



## **Leadership by Learning Design: embrace complexity where it exists**

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### ***Abstract***

There is a mismatch between established practice in Learning Design and the increasingly complex nature of the challenges the world is facing. This article connects Learning Design to complexity science so learners can be better equipped to create a thriving future. Learning Design methods have traditionally leaned heavily upon the reduction of learning into consumable units of knowledge, skill, or understanding that constructively align to create higher-level learning. Those structured and predetermined outcomes assume a level of order and predictability that is not applicable to all contexts, and even less applicable the more volatile, unpredictable, and rapidly changing our world becomes. This practice places the learning designer as passive and complicit in perpetuating those challenges. Learning Design can lean upon complexity science to treat learning as a complex, adaptive system of interrelated and co-dependent parts. When the anthropic complexity approach of the Cynefin framework is applied to the design of learning experiences for climate action and decolonisation, this sense-making framework identifies opportunities to change praxis so that the learners are better prepared to address wicked problems in an increasingly complex world. These are changes that learning designers need to lead in an ethical and considered fashion.

**Keywords:** complexity science; Cynefin; Learning Design; sustainable development education; climate change.

## ***Introduction***

... all thinking involves a risk. Certainty cannot be guaranteed in advance. The invasion of the unknown is of the nature of an adventure; we cannot be sure in advance (Dewey and Hinchey, 2018, p.158).

As learning designers, we face challenges to what has been accepted as normal practice. Learners confront an uncertain, volatile future requiring skills to navigate complexity (Scott, Coates and Anderson, 2008). The prevalent reductionist approach to Learning Design fails to foster these capabilities (Fadeeva et al., 2014; O'Brien, 2022). To support a thriving future where learners tackle wicked problems, practice must evolve. This article examines Learning Design through a complexity science lens using the Cynefin framework and its value for designers leading this transition (Snowden and Boone, 2007; O'Brien, 2018). This leadership role may demand new capabilities from learning designers.

## ***Learning Design and complexity***

The more we study the major problems of our time, the more we come to realise that they cannot be understood in isolation. They are systemic problems, which means that they are interconnected and interdependent (Capra, 1996, p.3).

In this article, Learning Design (noun and capitalised) refers to the profession or discipline. Designing learning (verb and non-capitalised) is the practice of shaping learning experiences, while *a learning design* is the outcome of this process. Learning Design originated from instructional design methods developed by the US military (Case and Bereiter, 1984), with constructive alignment as their backbone (Biggs, 1996; Wang et al., 2013; Kandlbinder, 2014). This reductionist approach assumes learning can be broken into smaller parts and reassembled into knowledge, skills, and capabilities. Such linearity aligns with Dewey's 'quest for certainty' (as cited in Reich, Garrison and Neubert, 2016, p.1006) and Malcolm's view of Learning Design as 'anchored with a profile of an ideal graduate' (2013, p.121).

This approach offers benefits: ensuring learning consistency, providing structure for new knowledge, enabling efficient knowledge acquisition, filtering irrelevant content, and maintaining assessment standards (Biggs and Tang, 2011). However, it relies on predefined, tangible learning outcomes — centred on a linear 'Model of Instruction', where

the teacher is external and the learner an obedient subject in a closed system (Biggs and Collis, 2014, p.8).

Ings critiques obedient learning, advocating for creative, open spaces for disobedient learning (Ings, 2017). Sousanis (2015) describes such a shift as an unflattening of learning — potentially better suited to the complex, multidimensional futures learners face.

A consequence of our emphasis on assessing only what can be made tangible is that students are forced to remanufacture the process of their thinking into a narratable product. Unfortunately, what gets rewarded (and reinforced) is not authentic thinking at all, but the ability to construct illustrated explanations that are often quite artificial. These render invisible and inconsequential the illogical leaps our thinking makes (Ings, 2017, p.22).

So, does current *learning design* practice prepare learners for a disobedient, unflattened, complex world? The answer is both yes and no, and therefore worthy of further study. Snowden might call this bounded applicability (Snowden, 2019) — where the balance of benefits and limitations shifts within ever-adapting contexts, known as Complex Adaptive Systems (CAS) (Miller and Page, 2007).

## ***Learning and Complex Adaptive Systems***

Learning Design is not the first practice to grapple with complexity. Complex Adaptive Systems (CAS) exist in economies, ecologies, weather, traffic, social organisations, and cultures (Dooley, 1996). While CAS characteristics vary, core elements include non-linearity, numerous heterogeneous agents, self-organisation, adaptation, and emergent rules forming schema through co-evolution (Holland, 2006; Patton, 2010; Ellis and Herbert, 2011; Malcolm, 2014; Angeli and Montefusco, 2020). CAS has been used to examine design, strategy, management, policy, and education (Morel and Ramanujam, 1999; Chiva-Gomez, 2004; Davis, Sumara and Simmt, 2006; Ellis and Herbert, 2011; Hammer, Edwards and Tapinos, 2012; Ng and Lee, 2014).

The range of approaches to this complexity is vast and forms the field of complexity science. Capra and Luisi (2014) describe a historical pendulum swing between reductionist and holistic worldviews. Complexity science emerged from the push for a holistic perspective, forming an interconnected web of theory and practice. Castellani and

Gerrits (2021) map its evolution across academic traditions, with applied complexity standing out as recent and having the potential for application to Learning Design. Snowden's Cynefin framework sits within this theme, under human-centredness of anthro-complexity, and focuses on sense-making (Snowden and Boone, 2007).

Anthro-complexity, rooted in the ordinary nature of human interaction, supports sense-making in daily life. Snowden characterises human CAS by intelligence, intentionality, and identity (Snowden, 2021; 2022), implicitly linking them to learning. Humans reflect on experiences, interactions, and spirituality. This abstraction from experience allows for shifting perspectives and as such cognition and learning function as CAS (Harkema, 2003; Davis, Sumara and Simmt, 2006). We have the capacity to intentionally create goals and make deliberate choices beyond our immediate stimuli; the choices of one human, socially constructing the intentions of others (Leisman et al., 2012). Learning occurs within CAS, where identity is shaped by context, time, and adjacent agents (Cilliers, 2010). At anthro-complexity's core is the idea that we act, learn, and exist within complexity, finding coherence in our narratives.

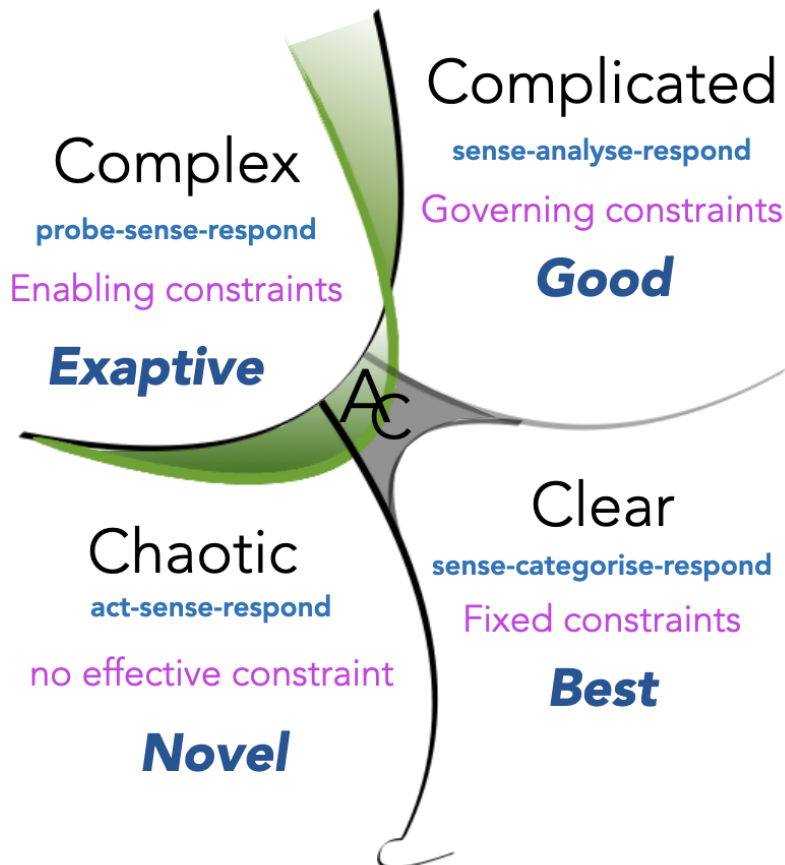
The Cynefin framework aids sense-making and decision-making by applying bounded solutions to different domains (Snowden and Boone, 2007). The Cynefin framework helps navigate multiple domains and the transitions between them. The Welsh word Cynefin translates roughly to 'the place of your multiple belongings' (Snowden, Greenberg and Bertsch, 2021, p.16). While similar to the Māori concept Tūrangawaewae, which describes the place in which you stand, Cynefin emphasises movement between domains and has no direct English equivalent (Snowden, personal communication, 23 March 2022; Te Aka Māori Dictionary, n.d.).

### ***The Cynefin framework***

The anthro-complexity approach of the Cynefin framework proposes that systems exist in different domains based on complexity. The framework's primary components are three domains: ordered, complex, and chaotic. As shown in Figure 1, each domain has distinct characteristics, constraints, types of performance measures, and ways of working — bounded applicability (Snowden, 2006).

This article explores each Cynefin framework domain at a fundamental level, drawing from Snowden, Greenberg, and Bertsch (2021). Within each, key characteristics are outlined in terms of activity, constraints, practice, the nature of learning, and examples of learning.

**Figure 1. Cynefin domains (from <https://cynefin.io/wiki/File:Cynefin18FEB2021.png>, under CC BY-SA 4.0).**



### ***The ordered domain***

The ordered domain is divided into ‘clear’ and ‘complicated’ (Snowden, Greenberg and Bertsch, 2021). Both have constraints that enable predictable outcomes. In the clear domain, constraints are fixed, and performance is measured by predetermined Key Performance Indicators (KPIs). The link between cause and effect is obvious, allowing best practices to emerge. Learning designs in this domain are predetermined, linear, and unambiguous, and controlled within a structured context. Assessments are standardised, requiring little interpretation — e.g. online, multiple-choice tests. Examples include induction modules ensuring minimum knowledge transfer or anatomy tests requiring

correct identification of features. Information is basic, enabling safe workplace entry or progression to further learning. Assessment focuses on recall, with clear right and wrong answers. While hierarchical views of learning are debated, learning in the clear domain aligns with lower order thinking in Bloom's and SOLO taxonomies (Pring, 1971; Ormell, 1974; Furst, 1981; Biggs and Collis, 2014). In the clear domain, the focus is most likely on content acquisition.

In the complicated domain, causality is less visible and may require analytical expertise to uncover (Snowden, Greenberg and Bertsch, 2021). Constraints are shaped by laws, rules, and codes, open to interpretation and inconsistent application. Instead of a single best practice, models of *good* practice evolve. Performance is measured against common objectives or accepted standards. Learning designs introduce extensive, sometimes contradictory knowledge sources. Multiple tools or methods may address the same problem. Learners develop transferable competencies to resolve issues and navigate context. Examples include gathering field data where controlled conditions are impossible or conducting mixed-methods research requiring integration of diverse data. These activities involve higher-order thinking beyond content retention. In the complicated domain, the focus is most likely on competency development.

### ***The complex domain***

The complex domain involves systems where entanglement between agents prevents identifying linear causality. This is the realm of complex adaptive systems and wicked problems (Dooley, 1996; Malcolm, 2014; Zivkovic, 2015). Constraints are more permeable, based on heuristics or principles enabling distributed decision-making within a broad range of actions. They allow coherent heterogeneity across the system, with interactions fostering emergent change. Models of practice are fluid, requiring exaptive innovation — radically repurposing capabilities for new contexts (Mastrogiorgio and Mastrogiorgio, 2020; Melis, Lara-Hernandez and Melis, 2022; Sedita, Blasi and Ganzaroli, 2022). Performance is measured by progress velocity and its energy cost (vector targets).

The complex domain has been described as learning on the edge of chaos (Mann et al., 2017b; Johannessen, 2022). Learning is often open-ended, with high learner agency and lower constraint levels. Heutagogical principles may be evident, as learners control their

learning (Kenyon and Hase, 2001; Blaschke and Hase, 2016; Mann et al., 2017 a). Learning and sense-making emerge rather than proving/disproving hypotheses.

Project- or inquiry-based learning — where multiple outcomes exist — or authentic assessments help learners navigate complexity (Reeves, Herrington and Oliver, 2002). For instance, students fostering behavioural change by implementing diverse anti-drunk-driving initiatives in their community engage with a complex domain. Distinguishing capabilities from competencies is key. Capabilities involve responsiveness, creativity, and contingent thinking in uncertain conditions (Scott, Coates and Anderson, 2008, p.12), while competencies focus on well-defined tasks in predictable settings (ordered domains). In the complex domain, the focus of learning is most likely on the development of capabilities.

### ***The chaotic domain***

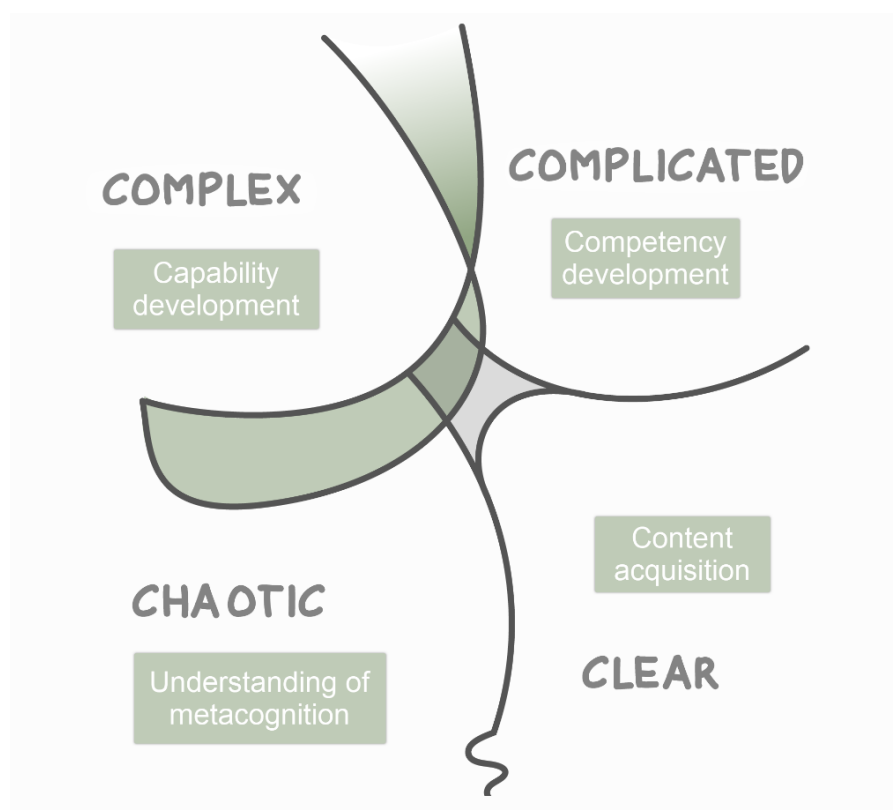
Chaotic systems lack effective constraints. Causes of change and actions appear incoherent or absent. Practice is a novel response to an unpredictable context, using available resources. Performance is measured by survival. Learning in chaos is rarely designed, instead focusing on improvisation for immediate needs. Resilience may develop in response to chaos, though stress often hinders learning (Joëls et al., 2006). However, reflective practice after exposure can enhance learning (Moon, 2013).

A relevant example from the author's practice is military Adventure Training (AT), designed to condition leaders' capabilities in high-stress, real-risk situations. Exposure to battle-like conditions fosters reflection and metacognitive awareness before combat (Morrison and Fletcher, 2002; Army Adventurous Training Group, n.d.). Though training activities incorporate risk management and preparation, open and volatile environments can push learners (and instructors) into chaotic situations (Davids et al., 2013). Examples include being trapped against sea cliffs as tidal surges arrive an hour early, responding to climbers critically injured in ice falls, or improvising a pulley system to rescue a kayaker from a waterfall. These real events, though unplanned, were expected within open-ended adventurous training (Boyes and O'Hare, 2003; Collins, Carson and Collins, 2016). In the chaotic domain, the learning is most likely focussed on metacognition.

## ***The nature of knowledge and learning in each domain***

The nature of knowledge across domains has been described as known (clear), knowable (complicated), unknowable-in-advance (complex), and unknowable-ever (chaotic) (Zimmerman, Lindberg and Plsek, 2009; Patton, 2010). Davis, Sumara, and Simmt (2006, p.134) stated that 'education for a complex world entails a certain trans-disciplinarity', but focused on knowers and knowledge rather than the nature of learning itself.

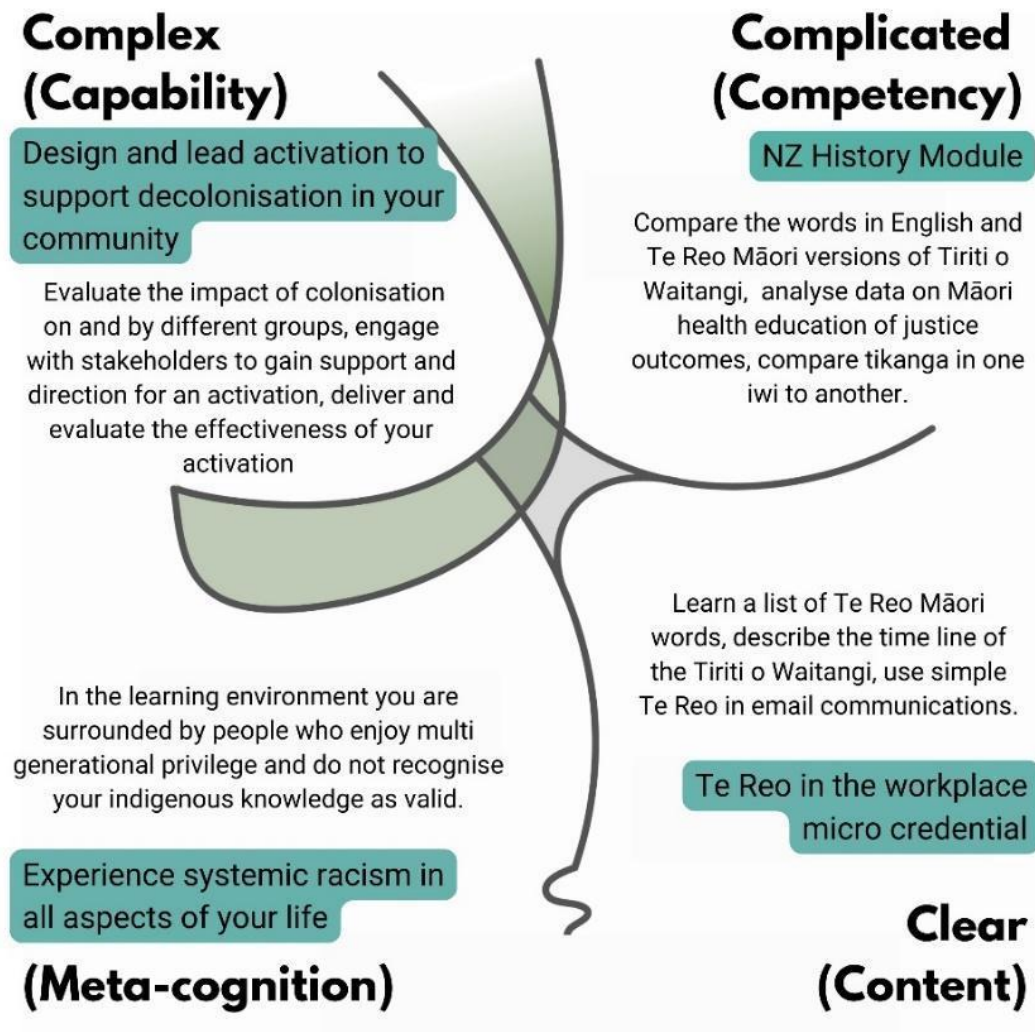
**Figure 2. Cynefin: the nature of learning in the domains of the Cynefin framework (adapted from [https://cynefin.io/wiki/File:Liminal\\_cynefin-1.png](https://cynefin.io/wiki/File:Liminal_cynefin-1.png), under CC BY-SA 4.0).**



The nature of learning in each domain has received less attention than the nature of knowledge. Figure 2 outlines the likely focus of learning in each Cynefin domain: content acquisition (clear), competency development (complicated), capability development (complex), and metacognition (chaotic). While these describe primary learning focuses, they do not exclude other learning types. For instance, content acquisition may be required in emergencies to manage chaos. This appears to be a novel adaptation of the framework, and an important connection for its application to Learning Design.

## Applying the Cynefin framework to Learning Design

Figure 3. Designing learning for decolonisation through the lens of the Cynefin framework (adapted from [https://cynefin.io/wiki/File:Liminal\\_cynefin-1.png](https://cynefin.io/wiki/File:Liminal_cynefin-1.png), under CC BY-SA 4.0).

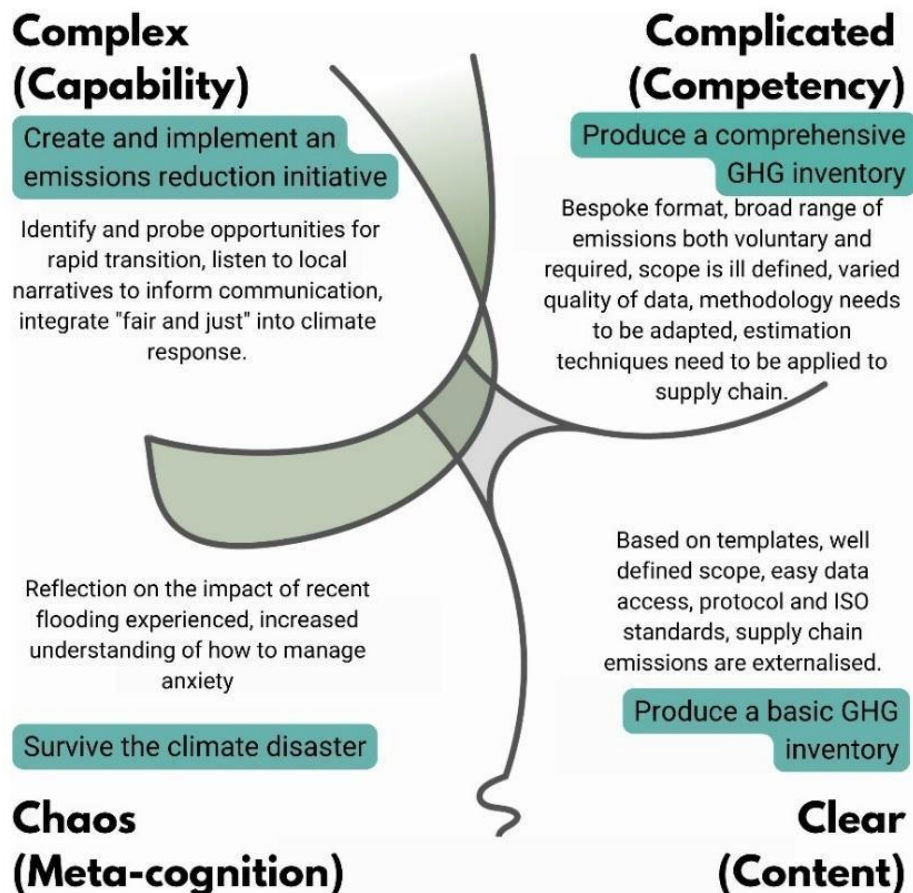


We have established that complexity science, particularly applied complexity thinking, is relevant to Learning Design when we view learning as a Complex Adaptive System (CAS) in which we exercise being-acting-learning. The Cynefin framework's domains provide a sensemaking structure to explore the nature of knowing and learning at various levels of complexity. In this section, two concrete examples are provided to show how the Cynefin framework can be applied to learning designs, preparing students for a complex and rapidly changing future. These examples address two of the most complex, wicked problems: climate change and colonisation.

Figures 3 and 4 illustrate how learning designs could differ when addressing these issues through the Cynefin lens. Figure 3 shows the varied nature of learning in relation to climate change, while Figure 4 focuses on decolonisation within Aotearoa-New Zealand's Treaty context. In the clear domain, learning experiences could increase foundational knowledge, enough to engage at deeper levels, for example simple maths to calculate greenhouse gas emissions from given data or recalling Te Reo Māori vocabulary.

In the complicated domain, learning becomes more nuanced. Tasks require more planning to clarify uncertainties, and there may be multiple methods of achieving the correct outcomes. Learners will develop competencies to complete tasks in a safe or controlled environment. Examples include estimation techniques for emissions data not directly available or presenting data from various sources with inconsistent collection methods.

**Figure 4. Designing learning for climate change through the lens of the Cynefin framework. (adapted from [https://cynefin.io/wiki/File:Liminal\\_cynefin-1.png](https://cynefin.io/wiki/File:Liminal_cynefin-1.png), under CC BY-SA 4.0).**



While activities in the clear and complicated domains might help learners progress towards addressing wicked problems, they are unlikely to directly impact those problems through learners' participation. The learning and the context of the problem are isolated by the constraints of the learning environment (Rancati and Snowden, 2021). In this way, the learning designer fails to lead change, and their work is less likely to contribute to a thriving future.

In the complex domain, learning designs are more authentic, open-ended, and directly engaged with the real context where change is needed. There are limitless variations in activities, outcomes, and experiences. Learners have more agency and co-design responsibility. The learning design is non-repeatable, as it could be implemented many times with different experiences. For example, stakeholder engagement on climate change involves diverse perspectives, outcomes, and socio-political agendas. Any activity requiring the integration of concepts of justice or fairness into social transformation will inevitably encounter changing relationships between agents in a system. The key characteristic of the learning in this domain is its integration with real change. This is a metaphorical reference to hands that are hardened by difficult work where the learning centres around the capabilities required to lead change (the hardening of the hands) (Smith, 2022). These capabilities (personal capabilities, interpersonal capabilities, and cognitive capabilities) can then be applied to many contexts, beyond the context of the learning experience (Scott, Coates and Anderson, 2008).

In the chaotic domain, learning might occur through reflection after returning to a less chaotic context. Due to the lack of constraints, such experiences could be traumatic for learners. For example, exposure to systemic racism or the negative impacts of climate change (and the inequity of those impacts) may not be justifiable as planned learning experiences. This raises the ethical question of whether learning designs that involve chaos are always justifiable. The learning here is likely to focus on metacognition (e.g. 'How did I manage that?'), a valuable attribute, but one that comes with risks that may not always be acceptable.

Identifying the differences in the nature of learning across domains does not imply a required sequence from content to higher-order learning. While scaffolding knowledge and skills can be beneficial, learners might find themselves tumbling from the clear domain into the chaotic domain (Berg and England, 2021). Learners who refuse to 'look up' may be choosing to ignore the signals of impending chaos.

The original question asked whether reductionist learning design approaches adequately prepare learners to make sense of a complex, dynamic world. Based on examples of learning through anthro-complexity, the prevalent approach seems bound to the ordered domains of clear and complicated. This does not mean that we should abandon linear learning, constructive alignment, or predetermined outcomes. Content and competencies are necessary, and learning in the ordered domains should continue. However, the untapped opportunity for learning designers to lead real change lies within the complex domain.

If learning designers are committed to a thriving future where learners can tackle wicked problems, their practice must expand to include more learning in, and for, the complex domain, without intentionally stumbling into the fraught ethics of learning in chaotic domain.

### ***Learning in and for the complex domain***

So, what is the guidance that learning designers need to change their practice, to better support learning in and for the complex domain? As seen in the earlier discussion around climate change and colonisation, to support learning in and for the complex domain, learning designers need to rethink their practices and adapt their approaches. Drawing from the earlier discussion (Figure 3 and 4), there are some common aspects of this scaffolding: increasing the authenticity of experiences, creation of leadership opportunities, high levels of learner agency, and the opportunity to *probe* the real-life context. It is worth looking at existing scaffolding around these aspects, and how to integrate them into one point of reference.

Authenticity of experience is core to real engagement with wicked problems. While referring to online design, Reeves, Herrington, and Oliver (2002) describe a range of characteristics relevant to all authentic learning experiences. These include having real-world relevance, being ill-defined, providing the opportunity for students to examine the task from different perspectives, interdisciplinarity, allowing competing solutions and diversity of outcome, and having outcomes that have value beyond the learning activity itself.

Learning can be considered as a leadership activity in its own right. Learning as leadership in the complex context of civil society is central to Malcolm (2014). They provide a set of complexivist strategies within the four categories of personal, relational, structural, and cultural strategies. Within the category of personal strategies there is emphasis on curiosity, deliberate redistribution of power, small actions leading to large outcomes, and self-awareness. Relational strategies focus on facilitation of intentional inquiry which develops respectful relationships, stillness, and collective wisdom. This inquiry needs to be a well-resourced, ongoing cycle of sense-making and learning-informed action. Within these relationships, uncertainty, messiness, diversity, tensions, discomfort, disturbance, paradoxes, and a distance from equilibrium act as the energy for learning. Structural strategies seek to maximise connectivity even beyond the system's immediate agents. This connectivity is inherently linked to the work of allies. Support systems are created, which are temporary and avoid over-specifying roles and requirements. Cultural strategies emphasise the 'doing with' over the 'doing for' as this offers leadership opportunities across the system. Diversity is embraced in all forms, as it increases the range of possible actions and outcomes.

A high level of learner agency is apparent in the climate change and colonisation examples of learning in the complex domain. Indeed, it is not possible to separate learner agency from the ability to freely explore multiple perspectives and lines of enquiry as a leader, or from immersive authentic engagement. Heutagogy describes an approach to learning that centres on learners determining their own learning (Blaschke and Hase, 2016; Agonács and Matos, 2019). Heutagogy places increased emphasis on capability development, is learner-determined, is non-linear, and opens significant opportunities to address real world issues (Kenyon and Hase, 2001; Blaschke, 2012; Mann et al., 2017b; Narayan, Herrington and Cochrane, 2019). Change or innovation labs and hackathons are great examples of learning experiences embracing the concepts of heutagogy to address real world wicked problems. Zivkovic suggests characteristics of innovation labs that focus on addressing wicked problems at a systems level (Zivkovic, 2018). These characteristics include taking a place-based approach, taking a transition approach, enabling coherent action by diverse actors, involving users as co-creators, and recognising some dependence on governments to create enabling constraints. Examples of such learning experiences from the author's own practice include The Social Experiment, Waste Jam, Start-up Weekend, Audacious, and The Great Dunedin Brainstorm (Silveira, Bizarrias and Carmo, 2017; Waste Jam, 2019; Students Starting Businesses — Startup Dunedin, 2019).

All these events involve rapid ideation, validation, and parallel trialling of ideas, a process Snowden, Greenberg, and Bertch refer to as 'probe-sense-respond' (2021, p.15).

Probing is seen as the first step in sensemaking in the complex domain. Given the interdependencies, entanglement, and dynamic nature of complexity, it is not possible to make sense of the situation without first probing to acquire an observable response. These probes should be multiple, parallel, diverse, and fail-safe (Pelrine, 2011; Van Beurden et al., 2013; Lepmets et al., 2014; van Kemenade, 2021). Establishing scaffolding for learners to probe into wicked problems will help them reveal emergent patterns, to gain a sense of what is likely to work, then respond by amplifying and resourcing. This is quite different from the hypothesis-testing approach of sense-analyse-respond, which is more appropriate to the complicated domain, where learning is founded more on facts and binary approaches.

Characteristics of learning described in Malcolm (2014), Reeves, Herrington, and Oliver (2002), Snowden, Greenberg, and Bertsch (2021), Zivkovic (2018), and a range of work in the area of heutagogy described above, were listed (on post-it notes) and arranged into groups of emergent themes as an affinity diagram. Using affinity diagrams is an effective and efficient method of identifying emergent themes (Dam and Siang, 2020). The following themes emerged: real and wicked impact, the nature of learning, the nature of probes, the diversity of probes, and scaffolding for emergence. Characteristics which clustered to form these emergent themes were then used to develop a set of evaluative questions (O'Brien and O'Brien, 2025). Table 1 outlines the themes alongside a set of evaluative questions for each. From these themes, subsets of evaluative questions can be developed. These questions could allow learning designers to evaluate the extent to which the learning experiences they are designing will align with learning in and for the complex domain, and thus better support learners to lead change in an increasingly complex and dynamic future.

**Table 1. Emerging themes and evaluative questions.**

Learning theme	Evaluative questions
Real and wicked impact	<p>Will the activity of the learner have an impact on the context of change?</p> <p>Is the learning looking at issues from a systems level perspective?</p> <p>Is the learning intrinsically linked to place?</p> <p>Is there interplay with agents beyond the immediate system such as governments?</p>
The nature of learning	<p>Does the learning experience draw on multiple disciplines to create solutions?</p> <p>Will the learning develop learners' capabilities (beyond competency and content)?</p>
The nature of probes	<p>Does the learning experience create multiple opportunities to probe the real-world context in a manner that is fail-safe?</p> <p>Is parallel activity apparent in the probing activities?</p> <p>Could the learning experience allow multiple competing solutions to a real-world issue?</p> <p>Do learners have sufficient freedom to create multiple and non-linear pathways through the learning without the constraints of a hypothesis?</p>
The diversity of probes	<p>Do probing activities involve multiple and diverse actors within the system?</p> <p>Is there opportunity and support to explore a real-world issue from multiple perspectives?</p> <p>Is there the opportunity for learners to establish a role as an ally in creating real change?</p>
Scaffolding for emergence	<p>Is there recognition that change will happen through a transitional phases or temporary structures?</p> <p>Is there support for learners in understanding and embracing emergence as part of learning?</p> <p>To what extent do learners recognise their role as co-creators of change?</p>

## ***Example of applying evaluative questions to complex learning***

So far, this article has established the relevance of the Cynefin framework and anthropic complexity to Learning Design. We have identified an opportunity to further support learning designers to create more learning that is aligned to learning in and for the complex domain of the Cynefin framework. Several aspects of learning that can lead to real change through engaging in complex and wicked problems have been synthesised to provide a bank of themed evaluative questions. These questions are intended to allow the learning designer to evaluate the extent to which a learning experience will support learning for and in complex contexts. To examine the effectiveness of these questions, we can now look at their retrospective application to a learning experience that was specifically designed to address the wicked problem of waste minimisation.

Waste Jam was a weekend innovation event held in 2019 to increase the number of innovative ideas that targeted the reduction of waste in the city of Ōtepoti-Dunedin in Aotearoa-New Zealand. These innovations would also be supported by a waste-reduction innovation fund should they have sufficient potential for impact (Startup Dunedin, 2019; Waste Jam, 2019). The event was co-designed by a local start-up incubator, the founder of a national change initiative, and a learning designer from a local vocational education college (the author) (Startup Dunedin, 2019). Around 60 participants took part, supported by a team of facilitators, and a 'human library' of around 20 experts in the relevant fields of waste, technology, funding, business development, and environment. The participants included students from high school to doctoral study, local authority officers, environmental activists, fashion designers, inventors, technologists, and entrepreneurs.

Table 2 shows the application of the evaluative questions to Waste Jam. The questions were relatively simple. All questions seemed relevant to the experience of Waste Jam. There seemed to be good alignment between the themes needed to support learning in and for the complex domain and the design of Waste Jam.

While applying the evaluative questions to one example does not demonstrate conclusively that they will provide all the necessary scaffolding to support learning designers to design learning experiences for and in the complex domain, it does demonstrate that it is a usable starting point. It is a resource that has emerged from a significant body of complexity research and that could support reflection on and in the processes of *learning design*. It provides a mirror in which the learning designer can

evaluate the extent to which they are leading a transition into a thriving and increasingly complex future.

**Table 2: Application of evaluative questions for learning in the complex domain**

Complexivist learning theme	Evaluative questions	Example — Waste Jam
Real and wicked impact	Will the activity of the learner have an impact on the context of change?	Yes: the activity will lead to real waste reduction and diversion initiatives.
	Is the learning looking at issues from a systems-level perspective?	Yes: improving the waste system at a city level was the setting of the event.
	Is the learning intrinsically linked to place?	Yes: the event was directly linked to the needs of the city.
	Is there interplay with agents beyond the immediate system such as governments?	Yes: national governing bodies and government departments were involved.
The nature of learning	Does the learning experience draw on multiple disciplines to create solutions?	Yes: there were students and staff from high school, vocational ed. and universities. They came from a range of departments.
	Will the learning develop learners' capabilities (beyond competency and content)?	Yes: The two days required the capability to work with a diverse group, under pressure and in a changing environment where objectives pivot regularly.
The nature of probes	Does the learning experience create multiple opportunities to probe the real-world context in a manner that is fail-safe?	Yes: the validation of ideas allowed fails to happen fast at low cost. Sharing sessions allowed groups to learn from the parallel probes of other groups.
	Is parallel activity apparent in the probing activities?	Yes: each group's innovation idea was a separate probe into the same context.
	Could the learning experience allow multiple competing solutions to a real-world issue?	Yes: All the ideas could have been competing or complementing solutions to the problems with no clear or exclusive best option.
	Do learners have sufficient freedom to create multiple and non-linear pathways through the learning without the constraints of a hypothesis?	While there was scaffolding, groups went through the innovation process at different rates and via different approaches. For example, trying multiple ideas and pivoting compared to sticking with one idea throughout.

The diversity of probes

Do probing activities involve multiple and diverse actors within the system?

Yes: there was a 'human library' available that provided expertise and perspectives from multiple stakeholders in the system.

Is there opportunity and support to explore a real-world issue from multiple perspectives?

Yes: there were the opportunities, but the Māori representation among attendees was much lower than hoped.

Is there the opportunity for learners to establish a role as an ally in creating real change?

Yes: there were examples of team members raising concerns for groups of which they were not a member from an equity perspective.

Scaffolding for emergence

Is there recognition that change will happen through transitional phases or temporary structures?

Yes: the model was based on back-casting, so the emergence of the path forwards was emphasised from the start.

Is there support for learners in understanding and embracing emergence as part of learning?

Yes: the event had trained facilitators who coached groups through the process.

To what extent do learners recognise their role as co-creators of change?

Yes: this was a voluntary event where participants opted-in to contribute to solving city-wide waste issues.

## **Conclusion**

We create a context where voices are heard and hold up a mirror so that the “system can see itself” in different and potentially possibly transformative ways  
Sonja Blignaut (cited Snowden, Greenberg and Bertsch, 2021, p.127).

In this article, we explored the relationship between anthro-complexity and Learning Design. Applied Complexity Theory, particularly the subfield of anthro-complexity, was identified as relevant and applicable. The Cynefin framework, developed by Snowden (Snowden, Greenberg and Bertsch, 2021) proved useful in framing learning within different domains. Compared to prevalent Learning Design methodologies, the complex domain is often insufficiently addressed in linear, constructive-alignment-driven models.

Incorporating learning in and for the complex domain is crucial for two reasons. First, to prepare learners for a more complex and volatile future, learning in the complex domain helps develop the capabilities they will need. Second, if learning designers take responsibility for contributing to a thriving future, they must engage learners in addressing wicked and complex problems — something that cannot be accomplished within the constrained, ordered domains.

Applying the Cynefin framework to Learning Design allowed for the construction of evaluative questions that enable designers to reflect on their work’s relevance to preparing learners for an increasingly complex world. Future research could explore the application of these evaluative questions and the Cynefin framework in a broader range of learning contexts. Additionally, further investigation into the Cynefin framework might focus on the transition process between domains (through liminal zones), how to identify which domain learners are in (the aporetic zone), and how to best address the ethics of learning in chaos.

While there is a disconnect between established practice in Learning Design and the increasingly complex nature of the challenges the world is facing, this article has connected Learning Design to complexity science so learners can be better equipped to create a thriving future. This complexity lens on Learning Design provides the learning designer the opportunity to contribute directly and indirectly to addressing the wicked problems that we face as we move into an increasingly complex future. This is a leadership opportunity to take us into a thriving future.

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