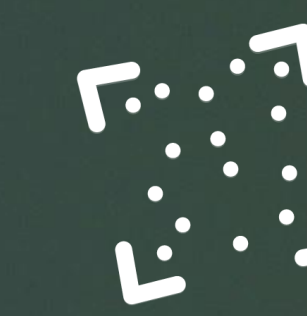
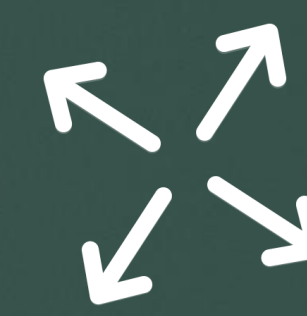
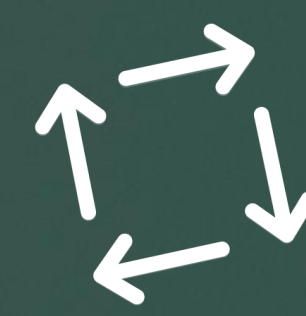
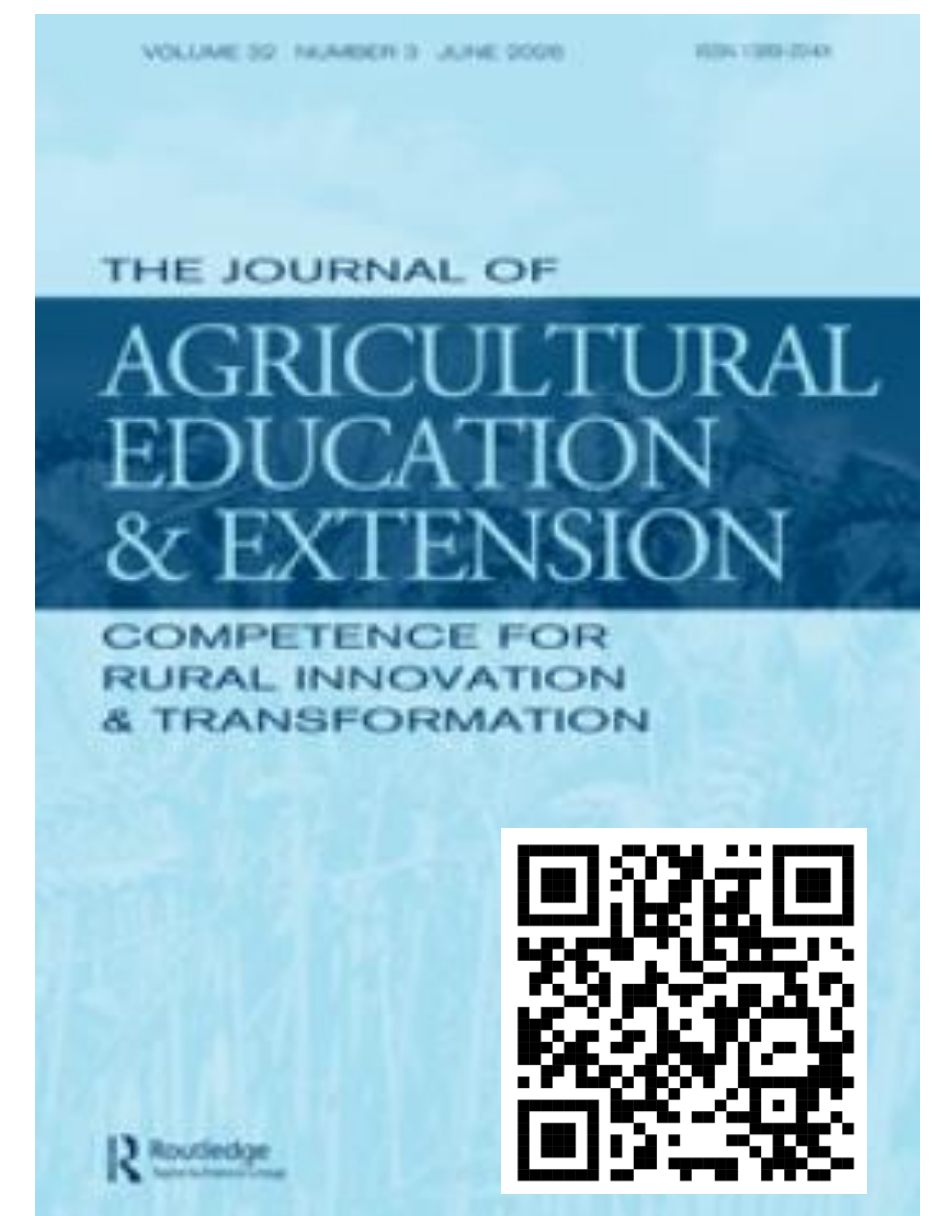




Agricultural living labs: bridging theory and practice through transformative learning

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Introduction

Climate volatility increasingly threatens agricultural systems, demanding innovative approaches to build resilience and advance sustainability through collaborative stakeholder engagement. Agricultural Living Labs (ALLs) have emerged as promising socio-technical platforms for co-creation, experiential learning, and transformation, yet their potential is hindered by conceptual heterogeneity, methodological pluralism, and insufficient grounding in transformative learning theories.

