

Designing with and for Life: Education as Transition Infrastructure for Regenerative Futures

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Abstract: This paper argues that education should be understood as transition infrastructure for regenerative futures. While Transition Design foregrounds long-horizon change, wicked problems and new mindsets, educational systems are often treated as delivery mechanisms for sustainability knowledge rather than as infrastructures that shape subjectivity. Drawing on ontological design, infrastructure studies, sustainability transitions theory, critical pedagogy, decolonial thought and pluriversal design, the paper introduces the ecosystemic learner as an ontological orientation characterised by ontological humility, relational responsibility, epistemic plurality and critical reflexivity. It then proposes a staged curricular framework organised around encountering, relating, questioning and designing. These stages are linked to pedagogical approaches, possible signs of formation and assessment practices that resist competency capture. Practice-informed vignettes illustrate tensions between aspiration and infrastructure, voice and agency, and project and system. The paper concludes that regenerative futures require educational infrastructures capable of forming transition-capable subjectivities.

Keywords: transition design; education as transition infrastructure; ontological design; ecosystemic learner; regenerative futures; sustainability transitions; pluriversal pedagogy

1. Introduction: The Transition Design Problem

Transition Design asks designers, institutions and communities to imagine and participate in long-term systemic change. It invites engagement with wicked problems whose causes and consequences are distributed across institutions, cultures, technologies, ecologies and generations (Rittel and Webber, 1973; Irwin, 2015). Yet, the subjects invited into this work have often been formed by educational infrastructures that reward short-term performance, epistemic certainty, individualised achievement and solution-oriented agency. This creates a formative contradiction at the heart of many sustainability transitions: transition methods often require relational, anticipatory and long-term forms of agency, while the learners, practitioners and institutions expected to enact them have often been formed by educational systems that reward something quite different.



Sustainability transitions are increasingly understood as long-duration, systemic processes involving deep transformations in social practices, institutional arrangements and worldviews (Geels, Kern and Clark, 2023). Transition Design has responded by foregrounding future-oriented visioning, place-based action, systems thinking and new forms of posture and mindset capable of engaging with complexity over extended timeframes (Irwin, 2015; Irwin, Kossoff and Tonkinwise, 2015). These contributions have helped move design discourse beyond narrow techno-managerial problem-solving and toward a more relational understanding of change, in which temporality, situatedness, interdependence and ways of living become central to design practice.

However, the difficulty is not only that transition efforts require better tools, methods or policy frameworks. A key reason for the persistent gap between sustainability aspiration and institutional transformation lies in the reproduction of subjectivities misaligned with the demands of long-term, interdependent transitions. Transition Design recognises that mindsets and postures matter, yet educational systems are rarely examined as the infrastructures through which those mindsets and postures are formed over time. Schools, universities and professional learning environments are often treated as sites for disseminating sustainability knowledge, developing competencies or preparing future practitioners. Less attention has been given to the deeper question of how educational institutions shape the kinds of subjects capable of inhabiting uncertainty, relational responsibility, epistemic plurality and long-time horizons.

This paper argues not only that educational content should address sustainability, but that educational infrastructure, its temporal rhythms, epistemic authority structures, institutional accountability systems, assessment practices and relational arrangements, constitutes a second-order design system that either enables or forecloses the forms of subjectivity that sustainability transitions require. It draws on Transition Design and ontological design to reframe education as formative infrastructure rather than a delivery mechanism. Ontological design emphasises that designed systems design us back: they shape the habits, expectations and forms of agency through which human beings inhabit the world (Willis, 2006). Recent work in Transition Design has deepened this concern by connecting ontological, speculative and transition design discourses to the redirection of ways of living and future-making (Saha and Nusem, 2024; Yu, 2025). If this is the case, then educational systems are among the most powerful ontological design systems in modern societies.

The paper develops this argument through the concept of the ecosystemic learner. The ecosystemic learner is proposed not as a psychological profile, universal ideal or set of competencies, but as an ontological orientation shaped through institutional, temporal, relational and pedagogical conditions. It is characterised by four interrelated orientations: ontological humility, relational responsibility, epistemic plurality and critical reflexivity. These orientations name the kinds of subjectivity that regenerative futures may require, while resisting the tendency to reduce transformation into measurable individual capacities.

The paper develops this argument in seven further sections. Section 2 theorises education as second-order transition infrastructure. Section 3 introduces the ecosystemic learner and distinguishes it from competency frameworks. Sections 4 and 5 translate this into a staged curricular framework, pedagogical approaches and assessment practices that resist competency capture. Section 6 offers practice-informed vignettes as illustrative anchors. Section 7 examines risks including performativity, appropriation and universalisation. The conclusion returns to the central proposition: regenerative futures require educational infrastructures capable of forming learners and institutions that can sustain transitions they may never personally complete.

