

INNOVATIVE PEDAGOGIES FOR SUSTAINABLE MINDSET FORMATION IN HIGHER EDUCATION: THE METHOD-COMPETENCY-MINDSET MODEL

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ABSTRACT

Higher education plays a key role in preparing future professionals capable of responding to the challenges of sustainable development. This paper explores how innovative pedagogies can foster the development of human capital by facilitating transformative learning experiences. Drawing on research in education for sustainable development, sustainable competencies, and sustainable thinking, the paper presents the Method-Competence-Mindfulness (MCM) model as an integrative conceptual framework. The model explains how innovative learning methods stimulate the acquisition of competencies and support deep changes in values, attitudes and identities. The paper argues that management and related education should be seen not only as professional training, but also as a driver of social change. The MCM model provides recommendations for aligning pedagogical practice with broader sustainable development and regional development goals, positioning universities as drivers of transformation towards a responsible and sustainable future.

KEY WORDS: *education for sustainable development, sustainability competencies, sustainability mindset, transformative learning, regional development.*

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Introduction

Changes in global economic, environmental and social systems are increasingly prompting higher education institutions to review and rethink the methods of training future professionals. Sustainable development requires graduates who are not only technically and analytically competent, but also capable of ethical judgment, systems thinking, and understanding the long-term consequences of their decisions (Cai, Wolff, 2022; Hasanova, Safarli, 2024). In management and social sciences, universities have a particular responsibility, as the values formed during education often influence how future managers and policymakers shape regional and international development trajectories (Probst, 2022; Mokski et al., 2023).

Traditional, lecture-based forms of instruction rarely provide the reflective and practice-oriented experiences needed for cultivating sustainability-oriented thinking (Araneo, 2024; Bucea-Manea-Țoniș et al., 2024). As a result, there is a growing demand for pedagogical approaches that foster deep learning, empathy, collaboration, and the ability to address challenges (Vilmala et al., 2022; Thoriq, Mahmudah, 2023). Methods such as flipped (inverted) learning, gamification and challenge-based learning (CBL) have shown potential in this regard by supporting student autonomy, encouraging active participation, and linking learning to authentic problem-solving contexts (Kaya, Ercag, 2023; Manzano-León et al., 2021; Martínez-Acosta et al., 2022; Rao et al., 2022; Turosu, 2024). Beyond improving skills, these pedagogies create the ability for

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students not only to reflect on corporate social responsibility, but to recognise practices such as greenwashing (Álvarez-García, Sureda-Negre, 2023).

Accordingly, innovative methods integrated into the learning process can serve as catalysts for developing a sustainability-oriented mindset among future professionals. Such a mindset, grounded in responsibility, systems thinking and ethical reasoning, is an essential component of sustainability-oriented human capital, and is recognised as a factor driving regional competitiveness and resilience (Mokski et al., 2023; Bucea-Manea-Țoniș et al., 2024). By bringing together perspectives from higher education, sustainability studies and regional development, this paper seeks to contribute to ongoing discussions about the role of education in promoting responsible leadership and supporting regional sustainability transitions.

The aim of the research is to conceptualise how innovative learning methods can stimulate sustainability competencies and mindset development, contributing to responsible leadership and sustainable regional development.

1. The theoretical background

Education for Sustainable Development (ESD) has become a leading element of modern higher education. Its ambition is to prepare students who not only understand sustainable development issues, but are also able to act on existing challenges (Cai, Wolff, 2022; Hasanova, Safarli, 2024). ESD encourages and even requires going beyond disciplinary boundaries. This is achieved by integrating systems, predictive and normative thinking, collaboration, and strategic action into learning outcomes. It links cognitive development with ethical and responsible professional behaviour (Mokski et al., 2023; Bucea-Manea-Țoniș et al., 2024).

Thoriq and Mahmudah (2023) and Araneo (2024) state that the transformative potential of ESD is most clearly realised when learning is organised in a way that forces students to question assumptions, reflect on values, and explore alternative futures, rather than simply receiving information. This method is particularly significant in fields where students routinely navigate trade-offs between economic performance, social justice and environmental integrity, which are at the heart of the sustainability dilemma (Bucea-Manea-Țoniș et al., 2024).