Purpose

This conceptual study addresses methodological and conceptual gaps in ALLs by integrating Mezirow's Transformative Learning (TL) theory into their design. It aims to enhance agricultural education and knowledge co-creation, enabling stakeholder-driven resilience amid climate volatility.

Key Definitions

• Agricultural Living Labs (ALLs)

LLs represent a platform for innovation in real-life environments that emphasize systematic user co-creation, integrating research and innovation activities within multi-stakeholder settings (ENoLL, <http://www.enoll.org>). ALLs specifically address sustainability challenges in farming systems, focusing on food security, water management, and climate adaptation (Yousefi et al., 2023; Cascone et al., 2024).

• Transformative Learning (TL)

TL theory, originally proposed by Mezirow (1978), focuses on how adult learners critically reflect on their assumptions and beliefs, leading to a transformation in their perspectives and actions (Taylor, 2007). It offers a promising framework for understanding and enhancing the potential of ALLs. Learning is the process of drawing on prior interpretations to develop a revised or entirely new understanding of the meaning behind a new experience, ultimately guiding future actions (Mezirow, 2000). Mezirow's research led to his delineation of ten phases of TL (Figure 1).

Building the integrated phases

Table 1: Overview of implementation steps clustering into Integrated Living Labs phases. Same color indicates similar phases.

Integrated LL phases	Sust. LL WI paper	Urban Transition Labs	RWE	Transdisciplinary Process	Pierson and Lievens (2005)	Malmberg et al. (2017)	Steen and Van Bueren (2017)	Radulescu et al. (2023)	Almirall et al. 2012
	Wanner et al. (2018) based on Gellert et al. (2013) and Liedtke et al. (2015)	Wanner et al. (2018) based on Nevens et al. (2013), Nevens & Roorda (2014), Völz, Bauknecht, & Kemp (2006)	Wanner et al. (2018) based on Gellert et al. (2013), Nevens & Roorda (2014), Völz, Bauknecht, & Kemp (2006)	Wanner et al. (2018) based on Scholz (2011), Scholz & Tietje (2002) and others	Pierson and Lievens (2005)	Malmberg et al. (2017)	Steen and Van Bueren (2017)	Radulescu et al. (2023)	Almirall et al. 2012
1. Initiation									
2. Insight research	1. insight research (analysis of material flows and patterns of action)	1. Analysing the system	1. System	1. Joint probl. definition	1. contextualization	1. exploration	1. initiation	1. initiation	1. Group selection
3. Prototyping	2. Prototyping (scenarios and prototypes)	2. Envisioning	2. Observing	2. Joint probl. representation	2. concretization	2. experimentation	2. plan development	2. preparation	2. Creation of an innovation arena
4. Field testing	3. Field testing (extended scope)	3. Exploring pathways	3. Recognizing	3. Jointly initiating a process of problem-solving	3. implementation	3. evaluation	3. co-creative design	3. co-creative design	3. Context development
5. Feedback loop		4. Experimenting	4. Planning		4. feedback		4. implementation	4. evaluation and link with decision-making	
6. Dissemination		5. Assessing	5. Action / Application				5. evaluation	5. feedback	
		6. Translating					6. refinement		
							7. dissemination		
							8. replication		

