or accept lower profits? Who is affected by each choice?' The receiving class analyses the dilemma from their own cultural and economic perspective, then the two classes hold a joint video-call discussion in which they compare their reasoning. The pedagogical value lies in the structured encounter with legitimate disagreement grounded in different institutional, economic,

and cultural contexts. Students learn that ethical reasoning is not about finding the universally correct answer but about justifying decisions transparently, considering affected stakeholders, and understanding how context shapes what counts as 'fair' or 'responsible'. This moves beyond the superficial multiculturalism of food festivals and flag displays towards genuine intercultural ethical deliberation.

Upper secondary school (ages 15–18): The Responsible Innovation Audit

Students engaged in a Bridge Level 3 project, a school cooperative, a social enterprise prototype, or a cross-border virtual venture, are required to conduct a 'Responsible Innovation Audit' of their own initiative before presenting to the external panel. The audit follows a structured framework with four dimensions: Impact (who benefits from this initiative, and who might be disadvantaged or excluded?), Sustainability (what are the environmental and resource implications if this initiative were scaled?), Equity (does this initiative reproduce or challenge existing inequalities?), and Technology Ethics (if the project uses digital tools or AI, have we considered data privacy, algorithmic bias, and informed consent?). Each dimension requires the team to gather evidence, not merely to assert good intentions, and to present this evidence alongside their project outcomes. The audit is assessed by the external panel, which includes at least one community member affected by the project's domain. The Responsible Innovation Audit operationalises Domain D at its highest K-12 level: it requires students to exercise ethical reasoning under genuine consequence, integrating intercultural awareness with sustainability analysis and technology governance in the context of their own real-world initiative.

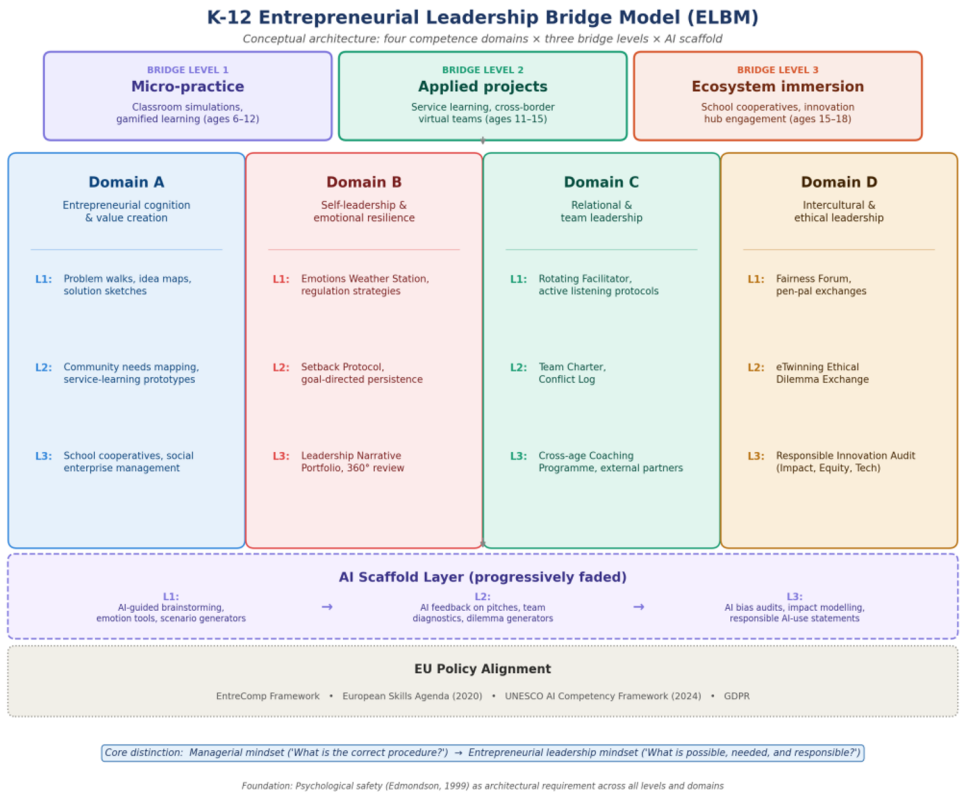


Fig. 1. K-12 ELBM Conceptual Architecture: four competence domains mapped across three bridge levels with integrated AI scaffold and EU policy alignment. (adapted from Hruška, Mateiaş, Seitz, and Christ. in press, Routledge)

4 The Staged Authenticity Framework for K-12 Environments

The original ELBM organises competence development across three bridge levels of increasing authenticity. The K-12 adaptation preserves this architecture whilst recalibrating each level for school environments, younger learners, and the institutional constraints of compulsory education systems.

4.1 Bridge Level 1: Micro-Practice (Classroom Simulations and Gamified Learning)

At the micro-practice level, learners engage with entrepreneurial leadership competencies in low-stakes, teacher-facilitated settings within the classroom (e.g. Xie et al. 2025). Activities include design-thinking challenges adapted for age-appropriate prob-

lems (e.g., improving the school library, reducing playground conflicts), gamified decision-making exercises, structured role-plays in which students practise facilitation, feedback, and conflict resolution, and guided journaling for emotional self-awareness. The emphasis is on behavioural rehearsal within a psychologically safe environment. Assessment at this level is formative: observation checklists, self-reflection prompts, and teacher-mediated feedback, not graded examinations.

Gamification at Level 1 serves a specific pedagogical function: it provides the bounded consequence structures that allow young learners to experience decision-making under uncertainty without disproportionate emotional risk. A simulation in which students allocate limited resources to competing classroom projects teaches opportunity cost and trade-off reasoning; the gamified frame ensures that ‘losing’ is instructive rather than punitive.

4.2 Bridge Level 2: Applied Projects (Service Learning and Cross-Border Virtual Collaborations)

At the applied-projects level, learners move beyond classroom simulations to engage with real needs in their school and community. Service-learning projects, designing a recycling initiative for the school neighbourhood, organising a cultural festival for the local community, developing an app prototype to assist elderly residents, provide the authentic contexts in which all four domains are activated simultaneously. The crucial pedagogical principle is that projects involve genuine stakeholders who are affected by the outcomes, creating real but bounded accountability.

Cross-border virtual collaborations, facilitated through the European School Education Platform (formerly eTwinning), Erasmus+ school partnerships, or bilateral agreements, introduce intercultural complexity at this level. Teams composed of students from different countries must negotiate language differences, divergent cultural norms, and varying institutional expectations, precisely the conditions under which intercultural and ethical leadership competencies (Domain D) become visible and developable. Rotating leadership roles within these international teams ensure that all participants practise relational leadership (Domain C) rather than defaulting to the most linguistically confident member.

4.3 Bridge Level 3: Ecosystem Immersion (School Cooperatives and Innovation Hub Engagement)

At the highest level of authenticity, upper-secondary students engage with real institutional and economic ecosystems. School cooperatives, student-governed enterprises that produce goods or services for the community, provide sustained contexts for practising all four ELBM domains under conditions of genuine consequence. Students manage budgets, negotiate with suppliers, resolve internal governance disputes, report to external stakeholders, and confront ethical dilemmas involving sustainability, fairness, and resource allocation.

Interaction with local innovation hubs, maker spaces, social enterprises, and municipal authorities extends the learning beyond the school's institutional boundaries. Mentoring relationships with local entrepreneurs, participation in youth innovation competitions, and partnerships with civic organisations provide external validation and real-world feedback that no classroom simulation can replicate. Critical safeguards, faculty supervision, clear psychological safety protocols, bounded financial exposure, and explicit ethical guidelines, ensure that ecosystem immersion develops competence without exposing young people to disproportionate risk.

5 Artificial Intelligence as a Cognitive Scaffold for K-12 Entrepreneurial Leadership

The role of artificial intelligence in the K-12 ELBM warrants particular care. The higher education model positions AI as both a pedagogical tool and a competence domain; this dual framing applies equally to K-12 education but requires additional safeguards given the developmental vulnerabilities and regulatory protections surrounding younger learners.

5.1 AI as Pedagogical Scaffold

Generative AI tools can enrich entrepreneurial leadership education at each bridge level by performing three functions: expanding the range of scenarios and stimuli available for practice, providing timely formative feedback that would otherwise depend entirely on teacher availability, and enabling personalised learning pathways that accommodate diverse developmental trajectories within a single classroom. At Level 1, AI-generated scenario prompts can supply branching 'What if?' challenges that test divergent thinking. At Level 2, AI can synthesise user-research data from service-learning projects, generate counter-arguments for pitch rehearsals, and provide automated feedback on written reflections. At Level 3, AI-powered data analysis tools can help student cooperatives model impact scenarios and evaluate strategic options.

However, the scaffold metaphor carries a critical implication that is often overlooked: scaffolds are temporary structures designed to be removed as the building becomes self-supporting. AI integration must be designed so that learners progressively develop the capacity to perform the scaffolded operations independently. This means that each use of AI must be accompanied by explicit metacognitive reflection: What did the AI do? Could I have done it without the tool? What judgement did I need to exercise that the AI could not? This reflective protocol is essential to prevent the emergence of cognitive dependency, a risk that is particularly acute for younger learners who have not yet consolidated the underlying competencies that AI tools augment.

5.2 AI as a Competence Domain: Developing AI Agency

Following the UNESCO (2024) AI Competency Framework for Students, the K-12 ELBM treats fluency in human–AI collaboration as a competence domain in its own

right rather than a supplementary technical skill. ‘AI agency’, the capacity to critically evaluate algorithmic outputs, understand system limitations and biases, deploy AI tools strategically, and navigate the ethical complexities of automated decision-making, must be cultivated progressively across the three bridge levels.

At Level 1, learners explore what AI can and cannot do through guided experimentation with age-appropriate tools, developing basic prompt literacy and output evaluation skills. At Level 2, they use AI as a collaborative partner in project work, documenting their prompts, evaluating outputs against primary evidence, and reflecting on the quality of AI-assisted versus unassisted reasoning. At Level 3, they engage with AI governance questions directly: conducting bias audits of algorithmic recommendations, producing responsible AI-use statements for their cooperative ventures, and debating the ethical boundaries of automated decision-making in their specific project contexts.

5.3 Safeguards and Ethical Boundaries

AI integration in K-12 settings must comply with stringent data-protection and child-safeguarding requirements, including the EU General Data Protection Regulation (GDPR) and national legislation governing minors’ digital interactions. Schools deploying AI tools within the ELBM framework must ensure that student data is not used for training commercial models, that algorithmic outputs are reviewed by qualified educators before being used for assessment purposes, and that learners understand the privacy implications of their interactions with AI systems. Teacher training must include not only technical fluency but also the capacity to model critical, ethical engagement with AI, demonstrating in practice the ‘AI agency’ that the framework asks students to develop.

6 K-12 Competence Rubric: Domains A–D × Bridge Levels 1–3

Table 1 presents an indicative competence rubric mapping the four reconceptualised domains against the three bridge levels for K-12 learners. For each cell, indicative performance descriptors and evidence artefacts are provided. The rubric is intended as a flexible design tool for curriculum developers and school leaders rather than a rigid assessment checklist.

Table 1. K-12 Competence Rubric: Domains A–D × Bridge Levels 1–3 (indicative performance descriptors and evidence artefacts).

Competence Domain	Bridge Level 1: Micro-Practice	Bridge Level 2: Applied Projects	Bridge Level 3: Ecosystem Immersion

Domain A: Entrepreneurial Cognition & Value Creation	Identifies everyday problems in school or neighbourhood; brainstorms multiple solutions; draws simple 'idea maps'. Evidence: problem diary; idea-board poster.	Designs and tests a service-learning prototype addressing a community need; gathers user feedback; iterates on design. Evidence: project journal; user-interview notes; revised prototype.	Participates in a school cooperative, social enterprise, or cross-border virtual venture; presents impact evidence to an external panel. Evidence: venture portfolio; impact metrics; pitch recording.
Domain B: Self-Leadership & Emotional Resilience	Names and labels own emotions using age-appropriate vocabulary; practises breathing/pause strategies; keeps a short reflection journal. Evidence: feelings log; teacher observation notes.	Sets personal learning goals; monitors progress and adjusts strategy after setbacks; gives and receives peer feedback constructively. Evidence: goal-tracking sheet; reflection essay; peer feedback form.	Demonstrates sustained self-regulation during a multi-week project under ambiguity; models recovery from failure for younger peers; articulates personal growth narrative. Evidence: mentoring log; 360° peer review; reflective portfolio.
Domain C: Relational & Team Leadership	Takes turns facilitating a small-group activity; practises active listening; uses structured feedback prompts ('I noticed... I wonder...'). Evidence: facilitation checklist; teacher observation.	Co-leads a cross-class or cross-school project team; negotiates role distribution; manages minor conflicts using a shared team charter. Evidence: team charter; conflict-resolution log; peer evaluation.	Leads a diverse team through a sustained external collaboration (e.g., with a local NGO or innovation hub); coaches peers; negotiates stakeholder trade-offs. Evidence: stakeholder feedback; team retrospective report; coaching journal.

Domain D: Intercultural & Ethical Leadership	Explores cultural similarities and differences through structured classroom exchanges (pen pals, video calls); discusses fairness in everyday scenarios. Evidence: cultural comparison poster; ethics scenario worksheet.	Collaborates in a virtual cross-border team (e.g., eTwinning); adapts communication for cultural context; analyses an ethical dilemma with multiple stakeholders. Evidence: intercultural reflection diary; ethical decision brief.	Demonstrates responsible decision-making in a project with real community impact; addresses sustainability and equity trade-offs; produces a ‘responsible innovation’ statement. Evidence: impact assessment; governance brief; responsible AI-use statement (where applicable).
--	---	---	--

Table 2 complements the competence rubric by specifying how AI scaffolding can be integrated within each domain across the three bridge levels. The design intention is that AI support is deliberately faded as learners advance through the levels, consistent with the scaffold-removal principle articulated in Section 5.

Table 2. AI Scaffold Integration by Domain and Bridge Level.

Competence Domain	AI Scaffold Integration Across Bridge Levels
Domain A: Entrepreneurial Cognition	Level 1: AI-assisted brainstorming tools (e.g., guided prompt chains); simple chatbot Q&A to explore ‘What if?’ scenarios; teacher-supervised AI output review. Level 2: AI supports customer/user-research synthesis; generates counter-arguments for stress-testing ideas; provides formative feedback on written pitches. Students document prompts and verify outputs. Level 3: AI used for data analysis and impact modelling; students critically evaluate AI recommendations against primary evidence; produce a responsible AI-use statement as part of the venture portfolio.
Domain B: Self-Leadership & Resilience	Level 1: Guided breathing and mindfulness apps with AI-personalised prompts; emotion-recognition journaling tools with scaffolded vocabulary suggestions. Level 2: AI-generated reflective prompts tailored to project milestones; automated goal-tracking dashboards; AI-supported peer-feedback summaries. Level 3: AI-

facilitated 360° feedback aggregation; personalised resilience analytics; AI-generated developmental narratives for portfolio reflection.

Domain C: Relational & Team Leadership	Level 1: Collaborative digital whiteboards with AI-suggested discussion prompts; role-play scenario generators for practising facilitation and turn-taking. Level 2: AI-supported team-health diagnostics (e.g., sentiment analysis of team reflections); automated meeting-summary tools; conflict-pattern alerts for teacher review. Level 3: AI-enhanced stakeholder simulation for negotiation practice; network-mapping tools; AI-generated team performance dashboards for retrospective analysis.
Domain D: Intercultural & Ethical Leadership	Level 1: AI-powered cultural-exchange matching (penal pairing by interest and language); interactive fairness-scenario generators with branching outcomes. Level 2: AI translation and cultural-context tools for cross-border collaboration; AI-assisted ethical-dilemma generators calibrated to age and complexity level. Level 3: AI bias-audit exercises (students evaluate an algorithm for fairness); AI-supported impact modelling for sustainability trade-offs; co-creation of responsible AI policy documents.

7 Implementation Considerations, Limitations, and Future Directions

7.1 Teacher Development and Institutional Culture

The K-12 ELBM cannot function as a bolt-on programme appended to existing curricula; it requires a shift in pedagogical culture that must be supported by sustained teacher professional development. Teachers accustomed to transmissive instruction and summative assessment need structured opportunities to develop facilitation skills, coaching competencies, and the emotional labour capacity required to maintain psychologically safe learning environments. This professional development must itself be experiential, modelling the staged-authenticity approach that teachers are expected to enact with students, rather than consisting of didactic workshops about active pedagogy. In this regard, by completing acknowledged models in entrepreneurial leadership and emotional intelligence, teachers have the opportunity to explore their individual and/or collective profiles, and learn how to integrate evidence-based findings both into personal development and their teaching practice.

7.2 7.2 Assessment Realignment

Conventional K-12 assessment architectures, dominated by written examinations and standardised tests, are fundamentally misaligned with entrepreneurial leadership competence. If schools assess primarily through recall-based testing, they signal that procedural knowledge matters more than adaptive capability, regardless of what the curriculum formally espouses. Realigning assessment requires portfolio-based approaches, structured observation of collaborative processes, rubric-guided peer and self-evaluation, and external stakeholder feedback at higher bridge levels. This realignment is politically sensitive in national systems where examination results carry high stakes for school accountability and student progression, and must be navigated with attention to institutional realities.

7.3 Equity and Inclusion

Entrepreneurial leadership education carries an inherent risk of reinforcing existing inequalities if it privileges socially confident, linguistically fluent, and economically advantaged students. The K-12 ELBM must be explicitly designed for inclusion: ensuring that psychologically safe environments are genuinely safe for marginalised and neurodivergent learners; providing scaffolding for students who lack social capital or family exposure to entrepreneurial cultures; and assessing competence development through diverse evidence formats that do not systematically disadvantage particular groups. Equity is not an ancillary consideration but a design constraint that must inform every element of the framework.

7.4 Limitations

Several limitations must be acknowledged. First, the K-12 ELBM adaptation presented here is a conceptual and design-level contribution; it has not yet been empirically validated across diverse European school systems. Second, the model assumes a degree of institutional flexibility and teacher autonomy that may not be available in all national curricular systems, particularly those with highly centralised examination regimes. Third, the integration of AI as both scaffold and competence domain raises unresolved questions about equitable access to technology, the pace of regulatory development, and the long-term cognitive effects of AI-mediated learning on developing minds. Future research should prioritise longitudinal implementation studies in diverse national contexts, comparative analysis of AI scaffold effectiveness across developmental stages, and systematic equity audits of entrepreneurial leadership programmes in K-12 settings.

8 Conclusion

The argument of this chapter rests on a conviction with significant policy implications: that the early formation of entrepreneurial leadership capacity is a developmental process that should not be deferred until higher education. The competencies at the heart of the Entrepreneurial Leadership Bridge Model (ELBM), entrepreneurial cognition, emotional resilience, relational leadership, and intercultural ethical reasoning, are not postgraduate luxuries. They are foundational capacities whose development begins in childhood and whose absence, if left unaddressed through the K-12 years, creates deficits that university programmes can only partially remediate.

The adapted framework presented here offers European K-12 systems a structured but flexible architecture for moving from education about early entrepreneurship, a curricular appendix that describes what entrepreneurs do, to education for entrepreneurial leadership: a pervasive pedagogical orientation that develops the agency, resilience, relational skill, and ethical grounding that young people need to act constructively in a world of radical uncertainty. The staged-authenticity model ensures that this early formation proceeds at developmentally appropriate pace, from classroom micro-practices through service-learning projects to genuine ecosystem engagement. The integration of artificial intelligence as both scaffold and competence domain positions the framework within the technological realities of contemporary education whilst insisting on the irreducible primacy of human judgement and ethical responsibility (e.g. Xie et al. 2025).

The seeds of agility, adaptability, and ethically grounded agency are best planted early. European K-12 education has the institutional reach, the policy mandate, and, with frameworks such as the ELBM, an emerging pedagogical architecture to prioritize and undertake this cultivation. This research endeavours to authentically study and convert entrepreneurial business leadership, planting early the seeds of agile entrepreneurship into k-12 practices for aspiring educational leaders. What remains is the collective will to move beyond the managerial paradigm, to accept that preparing young people for a world of predictable procedures is no longer sufficient, and to invest instead in the sustained, developmentally informed, and emotionally intelligent formation of entrepreneurial leaders.

Acknowledgments. Dr. Mateiaș D.E. has been participated as co-author in this research under the research project „Patterns of Intercultural Leadership for agile organizations”, contract no. 636/03.02.2026, the University of Bucharest – Research Institute of the University of Bucharest (ICUB).

References

1. Edmondson, A.C. (1999) ‘Psychological safety and learning behavior in work teams’, *Administrative Science Quarterly*, 44(2), pp. 350–383.
2. Edmondson, A.C. and Bransby, D.P. (2023) ‘Psychological safety comes of age: Observed themes in an established literature’, *Annual Review of Organizational Psychology and Organizational Behavior*, 10, pp. 55–78.

3. European Commission (2020) European Skills Agenda for Sustainable Competitiveness, Social Fairness and Resilience. Brussels: Publications Office of the European Union.
4. Goleman, D. (1998) Working with Emotional Intelligence. New York: Bantam Books.
5. Hruška, D., Mateiaș, D.E., J. Seitz, and O. Christ (in press). Sustainability and Innovation in the EU: Resilience in Education, Business and Law, Book Chapter “Conceptualizing Entrepreneurial Leadership in EU Education: Bridging Theory and Practice”, Routledge.
6. Kuratko, D.F. (2005) ‘The emergence of entrepreneurship education: Development, trends, and challenges’, *Entrepreneurship Theory and Practice*, 29(5), pp. 577–590.
7. Lackéus, M. (2015) *Entrepreneurship in Education: What, Why, When, How*. OECD Entrepreneurship360 Background Paper. Paris: OECD.
8. Mateiaș, D. E., Low, G., and Hammett, R. (2024). A transformative model for teaching and learning emotional intelligence for aspiring entrepreneurial leaders. *Journal of the International Council for Small Business*, 6(2), pp. 206-215
9. Mayer, J.D. and Salovey, P. (1997) ‘What is emotional intelligence?’, in Salovey, P. and Sluyter, D.J. (eds.) *Emotional Development and Emotional Intelligence: Educational Implications*. New York: Basic Books, pp. 3–34.
10. Nabi, G., Liñán, F., Fayolle, A., Krueger, N. and Walmsley, A. (2017) ‘The impact of entrepreneurship education in higher education: A systematic review and research agenda’, *Academy of Management Learning & Education*, 16(2), pp. 277–299.
11. Northouse, P.G. (2019) *Leadership: Theory and Practice*. 8th edn. Thousand Oaks, CA: SAGE.
12. Piaget, J. (1952) *The Origins of Intelligence in Children*. New York: International Universities Press.
13. Renko, M., El Tarabishy, A., Carsrud, A.L. and Brännback, M. (2015) ‘Understanding and measuring entrepreneurial leadership style’, *Journal of Small Business Management*, 53(1), pp. 54–74.
14. Schoemaker, P.J.H., Heaton, S. and Teece, D.J. (2018) ‘Innovation, dynamic capabilities, and leadership’, *California Management Review*, 61(1), pp. 15–42.
15. UNESCO (2024) *AI Competency Framework for Students*. Paris: UNESCO.
16. Vygotsky, L.S. (1978) *Mind in Society: The Development of Higher Psychological Processes*. Cambridge, MA: Harvard University Press.
17. Xie, Y., Wang, H. and Garcia, J.M. (2025) ‘Generative artificial intelligence in entrepreneurship education enhances entrepreneurial intention through self-efficacy and university support’, *Scientific Reports*, 15, 9545.

Open Access This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License (<http://creativecommons.org/licenses/by-nc-nd/4.0/>), which permits any noncommercial use, sharing, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if you modified the licensed material. You do not have permission under this license to share adapted material derived from this chapter or parts of it.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