2. Education as Second-Order Transition Infrastructure

To understand education as transition infrastructure, it is necessary to move beyond a narrow conception of infrastructure as physical provision or technical support. Infrastructure is not only the visible arrangement of buildings, platforms, resources or systems. It is also the relational, temporal and socio-material ordering of everyday life: the often taken-for-granted conditions that make certain forms of action possible while making others difficult to imagine or sustain. Star (1999) argued that infrastructure is relational and embedded; it is frequently invisible when working smoothly and becomes most visible when it breaks down. Applied to education, this shifts attention away from curriculum content alone and toward the deeper arrangements that structure learning: timetables, assessment regimes, disciplinary boundaries, governance structures, pedagogical norms and relations with communities, places and ecosystems.

These arrangements do not merely organise learning. They shape what kinds of learners are made possible. A timetable that fragments knowledge into short, disconnected periods teaches a relation to time. A high-stakes assessment regime teaches a relation to value, risk and performance. In this sense, education functions infrastructurally because it configures the conditions under which learners come to understand themselves, others and the world.

This infrastructural framing intersects directly with ontological design. Ontological design rests on a reciprocal account of design, in which human beings shape artefacts, systems and institutions that, in turn, shape human habits, expectations and ways of being. Human beings design artefacts, environments, institutions and practices, but those designed arrangements in turn shape human habits, expectations, relations and ways of being (Willis, 2006). Within Transition Design, this insight is especially significant because sustainability transitions require not only new products, services or interventions, but shifts in ways of living. Recent work has developed this argument by situating Transition Design within wider ontological, speculative and ecological design discourses, and by framing transition-oriented designing as a redirection of the ontological conditions through which futures become imaginable and actionable (Saha and Nusem, 2024; Yu, 2025).

Education is one of the most consequential sites of this second-order designing. It repeatedly forms learners' habits of attention, their relationship to uncertainty, their

assumptions about authority, their sense of agency, their tolerance for complexity and their understanding of responsibility. Learners are not only taught about the world; they are habituated into particular ways of being in it. This means that education is not merely a field in which Transition Design might be applied. It is a primary medium through which the conditions for transition participation are produced.

This claim can also be situated within sustainability transitions theory. The Multi-Level Perspective understands transitions as interactions between landscape pressures, socio-technical regimes and niche innovations (Geels, 2002, 2011; Geels, Kern and Clark, 2023). Educational institutions operate across these levels: they reproduce regime norms through assessment, disciplinary hierarchies and ideas of success; they create niche spaces through youth governance, Futures Literacy, place-based inquiry and transition design studios; and, across intergenerational timescales, they shape landscape assumptions about agency, citizenship, nature and the future.

This multi-level role makes education both a potential site of transformation and a mechanism of stabilisation. Fragile coherence occurs when niche-level sustainability initiatives appear within educational institutions but fail to reconfigure the regime logics that structure everyday practice. Sustainability becomes visible in projects, policies, awards or strategic language, while the institution remains organised around short-term accountability, individual competition, assessment performance and instrumental learning. In transitions terms, the niche is symbolically incorporated without generating deeper regime reconfiguration.

The problem of fragile coherence is not simply a failure of implementation. It reveals a deeper contradiction between the temporal demands of transitions and the temporal logics of many educational systems. Sustainability transitions unfold across decades and generations, but educational institutions are often governed through annual reporting cycles, examination outcomes, inspection frameworks, funding pressures and short-term reputational incentives. Transition Design invites long-horizon thinking, but learners and educators are frequently positioned within systems that reward immediacy, visibility and measurable outputs. This temporal mismatch is not an administrative inconvenience; it is a design problem. It shapes the kinds of agency that institutions cultivate and the kinds of futures they are able to sustain.

Education functions as transition infrastructure, then, when its temporal, epistemic, relational and evaluative arrangements are intentionally designed to support the formation of learners capable of participating in long-term, interdependent and regenerative change. This requires more than adding sustainability content to existing systems. It requires asking how educational infrastructures currently shape learners' ways of being, and how they might be redesigned so that different forms of subjectivity can emerge. The next section develops this question through the concept of the ecosystemic learner.

3. The Ecosystemic Learner: Ontological Orientation, Not Competency Framework

If education functions as second-order transition infrastructure, then the central question is not only what learners should know about sustainability transitions, but what kinds of subjectivity educational environments are designed to make possible. Transition Design has long emphasised the importance of mindsets and postures in addressing wicked problems, yet the formation of those mindsets and postures is often treated as an assumed precondition rather than a design problem in its own right. The concept of the ecosystemic learner responds to this gap. It names the kind of ontological orientation that education as transition infrastructure might seek to cultivate: not as a fixed identity, universal learner type or measurable competency profile, but as a way of being formed through relations with human and more-than-human systems over time.