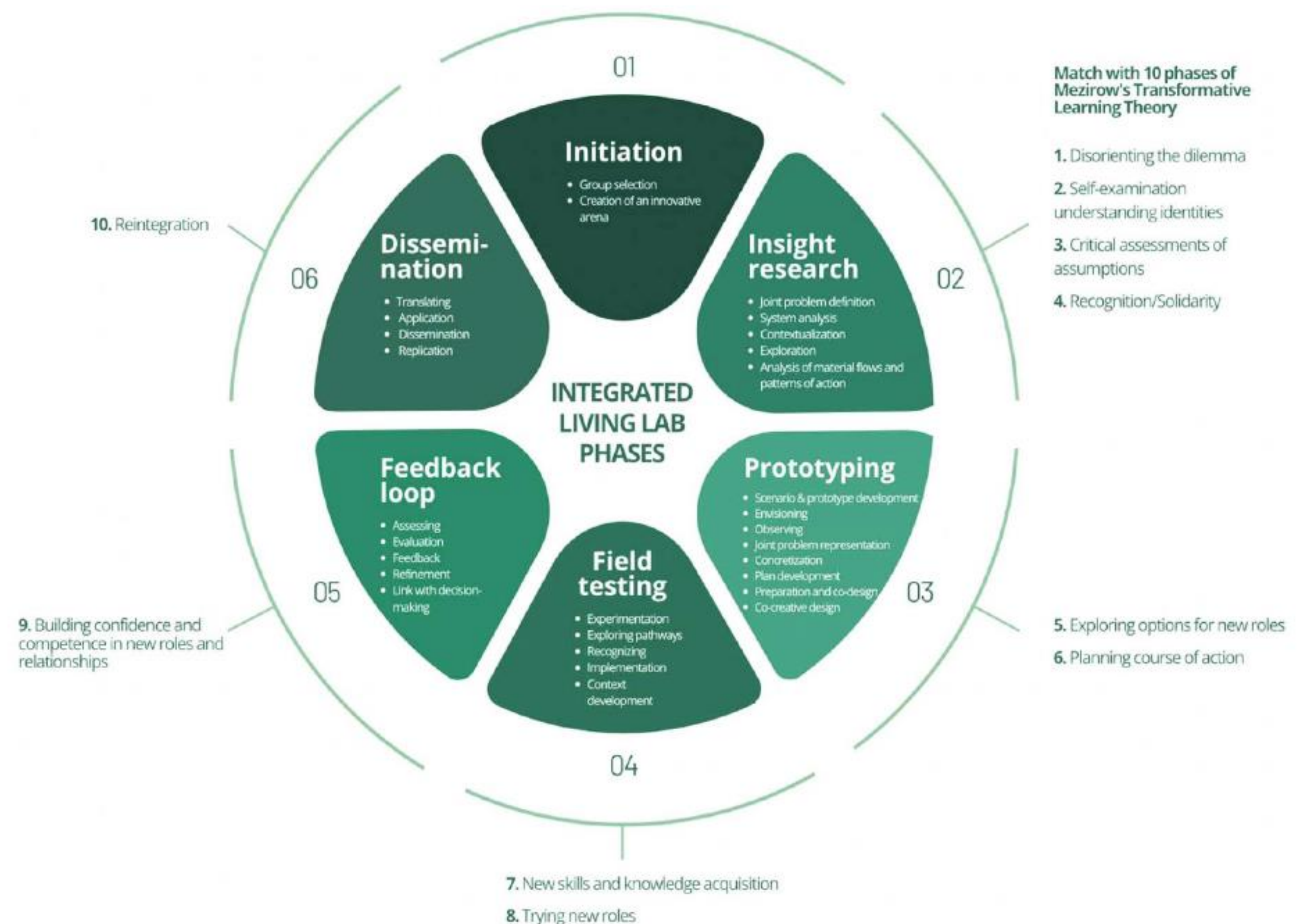
Source: Author's elaboration

Through a four-phase **methodological approach**— (1) a scoping review of LL frameworks, analyzed for objectives, phases, and methods; (2) inductive clustering of overlapping elements into six integrated LL phases; (3) deductive cross-fertilization mapping these phases onto Mezirow's TL stages to build the **TRANSFORM-ALL framework**; and (4) validation with experts at an international forum, yielding positive feedback and refinements for practical application. The phases and clustering across major LLs framework is presented in Table 1.

TRANSFORM-ALL Framework

This framework model structures ALLs into six interconnected phases (Figure 1): **01 Initiation** (triggering disorienting dilemmas), **02 Insight Research** (critical reflection and assumption analysis), **03 Prototyping** (collaborative experimentation), **04 Field Testing** (context-adaptive knowledge application), **05 Feedback Loop** (iterative reflective discourse), and **06 Scaling/Dissemination** (stakeholder-driven systemic change). These phases align with TL mechanisms, fostering spaces for critical reflection, collaborative knowledge production, and iterative adaptation.

Figure 1: Phases of TL in ALLs.



Why is this framework useful?

It provides a set of transferable lessons derived from the meta-analysis and clustering of implementation phases across major LLs frameworks. **TRANSFORM-ALL's** originality lies in its novel integration of TL theory into participatory innovation, positioning ALLs as tools for harmonizing ecological stewardship in sustainable transitions with collective learning processes. By embedding structured learning architectures into ALLs, this research enhances agricultural systems' capacity to respond to climate volatility through stakeholder-driven resilience, offering a robust yet adaptable model for education and systemic change.

Poster references:

