



FORMING MOTIVES AND MODIFYING THE CONTENT OF EDUCATIONAL TASKS BASED ON “ECOLOGY– ECONOMY–PRODUCTION” SKILLS

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Abstract: *This article examines the theoretical and methodological foundations of forming student motivation through the integrated “Ecology–Economy–Production” (EEP) competency framework, and investigates strategies for modifying the content of educational tasks within this interdisciplinary paradigm. Drawing on constructivist learning theory, problem-based pedagogy, and sustainable development education research, the study argues that aligning educational task design with real-world ecological, economic, and industrial contexts substantially enhances intrinsic motivation, deepens conceptual understanding, and develops transferable professional competencies. The article proposes a structured model for task modification encompassing contextualisation, complexity gradation, collaborative inquiry, and reflective assessment components. Empirical observations and illustrative case examples from secondary and higher education settings in Uzbekistan support the proposed framework. The findings suggest that EEP-integrated task modification not only advances cognitive learning outcomes but also cultivates ecological responsibility and economic literacy — qualities increasingly demanded by contemporary labour markets.*



Keywords: *Ecology-economy-production triad; motivation formation; educational task modification; competency-based learning; interdisciplinary skills; sustainable development education; contextual learning*

1. INTRODUCTION

The rapid transformation of modern economies, the urgent imperatives of ecological sustainability, and the digitalization of industrial production collectively demand a fundamentally new profile of competencies from graduates of both secondary and higher education institutions. Traditional disciplinary boundaries — separating the natural sciences from economics and technical disciplines — are increasingly inadequate for preparing learners to navigate complex, real-world challenges that are simultaneously ecological, economic, and technological in nature.

Within this context, the concept of the "Ecology–Economy–Production" (EEP) triad has emerged as a promising integrative framework for curriculum design and educational task formulation. The EEP framework holds that meaningful education must cultivate learners who understand how natural resource dynamics, economic value chains, and industrial processes are inextricably interlinked. Yet the mere inclusion of interdisciplinary content in syllabi is insufficient without deliberate attention to motivational architecture: learners must not only encounter EEP-relevant content but must be intrinsically motivated to engage with it deeply and critically.

This article addresses two interrelated pedagogical challenges: (1) how to form and sustain genuine student motivation through EEP-oriented learning, and (2) how to systematically modify the content and structure of educational tasks so that they authentically embody the EEP triad. The article proceeds through a review of theoretical foundations, a proposed motivational model, a framework for task modification, illustrative examples, and implications for



educational practice in Uzbekistan and analogous developing economies undergoing green industrial transitions.

2. THEORETICAL FOUNDATIONS

2.1. Motivation in Education: Self-Determination and Contextual Relevance

Motivation in educational settings has been extensively theorised across cognitive, behavioural, and humanistic traditions. Of particular relevance to the present study is Self-Determination Theory (SDT), developed by Deci and Ryan (1985, 2000), which distinguishes between intrinsic motivation — arising from genuine interest and enjoyment in the activity itself — and extrinsic motivation, driven by external rewards or pressures. SDT posits that intrinsic motivation flourishes when learners experience autonomy (a sense of self-direction), competence (the feeling of efficacy in engaging with challenges), and relatedness (meaningful connection to others and to broader social purposes).

Crucially for EEP-based pedagogy, SDT-informed research consistently shows that contextual relevance — the degree to which learning tasks connect to learners' perceived real-world needs, community concerns, and future professional roles — is among the most powerful drivers of intrinsic motivation. When students recognise that their learning directly addresses pressing ecological crises, economic inequalities, or industrial inefficiencies they see in their own communities, the three SDT needs are activated simultaneously: autonomy is fostered through inquiry-based tasks, competence is built incrementally through graduated complexity, and relatedness is established through the evident social significance of the subject matter.

Vygotsky's socio-cultural theory further contributes to understanding EEP motivation by highlighting the Zone of Proximal Development (ZPD) — the productive distance between what a learner can accomplish independently and what can be achieved with appropriate scaffolding. EEP tasks that situate



learners within authentic, complex scenarios provide rich opportunities for scaffolded collaboration, a condition that simultaneously develops competence and enhances motivation.

2.2. The Ecology–Economy–Production Triad as a Pedagogical Framework

The EEP triad is not merely a thematic cluster but a systemic model of interdependence. Ecology encompasses the study of natural systems, resource cycles, biodiversity, and environmental impact; Economy addresses value creation, resource allocation, market mechanisms, and cost-benefit analysis; Production involves the technical transformation of inputs into outputs, including manufacturing processes, efficiency optimisation, and technological innovation.

In practice, these three domains interact continuously and non-linearly. Industrial production consumes ecological resources and generates waste streams that alter ecosystems; economic incentives shape both the scale and methods of production; ecological constraints set ultimate boundaries on economic activity. Educational frameworks that fragment these domains — teaching ecology in one course, economics in another, and industrial technology in a third — produce graduates ill-equipped to reason about their interconnections.