Despite this increasing acknowledgement and strategic imperative, the practical implementation of SDR remains insufficient. Reviews note recurring obstacles, including fragmented curricula, limited interdisciplinarity, weak competency assessment and insufficient pedagogical innovation, all of which limit the extent to which programmes can support genuine transformation (Probst, 2022; Vilimala et al., 2022). Overcoming these constraints requires sustained institutional support and the active use of learner-centered pedagogies that promote participation, collaboration and reflection, conditions essential for developing sustainability-oriented human capital relevant to regional development (Probst, 2022; Mokski et al., 2023).

The roles of teachers and innovative pedagogical methods are crucial in this process. Approaches such as flipped learning, gamification and challenge-based learning (CBL) offer learning environments that emphasise autonomy, collaboration and applied problem solving (Manzano-León et al., 2021; Kaya, Ercag, 2023). Research shows that well-structured CBL formats can enhance motivation, strengthen the relevance of learning, and improve knowledge transfer (Martínez-Acosta et al., 2022; Galdames-Calderón et al., 2024).

In addition to these established active formats, pedagogies based on design, community engagement and advanced technology are increasingly discussed in the literature. Design thinking encourages students to combine creativity with empathy and ethical thinking, and to view sustainability issues as challenges that involve balancing appropriateness, innovation and social impact. Value-based and transformational pedagogies, in turn, emphasise inner development, the importance of understanding meaning, and emotional engagement, which are essential for developing a sustainability mindset (Tran, 2024).

Service learning and living lab formats extend the learning space through collaboration with municipalities, NGOs and enterprises. Comparative studies point to their strengths, such as opportunities for stakeholder engagement, civic responsibility and context-based learning, while also noting challenges related to governance, continuity and assessment (Lakatos et al., 2024; Morales et al., 2024; Van Der Wee et al., 2024; Hadfield et al., 2025; Herth et al., 2025).

Emerging technologies open new possibilities for affective and systems-aware learning. Immersive and extended reality (XR) environments help students experience socio-ecological interactions and explore the long-term consequences of decisions made (Stracke et al., 2025). Meanwhile, AI learning and learning analytics offer adaptive feedback and evidence-based assessment of sustainability competencies such as collaboration, ethical reasoning and systems thinking, although their responsible use requires new literacies and transparency (Alamäki et al., 2024; Gourma et al., 2024; Leal Filho et al., 2025; Llanos-Ruiz et al., 2025). Together, these pedagogies form a broad landscape of transformative practices that move learners from cognitive awareness to value-based action.

The sustainability mindset integrates cognitive, affective, and ethical dimensions into an orientation that seeks to reconcile economic, social and ecological considerations. In management and related fields, it is conceptualised as the alignment of being, thinking and doing, linking personal values and identity (being) with systemic and critical thinking (thinking) and responsible practice (doing) (Kassel et al., 2016; Farias et al., 2020). Papers in Responsible Management Education demonstrate that embedding this mindset into curricula through interdisciplinary projects and reflective assessment nurtures ethical reasoning, resilience and strategic foresight (Cripps, Smith, 2024).

From a human-capital perspective, higher education becomes a background for cultivating dispositions that extend beyond professional roles into civic engagement and community participation. When programmes foster empathy, self-reflection and systems thinking, graduates are better positioned to enact substantive corporate social responsibility (CSR) and to resist superficial sustainability narratives such as greenwashing (Probst, 2022; Álvarez-García, Sureda-Negre, 2023; Mokski et al., 2023). Transdisciplinary living lab experiences and AI/XR-enabled reflective practices can further accelerate this development by situating learning within real-world problem contexts and providing feedback loops that reinforce agency and ethical decision making (Van Der Wee et al., 2024; Leal Filho et al., 2025; Stracke et al., 2025).

In this sense, the sustainability mindset functions both as an educational outcome and as a regional development resource. Graduates who combine sustainable values with systems cognition and action competence contribute to strengthening regional capacities for innovation, inclusivity and resilience. This provides the conceptual bridge to the next section, where the paper proposes the Method-Competency-Mindset framework, linking specific pedagogies to competency formation and mindset shifts in support of sustainability-oriented human capital.

2. Research methodology

This study adopts a theory-building design, and relies on a narrative, concept-driven literature review. The analysis draws on main cores: (i) education for sustainable development (ESD); (ii) sustainability competencies; (iii) transformative learning; and (iv) innovative pedagogies in higher education. These strands were brought together as the research problem lies at their intersection. For the purposes of the research, papers were revisited and organised with the analytical goal of tracing how different pedagogical approaches are linked to sustainability-related learning outcomes.