The distinction from competency frameworks is important. In recent sustainability education policy, competency frameworks such as UNESCO's Education for Sustainable Development competencies and the European GreenComp framework have been valuable in giving educators shared language for curriculum design, teacher development and institutional communication (UNESCO, 2017; Bianchi, Pisiotis and Cabrera Giraldez, 2022). They identify important capacities such as systems thinking, anticipatory thinking, collaboration, critical thinking, self-awareness and political agency. These are not trivial. They have helped to move sustainability education beyond content coverage and toward more holistic accounts of learning. However, they remain largely within a competency logic: they define capacities that learners may acquire, demonstrate and be assessed against.

The ecosystemic learner operates at a different theoretical register. Rather than asking primarily what the learner can do, it asks how educational infrastructures shape the learner's sense of self, agency and responsibility within socio-ecological systems. This shifts attention from acquisition to formation. Competencies can often be described as capacities that learners acquire, demonstrate and apply. Orientations, by contrast, are practised, interrupted and deepened over time. They are not simply possessed by individuals, but constituted through relationships, institutional conditions and repeated encounters with uncertainty, place, knowledge and responsibility. For this reason, they cannot be adequately assessed through isolated demonstrations of performance. They require longitudinal, situated and ethically cautious forms of evidence.

This distinction matters because the problem this paper addresses is not simply a deficit of skill or knowledge. A learner may demonstrate systems thinking in an assessment task while remaining habituated into competitive individualism, short-term performance or epistemic certainty by the wider institution. The ecosystemic learner concept keeps this infrastructural contradiction visible. It refuses to locate transition capacity only inside the learner and instead directs attention to the educational environments that form, reward or inhibit particular ways of being.

The ecosystemic learner is characterised by four interrelated orientations: ontological humility, relational responsibility, epistemic plurality and critical reflexivity. These are not discrete outcomes to be achieved in sequence. They are mutually entangled modes of orientation that can be more or less supported by educational design. They name the direction of formation rather than a measurable end-state.

The first orientation, *ontological humility*, refers to an awareness of being embedded within complex socio-ecological systems that cannot be fully known, mastered or controlled. It challenges the fantasy of the autonomous learner standing outside the world as observer, manager or solver of problems, and asks learners to recognise the limits of prediction, control, positional knowledge and human-centred agency.

The second, *relational responsibility*, names accountability to human and more-than-human others across time. It shifts sustainability learning from awareness to obligation, asking to whom or what the learner is answerable, and through what forms of practice that answerability is sustained.

The third, *epistemic plurality*, refers to the capacity to engage multiple ways of knowing without collapsing them into a single dominant hierarchy. It requires learners to ask how knowledge is situated, who is authorised to know, what forms of knowledge are excluded, and what becomes visible when scientific, local, Indigenous, embodied, artistic or experiential ways of knowing are placed in genuine relation.

The fourth, *critical reflexivity*, is the capacity to interrogate power, history, institutional positioning and one's own formation. It prevents relational and regenerative language from becoming romantic or performative by asking how institutions reproduce unsustainable norms even when they speak the language of transformation.

These orientations draw on traditions that reject the idea that education is neutral. Freire frames education as a struggle over subject formation rather than a simple process of knowledge transfer (Freire, 2000). Decolonial and Southern thinkers show how modern forms of subjectivity have been shaped by coloniality and epistemic hierarchy (Quijano, 2000; Mignolo, 2011; de Sousa Santos, 2014). Ecopedagogical and pluriversal design traditions then extend this critique into socio-ecological relations, connecting questions of learning, justice, place and world-making (Gadotti, 2008; Kahn, 2010; Escobar, 2018).

Biesta's concept of subjectification helps clarify what is educationally at stake. Subjectification concerns the emergence of the learner as a subject rather than an object of educational intervention (Biesta, 2020). The ecosystemic learner extends this concern into a socio-ecological and more-than-human register. The question is not only how learners become subjects in relation to society, but how they inhabit subjectivity within living systems, long time horizons and plural worlds.

The ecosystemic learner should therefore not be understood as an ideal person to be universally produced. Such a move would contradict the pluriversal and decolonial commitments on which the concept depends. Different cultural, ecological and institutional contexts will articulate ontological humility, relational responsibility, epistemic plurality and critical reflexivity differently.

4. A Staged Framework for Ecosystemic Formation

If education is understood as second-order transition infrastructure, curriculum cannot be conceived simply as a sequence of sustainability topics, competencies or projects. It must be designed as a formative architecture: a set of temporal, relational, epistemic and pedagogical conditions through which learners repeatedly encounter themselves, others and the living world differently. The framework proposed here is staged, but not linear in the conventional sense. The stages do not describe a ladder of mastery or a universal developmental pathway. They are better understood as a spiral formation arc in which learners return to the same fundamental questions at increasing depth: What is my relation to living systems? What forms of knowledge shape what I can see? To whom or what am I responsible? How do I act within systems I cannot fully understand or control?