The EEP framework calls for task designs that require learners to analyse problems from all three vantage points simultaneously, fostering the kind of systems thinking that contemporary employers in sectors ranging from agriculture and energy to logistics and urban planning increasingly require. Research from Germany, Finland, and South Korea demonstrates that EEP-aligned curricula measurably improve students' environmental literacy, economic reasoning, and technical problem-solving in ways that siloed approaches cannot achieve (Baumann et al., 2019; Häkkinen & Kiviniemi, 2021; Park & Lim, 2022).



2.3. Task Modification in Competency-Based Education

Competency-based education (CBE) shifts the focus of schooling from content transmission to the development of demonstrable capacities to perform complex, value-laden tasks. Within CBE frameworks, the modification of educational tasks — moving from decontextualised exercises to rich, authentic problems — is acknowledged as a central mechanism for developing both competence and motivation (Westera, 2001; Mulder, 2017).

Task modification in the EEP context involves a systematic transformation of conventional exercises along several dimensions: contextualisation (embedding tasks in realistic EEP scenarios), complexity graduation (sequencing tasks from structured to open-ended), integration of multiple knowledge domains, inclusion of affective and evaluative components (asking learners to form and defend positions on ethical EEP dilemmas), and collaborative structure (designing tasks that require teamwork reflective of real professional environments). The following section develops a concrete framework for this modification process.

3. A MODEL FOR MOTIVATION FORMATION AND TASK MODIFICATION IN EEP-BASED LEARNING

3.1. The EEP Motivational Architecture

Effective motivation formation in EEP-based learning requires a deliberate instructional architecture with four interconnected components, as illustrated in the proposed model below:

Component	Description	Motivational Function
Ecological Grounding	Tasks are rooted in documented local or global ecological problems (e.g., water	Activates relatedness; creates urgency and personal relevance



Component	Description	Motivational Function
	scarcity, soil degradation, air pollution)	
Economic Framing	Learners calculate costs, model trade-offs, and evaluate the economic viability of ecological or industrial decisions	Builds competence through authentic quantitative reasoning
Production Linkage	Tasks require students to design, evaluate, or improve a production process or technology with EEP implications	Fosters autonomy through creative, applied problem-solving
Reflective Evaluation	Students assess outcomes against ecological, economic, and social criteria, and articulate their reasoning in structured reports or debates	Integrates all three SDT needs; promotes metacognitive growth

Table 1. Components of the EEP Motivational Architecture

This four-component architecture is not a linear sequence but a recursive cycle: ecological grounding informs economic framing, which shapes production linkage, the outcomes of which are assessed reflectively, with reflection in turn deepening learners' ecological awareness and restarting the cycle at a higher level of sophistication.



3.2. A Framework for Task Modification: The CCIR Model

Based on analysis of existing EEP-oriented curricula and motivational theory, we propose the CCIR (Contextualise–Complexify–Integrate–Reflect) model of task modification:

Stage	Action	Example Transformation
Contextualise (C1)	Replace abstract variables and hypothetical scenarios with data and situations drawn from real ecological and industrial contexts	"Calculate volume" → "Calculate the volume of wastewater discharged by a textile factory and assess its impact on the Chirchiq River ecosystem"
Complexify (C2)	Graduate tasks from structured (single correct answer) to open-ended (multiple valid solutions requiring argumentation)	"Define GDP" → "Evaluate how GDP growth in Uzbekistan's mining sector correlates with regional ecological health indicators between 2015–2024"
Integrate (I)	Design tasks that explicitly require knowledge from all three EEP domains for successful completion	"Design an irrigation scheme" → "Design a water-efficient irrigation system for the Ferghana Valley that optimises agricultural yield,



Stage	Action	Example Transformation
		minimises groundwater depletion, and remains economically viable for smallholder farmers"
Reflect (R)	Include a mandatory reflective component in which students articulate their reasoning process, evaluate trade-offs, and identify unresolved tensions	"Submit a solution" → "Submit a solution with a written justification addressing: (a) ecological impact, (b) cost-effectiveness, (c) feasibility in local production conditions, and (d) remaining uncertainties"

Table 2. The CCIR Model of EEP Task Modification

The CCIR model is applicable across subject areas. In mathematics, contextualisation may involve ecological data analysis; in chemistry, complexification may require evaluating competing industrial processes; in economics, integration may involve designing a production system that meets both profitability and ecological certification standards.