The selection of sources was guided by conceptual relevance. Priority was given to studies that examine innovative pedagogies in higher education, publications that define or operationalise sustainability competencies, and contributions that discuss mindset formation, value change or identity-related aspects of learning.

3. Results

Recent studies suggest that higher education is in the midst of a pedagogical shift, as institutions seek to align learning processes with the principles of sustainable development. Education for sustainable development (ESD) provides a normative and strategic reference point (Cai, Wolff, 2022; Probst, 2022), but its impact depends on learning designs that can translate sustainability principles into concrete experiences and assessable competencies (Mokski et al., 2023; Araneo, 2024).

Drawing upon the theoretical pillars of sustainability competencies, transformative learning (Tran, 2024) and the sustainability mindset paradigm (Kassel et al., 2016; Cripps, Smith, 2024), this study proposes the Method-Competency-Mindset (MCM) model as an integrative conceptual framework.

The model (Fig. 1) supposes a relationship between learning methods, competency formation, and mindset transformation:

- I. Methods refer to the pedagogical environments and strategies that create conditions for experiential, reflective and value-based learning.
- II. Competencies denote the observable skills and capacities, such as systems thinking, critical reflection, collaboration and ethical reasoning, that mediate between action and cognition (Bucea-Manea-Țoniș et al., 2024).
- III. Mindset refers to the internalised integration of knowledge, values and identity that guides sustainable behaviour and decision making (Kassel et al., 2016; Farias et al., 2020; Cripps, Smith, 2024).

Learning methods activate cognitive, behavioural and affective dimensions of learning (Tran, 2024). This relationship is not linear: as students' mindsets develop, they may participate in learning environments in more reflective and responsible ways, which in turn can deepen and extend competency development (Kassel et al., 2016).

Flipped learning frees in-class time for analysis, discussion and problem-solving, rather than content delivery. This structure requires students to process information independently before the class, which strengthens autonomy and metacognitive regulation. In-class activities focused on application and discussion enhance critical and reflective thinking, both of which are foundational for sustainability-related judgement.

Gamified activities simulate simplified systems where decisions have consequences. Collaborative tasks within games foster teamwork, while dilemmas embedded in game narratives encourage ethical reasoning.

Challenge-based learning requires learners to address open-ended, real-world challenges. Students map problems, identify dependencies, consider stakeholders and evaluate long-term solutions. This systems-oriented process aligns directly with the systems thinking competence at the core of sustainability education.

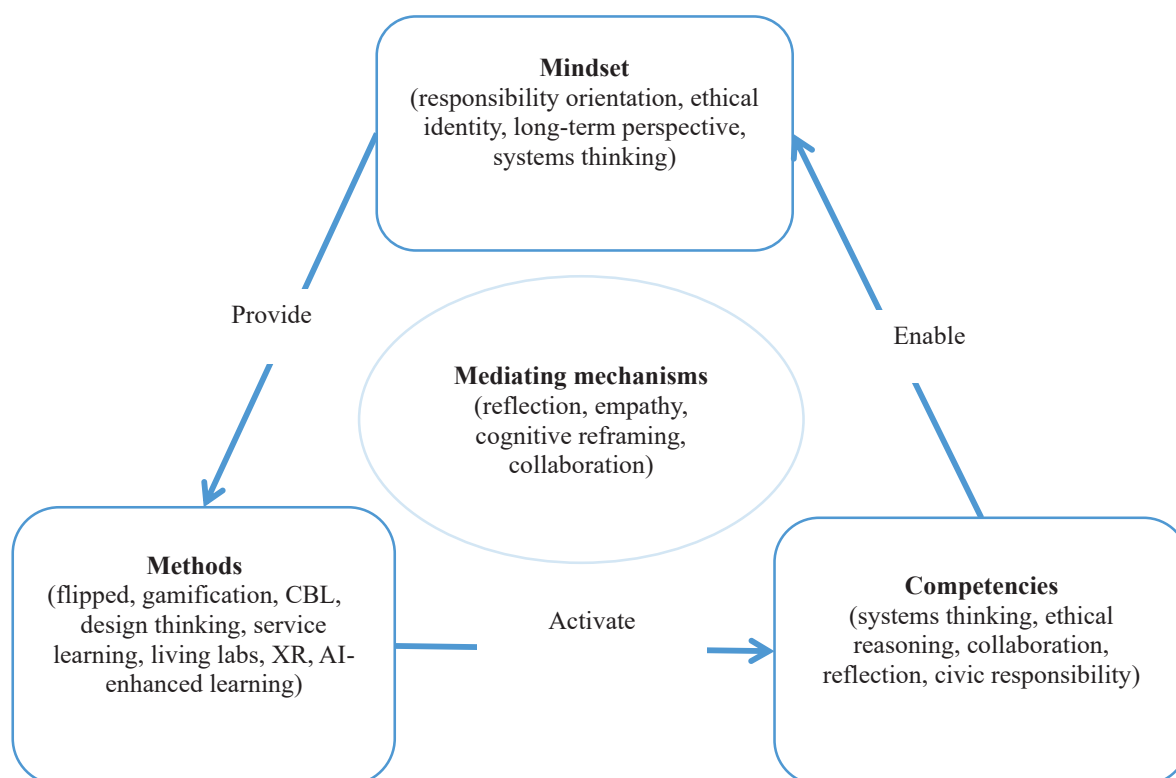


Figure 1. The Method-Competency-Mindset (MCM) triangle

Source: Compiled by the authors, based on Kassel et al. (2016), Farias et al. (2020), Cripps and Smith (2024), and Tran (2024).

Note: Innovative pedagogies serve as catalysts for the development of sustainability competency and, through repeated experience and reflective processing, contribute to the internalisation of a sustainability-oriented mindset. The feedback loop reflects the recursive influence of an emerging mindset on engagement, learning behaviour, and responsible decision making.

Design thinking starts with understanding users and contexts through empathy and observation. This orientation towards others helps students recognise the social impacts and ethical dimensions of decisions. The synthesis of diverse inputs promotes integrative reasoning, while iterative prototyping supports innovation competence.

Service learning and living labs place students in authentic social or community contexts. Reflection on their role in community projects enhances social responsibility and a commitment to shared value creation.

Immersive environments allow students through visualisation to experience long-term consequences or engage with future scenarios. Emotional immersion enhances motivation and empathy, while simulated futures encourage anticipatory and long-term thinking.

AI-based tools personalise feedback and highlight patterns in students' learning behaviour. These insights strengthen self-regulation and reflective competence. Such courses also develop ethical digital literacy, a growing component of sustainability-related professional competence.

The MCM model can be operationalised through different pedagogical pathways. Table 1 outlines how selected methods contribute to specific competencies and sustainability-oriented mindset outcomes.

Table 1. Linking learning methods, competencies and mindset outcomes

Learning method	Key competencies developed	Resulting mindset shifts
Flipped learning	Critical reflection, autonomy, peer learning	Awareness of responsibility for self-directed learning; openness to plural perspectives
Gamification	Motivation, collaboration, ethical reasoning	Empathy, accountability, social awareness
Challenge-based learning (CBL)	Systems thinking, creativity, problem-solving	Agency, solution orientation, resilience
Design thinking	Integrative reasoning, empathy, innovation	Seeing sustainability as a design challenge, valuing co-creation
Service learning/living labs	Civic responsibility, stakeholder engagement, teamwork	Commitment to community impact and shared value creation
Immersive/XR learning	Systems awareness, emotional intelligence	Empathy, holistic thinking, long-term orientation
AI-augmented learning/learning analytics	Reflective competence, ethical use of technology	Responsible digital citizenship, adaptability

Source: Compiled by the authors, based on Manzano-León et al. (2021), Martínez-Acosta et al. (2022), Galdames-Calderón et al. (2024), Alamäki et al. (2024), and Stracke et al. (2025).

Thus, the MCM model formulates the logic: pedagogical interventions → competence acquisition → mindset transformation → contribution to sustainability-oriented human capital. Such an integrative approach reflects the multidimensional nature of transformative learning, bridging cognitive, behavioural and affective domains (Tran, 2024).

Research on transformative learning and sustainability competencies suggests that the relationship between learning methods, competency development, and expected mindsets is mediated by a number of recurrent learning mechanisms.

Cognitive mechanisms. Active and problem-oriented methods stimulate perspective-taking, systems reasoning and critical evaluation. These processes help learners to rethink prior assumptions and recognise long-term implications, forming the basis for sustainability-oriented thinking.

Affective mechanisms. Methods such as design thinking, service learning and immersive XR environments engage the emotions, empathy and moral awareness. Affective engagement often precedes value reorientation, and supports a deeper focus on responsibility and care.

Behavioural mechanisms. Collaborative, applied and community-based tasks encourage agency, teamwork and accountability. Repeated engagement in meaningful action reinforces new behavioural patterns and strengthens the internalisation of sustainability values.

Reflection and meaning-making. Reflection is the bridge between competencies and identity. When students revisit their experiences and question taken-for-granted assumptions, they may reconsider personal priorities, ethical commitments, or their own future professional roles.

Based on these mechanisms, there are several possible shifts related to identity: a reorientation of values, an expansion of professional identity, and the development of civic identity and social responsibility. However, the practical application of the MCM model does not assume that this will lead to a change in identity. Instead, it outlines how over time, pedagogical experiences can support the integration of values related to sustainable development into the emerging professional and personal identities of students.

The MCM framework is a tool for designing and evaluating sustainable development-oriented curricula. It can help align teaching methods with desired learning outcomes and thinking goals. Moreover, it emphasises that the development of sustainable human capital requires long-term, iterative engagement, rather than isolated educational interventions (Kassel et al., 2016; Cripps, Smith, 2024).

Applied at the institutional and regional levels, the model can inform living lab partnerships and other collaborative initiatives that position universities as catalysts of sustainable regional development (Van Der Wee et al., 2024; Herth et al., 2025). By implementing the logic of MCM, higher education institutions can systematically educate graduates who integrate sustainable development values into professional, academic and civic spheres.

Although the MCM model provides an integrative way to connect pedagogical methods with sustainability-related outcomes, several limitations and application challenges must be acknowledged.

The effectiveness of pedagogical approaches depends largely on the level of institutional culture, approaches to curriculum development, existing assessment practices, and the existing experience of teachers. A method that successfully develops systems thinking or reflective competence in one programme may fail in another.

Innovative pedagogies require skills, technical moderation, time for teacher training, and personal qualities that ensure the ability to adapt in conditions of uncertainty. On the other hand, students have different levels of motivation, previous experience, disciplinary and personal well-being, and tolerance for open-ended learning tasks, due to their mental, cognitive and psychological qualities. Some students may resist reflection, group work or ambiguity, which reduces the likelihood of developing deeper competence or thinking. This limits the generalisability of the model's pathways.

Changes in values, attitudes and identities resulting from transformational processes are gradual and non-linear. They are difficult to capture using standard assessment tools. Existing measurement tools often rely on self-reporting or short-term assessments, which may not reflect long-term internalisation. This makes it difficult to empirically test the model.

Furthermore, immersive environments, living labs, AI-enabled learning, and community partnerships, among other things, require technological, financial and administrative resources. Even when pedagogical approaches are desirable, universities may struggle with workload sharing, large class sizes, or stringent accreditation requirements.

In some cases, innovative approaches may be adopted as procedural techniques without engaging with their deeper transformative potential, for example: gamification may focus on scores and rewards rather than ethical dilemmas; competency-based learning may be reduced to project management exercises; reflection may become a formal requirement rather than a meaningful learning process. This weakens the link between competence and thinking that the model assumes.

Overall, these limitations suggest that the competency-based thinking model should be viewed as a heuristic tool. Its successful application depends on thoughtful adaptation to the institutional context, ongoing teacher support, and long-term pedagogical strategies that go beyond isolated instructional interventions.

Discussion

The MCM model suggests that higher education should be seen not only as a mechanism for training qualified specialists, but also as a driving force for responsible social transformation. When innovative pedagogical methods are purposefully aligned with sustainable development competencies and mindset development, students acquire the abilities necessary to influence transitions to sustainable development in different spheres of life: personal, organisational and civic.

From a regional development perspective, human capital focused on sustainable development generates cumulative and long-term impacts. Graduates who acquire ethical responsibility and systems thinking contribute to the reshaping of organisational cultures and business models, reduce harmful practices, and promote socially and environmentally responsible innovations. At the same time, their behaviour as consumers, family members, community volunteers and voters are transmitted more deeply as a model of behaviour, and supports the emergence of shared norms and values of sustainable development in society.

The model also points to the mentoring and continuity effect, thereby reinforcing the cycle of transformation not only in universities.

Universities act as partners, academic foundations and idea generators in solving regional problems. The scope of cooperation varies, from supporting green innovations to working with communities and local businesses. In this context, the MCM model helps to clarify which competences can be developed through certain pedagogical approaches, and how these results can strengthen regional development strategies. For many regions, the issue is not only about training specialists, but also about forming graduates who can think strategically, participate in cross-sector initiatives, and make responsible decisions.