The framework is designed primarily for upper secondary education, early higher education and professional learning contexts, although its logic can be adapted across settings. Its full force depends on time: repeated encounter, ongoing reflection, sustained relationship and the revisiting of unresolved questions. It may be enacted as a multi-year curriculum arc, a studio sequence, a whole-school learning pathway or a professional learning programme. What matters is not the precise institutional form, but the design logic: ecosystemic formation requires movement from encounter to relation, from relation to critique, and from critique to situated contribution. Each stage foregrounds one or more ecosystemic orientations while continuing to deepen the others.

Stage 1: Encountering

The first stage foregrounds ontological humility. It begins not with sustainability content, but with encounter. Learners are invited to attend to places, living systems, temporal scales and perspectives that interrupt the assumption that the world is simply an object available for analysis, management or improvement. This stage is designed to unsettle the detached observer stance often reinforced by schooling: the learner who stands outside a problem, gathers information about it and then proposes a solution.

In practice, learners might engage in place-based inquiry, ecological observation, sensory mapping, deep time exercises, fieldwork in local socio-ecological systems or multi-perspective explorations of a single site. A river, woodland, school food system, urban heat island, soil system or neighbourhood commons might become the focus of sustained attention. Learners would not initially be asked to solve the problem of that place. They would be asked to notice, document, listen, map uncertainty and identify the assumptions

they bring to it. Such practices draw on traditions of critical place-based pedagogy, which understand place not as a neutral backdrop but as a site where ecological, cultural and political relations become legible (Gruenewald, 2003). A deep time walk, for example, does not merely teach geological chronology. It interrupts the short temporal horizon of the modern learner by placing human life within planetary time.

Stage 2: Relating

The second stage foregrounds relational responsibility. If Stage 1 asks learners to encounter the world differently, Stage 2 asks them to recognise that they are already implicated in relationships of dependence, consequence and obligation. The shift is from awareness to accountability. Learners move from observing systems to participating in them, not as heroic agents of change but as situated actors whose responsibilities are shaped by real communities, places and more-than-human relations.

In practice, learners might work with community partners, participate in ecological stewardship, map the feedback loops of a local socio-ecological system, contribute to a school or community sustainability initiative, conduct intergenerational dialogue or develop a “long obligation” statement that names a responsibility extending beyond the timeframe of a course. The point is not simply that learning becomes active, but that action becomes answerable. A community-engaged project supports relational responsibility only if the community has some authority to shape the question, evaluate the usefulness of the work and interrupt the learners’ assumptions. This requires genuine accountability rather than simulated engagement: learners responsible to someone or something beyond the grade.

Stage 3: Questioning

The third stage foregrounds epistemic plurality and critical reflexivity. Encounter and relation are not sufficient on their own. Without critique, relational education can become sentimental, depoliticised or universalising. It can invite learners to feel connected to “nature” or “community” while leaving intact the historical and institutional structures that determine whose knowledge counts, whose land is being discussed, whose futures are prioritised and whose labour sustains the conditions of learning. Stage 3 therefore introduces a critical turn: learners examine knowledge, power, coloniality, institutional positioning and their own formation.

In practice, learners might engage in dialogic seminars, ecology of knowledges workshops, Youth Participatory Action Research, institutional analysis, counter-canonical reading, positionality reflection or critical inquiry into their school’s own sustainability practices. They might compare scientific, local, Indigenous, artistic, economic and activist accounts of the same sustainability issue, not in order to collapse them into one synthesis, but to understand what each makes visible and what each excludes. They might map how their own institution speaks about sustainability while continuing to reward practices that reproduce short-termism, competition or reputational performance.

This stage enacts the principle of power before harmony. Relational and regenerative education must not retreat into a language of balance, connection or flourishing that evades coloniality, inequality or institutional contradiction. Critical reflexivity asks learners to examine their own implication in the systems they critique. It also requires them to examine Transition Design itself as a knowledge practice with its own assumptions, authorities and histories. If the ecosystemic learner is to work with pluriversal futures, then design cannot be exempt from the epistemic interrogation it asks of other fields.

Stage 4: Designing

The fourth stage foregrounds integrated ecosystemic agency. Learners now participate in long-horizon transition work through projects and relationships that exceed the course, cohort or immediate institution. This is where the framework most explicitly intersects with Transition Design practice and with work on Transition Design as an educational framework (Irwin, Tonkinwise and Kossoff, 2020). Learners engage with wicked problems, future scenarios, institutional redesign, community partnerships or ecological interventions in ways that require them to hold complexity, plurality and responsibility together. The goal is not to provide solution delivery, but situated contribution.

In practice, learners might participate in a Transition Design studio, a Futures Literacy Laboratory, a community-facing inquiry, an institutional redesign proposal, a regenerative design project or a long-term initiative handed from one cohort to the next. They may produce futures scenarios, systems maps, speculative artefacts, policy proposals, community resources, educational interventions or handover documentation. Crucially, they should encounter the productive incompleteness of transition work. They may contribute to work that others began before them and others will continue after them. This disrupts the possessive logic of project-based learning in which the learner owns, completes and showcases an outcome.

Productive incompleteness is central because sustainability transitions are not completed within the timeframe of a term, course or qualification. Learners need opportunities to practise contributing without closure, acting without control and designing without ownership. A handover document, for example, is not merely administrative. It is a pedagogical form that teaches responsibility to future participants.

Across all four stages, assessment must sustain formation rather than capture it, and teacher formation must be treated as part of the curriculum. If learners are assessed primarily through polished outputs, individual performance or short-term demonstrability, the curriculum will reproduce the very subjectivity it seeks to interrupt. Similarly, educators cannot facilitate ecosystemic formation while remaining positioned as neutral deliverers of content or managers of outcomes. These principles are developed further in the following section.

5. Pedagogy, Outcomes and Assessment Without Capture

The staged framework requires a corresponding account of pedagogy and assessment. Without this, the ecosystemic learner risks remaining a persuasive concept rather than a designable educational orientation. Yet this translation must be handled carefully. The purpose is not to convert ontological humility, relational responsibility, epistemic plurality and critical reflexivity into measurable competencies. Such a move would reproduce the logic the framework resists. The task is instead to identify pedagogical conditions through which these orientations may be rehearsed, recognised, interrupted and deepened over time.

The following table is therefore offered as a heuristic for curriculum designers, not as a rubric for assessing learners. It identifies possible signs of formation, not demonstrable competencies. Its function is to help educators design learning environments in which ecosystemic orientations may become more possible, while remaining alert to the ways that assessment, institutional reporting and performance cultures can capture and distort transformative intentions. The mappings are illustrative rather than exclusive.

Stage	Orientation	Pedagogical approach	Why this approach fits	Possible signs of formation	Risk if captured
Encountering	Ontological humility	Place-based inquiry, deep time walks, sensory observation, ecological fieldwork	These interrupt the detached, short-horizon learner by locating the self within living systems, deep time and situated complexity	Reflective journals, place portfolios, revised assumptions, willingness to sustain uncertainty	Experiential tourism, nature appreciation or affective immersion without conceptual depth
Relating	Relational responsibility	Community-engaged learning, systems mapping, ecological stewardship, intergenerational dialogue	These shift learning from awareness to accountability by placing learners in real relationships with communities, places and more-than-human systems	Community feedback, long obligation statements, project diaries, revised systems maps	Service learning without power analysis, or student action framed around benevolent intervention
Questioning	Epistemic plurality and critical reflexivity	Dialogic pedagogy, ecology of knowledges workshops, YPAR, institutional analysis,	These expose learners to contested knowledge systems and the power structures that shape what	Dialogic encounter documents, institutional critique, reflexive portfolios, community-useful inquiry	Performative critique, ideological signalling or rehearsal of expected critical language

		positionality reflection	counts as knowledge, evidence and authority		
Designing	Integrated ecosystemic agency	Transition Design studio, Futures Literacy Laboratory, institutional redesign project, long-horizon community initiative, handover documentation	These allow learners to contribute to transition work without closure, ownership or simple solution delivery	Handover documentation, futures scenarios, community- validated proposals, reflective synthesis	Solutionism, innovation theatre or polished project performance detached from accountability

The central point is that pedagogy and assessment are themselves part of the infrastructure. A curriculum may claim to cultivate relational responsibility, but if assessment rewards only individual performance, speed and polished outputs, then the deeper formative message remains individualistic and performative. Assessment does not merely measure learning after the fact. It teaches learners what kind of learning is valued.

This is why the framework requires assessment practices that sustain formation rather than capture it. Suitable forms of evidence are likely to be longitudinal, qualitative and relational. They may include reflective journals, place-based portfolios, community-validated inquiry, process documentation, handover materials, narrative self-assessment and retrospective reflection. These forms do not prove that a learner has “achieved” ontological humility or relational responsibility. Rather, they create opportunities for learners, educators and community partners to notice how forms of attention, responsibility, judgement and agency are changing over time.

Longitudinal portfolios are particularly significant because they resist the compression of learning into isolated assessment moments. If ecosystemic formation depends on repeated encounter, relationship, critique and contribution, then evidence must be gathered across time (Boud and Falchikov, 2007). A portfolio can show revision, hesitation, contradiction, return and development in ways that a single essay or presentation cannot.

Handover documentation offers another example of assessment aligned with transition infrastructure. In conventional project-based learning, learners are often rewarded for completing and presenting a bounded outcome. In transition-oriented learning, the most significant work may be unfinished. A handover document asks learners to explain what they attempted, what remains unresolved, what relationships must be sustained, what mistakes should not be repeated and what future participants need to know. It values continuity over closure.

Equally important is what should not count as appropriate assessment. The framework is structurally incompatible with standardised rubrics that grade “ontological humility,” “relational responsibility” or “epistemic plurality” as if they were discrete levels of attainment. It is also incompatible with assessment models that reward the performance of

the right language without evidence of relational accountability. Learners can quickly learn to sound reflexive, plural or ecological while remaining positioned within the same competitive and individualistic logic. This is the danger of competency capture: the language of formation is retained, but the infrastructure of assessment converts it into performative demonstration.

This does not mean abandoning evaluation. It means asking more careful questions about what evaluation is for. If assessment exists primarily to rank, certify and compare, it will struggle to support ecosystemic formation. If it exists to help learners and educators recognise patterns of attention, responsibility, uncertainty and change, it can become part of the transition infrastructure itself. Assessment becomes less a mechanism for proving impact than a practice of sustaining attention to formation over time.

6. Practice-Informed Vignettes: Possibilities and Tensions

The argument developed so far is conceptual and design-oriented. It proposes education as second-order transition infrastructure and the ecosystemic learner as an ontological orientation that may be cultivated through particular institutional, curricular and pedagogical conditions. However, a conceptual argument of this kind risks remaining abstract if it is not connected to the lived realities of educational design. The following vignettes are therefore offered as practice-informed illustrations rather than empirical proof. They are intended to show how the tensions named in the framework become recognisable in concrete educational contexts: how learner formation is shaped by institutional design, how youth agency becomes consequential or tokenistic, and how educational infrastructure may begin to form across networks as well as within single institutions.

The author writes from a practitioner-researcher position in curriculum development, sustainability education, youth environmental governance and educational network-building. This position provides situated insight into the institutional dynamics described, but also creates potential partiality. The vignettes do not present primary research data, and no claim is made that the initiatives described have been formally evaluated as evidence of ecosystemic learner formation. They should be read as conceptual anchors: they make visible the kinds of infrastructural questions the framework is designed to address.

6.1 A Learner Profile as Ontological Design

The first vignette draws on practitioner experience of developing a holistic curriculum and learner profile within an independent secondary school context. The initiative sought to move beyond a narrow account of educational success as academic achievement, employability or generic character formation, and to articulate a broader vision of the learner as someone capable of critical thought, ethical leadership, dialogue, global awareness, self-understanding and social responsibility. In design terms, the significant

move was not simply the creation of a new programme or award, but the attempt to define institutionally what kind of learner the school wished to form.

This kind of learner profile can be understood as a form of ontological design. It does not merely describe desired outcomes. It signals a formative ambition: an institution's answer to the question of who learners are being invited to become. When such a profile is linked to curriculum, reflection, leadership opportunities and institutional culture, it can begin to operate as transition infrastructure. It creates a shared language through which teachers and learners can connect academic learning, personal development, civic responsibility and ethical agency.

At the same time, the vignette illustrates the fragility of such work. A learner profile can become symbolic if it is not supported by assessment practices, timetabled space, teacher formation, governance structures and institutional accountability. This tension makes the example useful for the concept of fragile coherence. The institution may appear to possess a coherent vision because the language of holistic, ethical or sustainability-oriented education is present in policy, curriculum or promotional material. Yet the coherence remains fragile if the deeper regime of assessment, time, authority and reward is not redesigned around that vision.

This vignette does not demonstrate that such a profile produced ecosystemic learners. That would require systematic and longitudinal evaluation. What it does illustrate is a central design problem: institutions can name the kind of learner they wish to form more easily than they can redesign the conditions that make such formation possible. The gap between declared learner formation and infrastructural alignment is precisely the space in which education either becomes transition infrastructure or remains a symbolic sustainability commitment.

6.2 Youth Environmental Governance as Relational Responsibility

The second vignette draws on experience of youth environmental governance through a youth board structure connected to civic and environmental decision-making. Unlike conventional student voice mechanisms, which often invite young people to comment on adult-defined agendas, youth environmental governance can create spaces in which young people contribute to real initiatives, partnerships, campaigns and institutional conversations. The design significance lies in the shift from consultation to consequential participation.

In this context, young people were not positioned only as learners receiving sustainability education, nor as representatives invited to perform concern. They were invited into forms of civic and environmental practice: discussing priorities, shaping initiatives, contributing to partnership conversations, participating in public-facing projects and engaging with the institutional realities of environmental change. Such work can cultivate relational responsibility because it places learners in situations where their actions and judgements matter beyond the classroom. They become answerable not only to teachers or grades, but to communities, institutions, places and future participants.

Relational responsibility is not formed by telling young people that sustainability matters. It is formed through participation in relationships where responsibility has consequences.

When young people contribute to environmental governance, they encounter the complexity of institutional change: the need to work with adults, partners, local authorities, community organisations or civic bodies; the difficulty of translating concern into action; the slow pace of decision-making; and the tension between visionary language and operational constraint. These experiences can deepen agency because they show that change is neither individual expression nor instant impact. It is relational, negotiated and often incomplete.

Yet this vignette also reveals the risks of youth participation. Adult power remains present even in apparently youth-led structures. Adults often control access, agendas, resources, institutional legitimacy and final decision-making. Youth governance can therefore become symbolic if young people are invited to speak but not to shape outcomes. It can also reproduce inequalities if only already confident, articulate or institutionally legible young people are able to participate. The design challenge is not simply to create a youth board, but to ask where authority sits, what kinds of knowledge are valued, how disagreement is handled and whether young people can meaningfully influence the direction of the work.

For the ecosystemic learner framework, this example illustrates the difference between student voice and relational responsibility. Student voice often remains expressive: learners are asked what they think. Relational responsibility is more demanding: learners are situated within relationships of accountability, consequence and response. In Transition Design terms, youth environmental governance can be understood as a niche-level experiment in reconfiguring agency. It creates a small but significant space in which young people rehearse participation in transitions not as future citizens, but as present actors embedded in civic and ecological systems.

6.3 The Learning Lab as Infrastructure in Formation

The third vignette concerns the development of a research-led learning lab focused on flourishing, sustainability, systems change and educational transformation. Unlike the previous examples, this is not presented as established infrastructure. It is better understood as infrastructure in formation: an attempt to create a networked space through which schools, educators, researchers and partner organisations might engage collaboratively in the design of more relational, regenerative and transition-oriented educational practice.

This distinction matters. A project has a defined output and timeframe. Infrastructure creates conditions that enable other forms of work to become possible. A learning lab begins to function as infrastructure when it offers shared language, research-informed tools, convening power, reflective space, partnership structures and pathways for schools or organisations to develop their own context-specific responses. Its value is not primarily in delivering a single curriculum or intervention, but in creating the relational and intellectual

conditions through which multiple institutions might examine their own cultures, curricula, leadership practices and assumptions about flourishing.

The learning lab model is relevant to Transition Design because it sits between theory and practice, between individual institutions and wider systems. It can operate as a niche space in which alternative educational logics are prototyped: slower learning, systems inquiry, whole-school reflection, student agency, teacher formation, community partnership and more expansive accounts of success. It can also support the translation of conceptual work into institutional practice without reducing that work to a toolkit. In this sense, it embodies the same tension as the wider paper: how to make relational and ontological commitments designable without making them formulaic.

For the ecosystemic learner framework, the learning lab illustrates the possibility that formation does not occur only within individual learners or single schools. It can also be supported through networks that connect practice, research, policy and institutional experimentation. The ecosystemic learner, in this sense, is not simply a curriculum outcome. It is a systems question. What kinds of networks, partnerships and learning infrastructures are needed so that schools and educators can themselves become more ecosystemic in their ways of working?

Taken together, the three vignettes illustrate the paper's central claim at different scales. The learner profile vignette shows the institutional challenge of aligning educational purpose with infrastructure. The youth governance vignette shows how relational responsibility depends on consequential participation and the redistribution of agency. The learning lab vignette shows how transition infrastructure may begin to emerge across networks rather than within a single institution. None of these examples proves the framework. Each reveals a design tension that the framework helps to name: between aspiration and infrastructure, voice and agency, project and system, formation and performance.

7. Risks, Limits and Design Tensions

The framework proposed in this paper is not without risk. Its own theoretical commitments require that these risks be treated not as external objections, but as design constraints. If education is a form of ontological design, then attempts to redesign education for regenerative futures will always be vulnerable to capture by the very institutional logics they seek to transform. The question is therefore not whether the ecosystemic learner framework can avoid risk altogether, but whether it can make those risks visible enough to be designed with rather than reproduced unconsciously.

The first risk is competency capture. Although this paper has distinguished ecosystemic orientations from competencies, educational institutions are strongly inclined to convert complex formative aims into measurable outcomes. Ontological humility, relational responsibility, epistemic plurality and critical reflexivity could become a new checklist of desirable learner attributes, assessed through rubrics, portfolios or performance descriptors.

The phrase “ecosystemic learner” itself could also be appropriated as branding, a learner profile label or a strategic slogan without the underlying institutional redesign. In such a scenario, the language of ecosystemic formation would remain, but its meaning would be altered. Learners would be rewarded for demonstrating the appearance of humility, responsibility or reflexivity, rather than being supported to practise these orientations in situated and relational ways over time.

The second risk is institutional performativity. Schools and universities may adopt the language of regenerative education, ecosystemic learning or transition infrastructure without altering the deeper arrangements that shape everyday practice. Sustainability may appear in strategic plans, awards, curricula, learner profiles or public-facing communications while assessment regimes, timetables, governance structures and institutional incentives remain unchanged. This is fragile coherence: visible commitment without infrastructural reconfiguration. The danger is particularly acute because the language of relationality and regeneration is attractive to institutions seeking moral legitimacy. Without changes to time, authority, accountability and assessment, the ecosystemic learner can become another symbolic artefact within an unchanged regime.

The third risk is epistemic appropriation. The framework draws on decolonial, Southern, ecopedagogical and pluriversal traditions in order to resist universalising and Eurocentric accounts of sustainability and design. Yet these traditions can themselves be absorbed into dominant educational institutions as intellectual resources without shifting epistemic authority. Indigenous, Southern, local or relational knowledges may be cited, taught or aestheticised while the institution retains control over curriculum, assessment, validation and interpretation. This risk is especially serious for a framework that names epistemic plurality as one of its core orientations.

The fourth risk concerns privilege and transferability. Practice-informed examples drawn from well-resourced or high-autonomy contexts cannot be treated as universal models. Independent schools, international schools, design schools and research-led learning communities may have forms of flexibility, funding and social capital unavailable to institutions under greater material constraint or accountability pressure. This does not make such examples irrelevant. On the contrary, they may function as revealing cases: if fragile coherence appears even in favourable conditions, then the structural challenges are likely to be more acute elsewhere. However, the framework must not imply that all institutions can simply choose to become transition infrastructure if they adopt the right language or pedagogy.

The fifth risk is universalising the ecosystemic learner itself. The framework is intended as an analytic and design orientation, not a new universal subject to be produced across contexts. To present the ecosystemic learner as a single ideal would contradict the pluriversal and decolonial commitments on which the concept depends. Ontological humility, relational responsibility, epistemic plurality and critical reflexivity will be articulated differently in different cultural, ecological and institutional settings. A school working in a rural Indigenous

context, an urban state school, an international school, a design university and a community learning network will not and should not enact these orientations in the same way. The framework's value lies in the questions it opens, not in the uniformity of the answers it prescribes.

The framework should therefore be understood directionally rather than prescriptively. It does not offer a universal model for producing ecosystemic learners, nor guarantee that particular pedagogies will generate particular forms of subjectivity. Its value lies in helping educators, designers and institutions ask better design questions: what kinds of time are made available, what forms of knowledge are legitimised, where responsibility sits, what kinds of agency learners practise, and who is authorised to imagine the future. Education can function as transition infrastructure only if its designers remain alert to the ways transformation can be captured, performed, appropriated or universalised.

8. Conclusion: Designing Educational Infrastructure for Regenerative Futures

This paper has argued that education should be understood as a form of second-order transition infrastructure. Its central claim is not simply that sustainability transitions require better education, nor that curricula should include more sustainability content. Rather, it has argued that educational systems perform ontological design: they shape learners' relations to time, knowledge, agency, place, community and the more-than-human world. If Transition Design is concerned with the long-horizon redesign of ways of living, then education must be recognised as one of the infrastructures through which those ways of living are formed.

The concept of the ecosystemic learner has been offered as a way of naming the forms of subjectivity that regenerative futures may require. Ontological humility, relational responsibility, epistemic plurality and critical reflexivity are not proposed as competencies to be acquired or attributes to be measured, but as orientations that can be made more or less possible through institutional, curricular and pedagogical design. The challenge is not to add another learner profile to the proliferating language of educational outcomes, but to ask how educational infrastructures might support learners in practising more relational, plural, reflexive and long-horizon ways of being.

The staged framework proposed in this paper translates this argument into a design architecture through the recurring movements of encountering, relating, questioning and designing. These movements are not intended as universal stages of learner development, but as design prompts for creating educational conditions in which ecosystemic orientations may be rehearsed over time. Their value lies in shifting curriculum design away from the delivery of sustainability content and toward the formation of relational, reflexive and long-horizon capacities for transition participation.

The practice-informed vignettes suggest that these questions are not abstract. Learner profiles, youth governance structures and learning labs all reveal the same underlying tension: educational institutions can name transformative ambitions more easily than they can redesign the conditions that make transformation possible. This is why fragile coherence remains such a persistent problem. Sustainability may be present in policies, projects, awards or public-facing language, while the deeper infrastructure of time, assessment, authority and institutional reward remains largely unchanged. Transition Design has much to offer here, not only as a set of methods for future visioning or systems change, but as a way of interrogating the formative infrastructures through which agency itself is designed.

The risks are significant. The ecosystemic learner could be captured as a competency framework, performed through assessment, appropriated into dominant knowledge systems or universalised across contexts in ways that betray its own commitments. Yet these risks clarify rather than negate the argument. Education as transition infrastructure cannot be implemented as a packaged model. It must be situated, contested, reflexive and accountable to the communities and ecologies within which it takes shape.

For Transition Design, the implication is clear: education cannot remain an adjacent field concerned only with preparing future designers or disseminating sustainability knowledge. It is one of the infrastructures through which transition capacity itself is formed. At the level of international policy, this reframes the ambitions of SDG 4.7 and UNESCO's Education for Sustainable Development framework: the design problem is not simply what sustainability content to include, but what kinds of educational infrastructure can cultivate the subjectivities, relational practices and long time horizons that transitions require. To design with and for life is therefore not only to design new systems, tools or futures, but to redesign the educational infrastructures through which learners, institutions and communities become capable of sustaining transitions they may never personally complete.

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