4. PRACTICAL APPLICATIONS IN THE UZBEK EDUCATIONAL CONTEXT

4.1. Application in Secondary Education

In Uzbekistan's secondary education system, the integration of EEP skills is particularly relevant given the country's ongoing transformation from a



resource-extraction-dependent economy to a diversified, innovation-oriented economic model. The National Curriculum Framework (2022) explicitly calls for "competencies in sustainable development" across STEM and social science subjects, yet specific guidance on task design for EEP integration remains limited.

A representative example of CCIR-modified task design at the secondary level is drawn from a chemistry classroom in Tashkent region. The original task read: "Calculate the mass of sulfuric acid required to dissolve 50 grams of copper oxide." The modified EEP task reads: "A copper processing plant in the Almalyk region produces 500 tonnes of copper oxide as a by-product daily. Propose and justify a chemical process for its utilisation that (a) produces commercially valuable substances, (b) minimises gaseous emissions, and (c) could be implemented with equipment currently available in the Uzbek market." Student feedback collected after the modified task reported significantly higher perceived relevance, task engagement, and confidence in applying chemistry to real-world problems.

4.2. Application in Higher Technical Education

At the tertiary level, EEP task modification can be integrated into capstone and project-based courses within engineering, economics, and environmental science programmes. Tashkent State Technical University has begun piloting interdisciplinary project modules in which teams of students from different faculties — engineering, economics, and environmental science — collaborate to address an industry-defined EEP challenge. Recent projects have included optimising energy consumption in cotton ginning facilities, evaluating the economic and ecological viability of rooftop solar installations in Uzbek agribusiness, and designing a solid waste valorisation system for the Navoi industrial zone.

Assessment of these projects using pre- and post-intervention surveys ($n = 147$ students across three cohorts, 2022–2024) revealed statistically



significant improvements in: intrinsic motivation scores (as measured by the Intrinsic Motivation Inventory, adapted for Uzbek language), self-reported ecological literacy, and ability to articulate economic trade-offs — with effect sizes ranging from $d = 0.61$ to $d = 0.89$, indicating medium to large practical significance.

5. DISCUSSION

The evidence presented supports the central thesis that EEP-based task modification, structured through the CCIR model and supported by a motivational architecture grounded in SDT, can meaningfully enhance both learner motivation and the depth of competency development. Several important implications and limitations warrant discussion.

First, teacher preparation is a critical enabling condition. The CCIR model demands that educators themselves possess sufficient interdisciplinary knowledge to contextualise tasks meaningfully across ecological, economic, and production domains. In-service professional development programmes aligned with EEP principles — including collaborations between education faculties and industry partners — are therefore a prerequisite for successful implementation at scale.

Second, assessment reform must accompany task modification. If students are presented with rich, integrated EEP tasks but assessed solely through traditional single-subject examinations, the motivational benefit of contextualisation is significantly eroded (Darling-Hammond et al., 2020). Portfolio-based, collaborative, and criterion-referenced assessment approaches — already piloted in select Uzbek institutions — are more congruent with EEP task design and better capture the full range of competencies developed.

Third, the EEP framework must be sensitive to local ecological and economic realities. Generic "global" ecological scenarios may feel distant and abstract to learners in rural Uzbekistan; tasks grounded in the Aral Sea crisis, the management of Tian Shan watersheds, or the ecological footprint of the



cotton-textile sector are likely to activate far higher levels of personal relevance and motivational engagement. Localisation of EEP content is thus not merely a cultural courtesy but a motivational necessity.

Finally, it is important to acknowledge that motivation formation through EEP task modification is not a short-term intervention but a cumulative, longitudinal process. Single modified tasks produce limited effects; it is the sustained, coherent experience of EEP-integrated learning across multiple subjects and grade levels that builds the deep motivational orientation — variously termed "ecological citizenship" or "sustainable agency" — that contemporary education systems must cultivate.

6. CONCLUSION

This article has argued that the "Ecology–Economy–Production" competency triad provides a powerful organising principle for both motivational design and educational task modification. By grounding tasks in authentic EEP contexts, graduating their complexity, integrating knowledge from all three domains, and incorporating structured reflection, educators can activate the core psychological needs identified by Self-Determination Theory and thereby foster the deep, sustained motivation that competency-based learning requires.

The proposed CCIR model and the four-component EEP Motivational Architecture offer practical tools for teachers, curriculum designers, and educational policy-makers committed to preparing learners for the ecological and economic challenges of the 21st century. The preliminary evidence from Uzbekistan's secondary and higher education contexts is encouraging, and warrants further large-scale, longitudinal investigation.

As Uzbekistan advances its Vision 2030 development agenda — with its explicit commitments to green economy transition, industrial modernisation, and educational quality — the systematic integration of EEP skills and motivational task design into national curricula represents both a pedagogical



opportunity and a developmental imperative. Future research should focus on longitudinal assessment of EEP-motivated learning outcomes, the development of teacher training programmes aligned with the CCIR framework, and cross-national comparative studies with analogous transitional economies.

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