In this way, the learning methods that promote systems thinking and support stakeholder collaboration and the ability to work in uncertainty help to create the type of human capital that local governments, communities and businesses often lack. The model can therefore serve as a guide for regional policies aimed at aligning educational transformations with economic and environmental priorities.

Overall, the MCM model can be seen not only as a tool for analysing pedagogical practice, but also as a means of strengthening the connection between higher education and regional policy. It highlights which types of learning experience best support regions striving for sustainable development, and helps to align educational goals with broader socio-economic priorities.

Finally, by viewing the transformation of thinking as a long-term, iterative development process, the MCM model challenges short-term views on higher education. It emphasises that the formation of a generation of citizens oriented towards sustainable development requires ongoing commitment, a reflective learning environment, and pedagogical practices that engage both cognition and values.

Conclusions

This paper has examined how innovative pedagogical methods can contribute to the development of sustainable human capital in higher education, with a focus on management and related fields. Drawing on research in education for sustainable development, sustainable development competencies and transformational learning, the study presented the Method-Competence-Mindset (MCM) model as an integrative

framework that explains how teaching methods stimulate the development of competencies, which in turn leads to the formation of sustainability thinking.

The arguments put forward here position education not only as a mechanism for training skilled professionals, but also as a strategic driver for responsible societal transformation. Students who internalise sustainable values and ethical responsibility are more likely to implement these principles in their organisational decision-making processes, contributing to more responsible business models and stakeholder relationships. At the same time, they integrate sustainable development practices into their personal, civic and community roles, acting as informed citizens, and responsible consumers, family members and community leaders. In the long term, these graduates can return as mentors, teachers and researchers, strengthening a culture of responsibility and sustainable development across generations.

The MCM model can thus be seen as a conceptual refinement of existing structures of mutual cooperation between higher education institutions and communities, which helps to align pedagogical practices with the broader goals of social and regional development. By developing pedagogies that engage the cognitive, behavioural and affective dimensions of learning, universities, especially those that prepare future managers and leaders, strengthen their position as catalysts for sustainable regional development.

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TVARUMO MĄSTYSENĄ AUKŠTAJAME MOKSLE FORMUOJANČIOS INOVATYVIOS MOKYMOSI PEDAGOGIKOS: METODO–KOMPETENCIJŲ– MĄSTYSENOS MODELIS

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Santrauka

Pastaraisiais dešimtmečiais aukštajam mokslui kyla vis sudėtingesnių ekonominių, aplinkosaugos ir socialinių iššūkių, kurie reikalauja naujų studijų ir dėstymo praktikų. JT Darnaus vystymosi darbotvarkė pabrėžia poreikį rengti absolventus, gebančius sistemiškai mąstyti, vertinti ilgalaikes pasekmes ir priimti atsakomybę dėl etiškumo. Todėl vien žinių perdavimo nepakanka – būtinos mokymosi patirtys, ugdančios kompetencijos ir formuojančios vertybines nuostatas.

Aktyvus, studentą įtraukiantis mokymasis remiasi realiais iššūkiais, bendrakūra, refleksija ir grįžtamoju ryšiu. Autentiški vertinimo būdai ir mokymasis veikiant didina studentų atsakomybę, padeda perkelti žinias į praktiką ir skatina vertybių internalizaciją.

Straipsnyje analizuojama, kaip inovatyvios pedagoginės praktikos prisideda prie darnaus vystymosi kompetencijų ugdymo ir tvarumo mąstysenos formavimo. Remiantis ESD, tvarumo kompetencijų ir transformuojančio mokymosi literatūra, siūlomas conceptualus modelis metodas–kompetencijos–mąstysena (MKM), paaiškinantis mokymosi metodų, kompetencijų formavimo ir vertybinių bei tapatybinių pokyčių tarpusavio ryšius.

Modelio logika grindžiama prielaida, kad tokie metodai kaip apverstos klasės, iššūkiais ar paslaugomis grįstas mokymas, žaidybinimas, dizaino apmąstymas ir gyvosios laboratorijos ugdo sisteminių mąstymą, skatina spręsti problemas ir etišką sprendimų priėmimą, ugdo kritiškumą, bendradarbiavimo gebėjimą. Ilgainiui šios kompetencijos gali tapti tvarumo mąstysena – atsakomybės, ilgalaikės orientacijos ir holistinio požiūrio pagrindu.

RAKTINIAI ŽODŽIAI: *darnaus vystymosi švietimas, tvarumo kompetencijos, tvarumo mąstysena, transformuojantis mokymasis; regioninė plėtra.*

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