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Scenario planning in educational leadership: developing innovation literacy through design-based professional learning

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Educational leaders are increasingly expected to communicate and enact innovation within volatile and uncertain conditions. Yet strategic initiatives frequently stall because leaders struggle to articulate new ideas in ways that stakeholders can understand, trust, and meaningfully differentiate from past practice. This study examined how design-based professional learning using scenario planning can build innovation literacy-the communicative, imaginative, and symbolic capacity to describe emerging futures. Using a design-based research methodology, the study examined 161 educational leaders across six leadership groups who participated in a 10-month professional learning series incorporating scenario planning, futures thinking, and iterative design cycles. A graduate student cohort (n = 11) completed a single adapted scenario-planning activity and provided a comparative case through which to examine the development of scenario literacy and innovation literacy in relation to leadership experience. Data sources included scenario artifacts, participant journals, field notes, session transcripts, and pre- and post-self-assessments. Quantitative data were analyzed descriptively and interpreted alongside qualitative evidence of shifts in participants' language, metaphors, and communicative practices. The triangulated findings indicated that leaders initially lacked scenario literacy and required explicit scaffolding to imagine plausible futures rather than reproduce current realities. As shared understandings of trust, disruption, and innovation developed, participants generated new metaphors, icons, and linguistic structures that enhanced communicative clarity. Participants also reported increased confidence and efficacy in describing innovations to stakeholders. The findings indicate that scenario planning, when embedded within a design-based professional learning structure, can expand educational leaders' communicative repertoires and strengthen system-level sensemaking. The study offers implications for leadership development, professional learning design, and the cultivation of the communicative capacities needed to lead innovation in complex educational environments.

KEYWORDS
complexity leadership, design-based research, educational leadership, futures thinking, innovation literacy, professional learning, scenario planning, sensemaking

1 Introduction

Educational leaders across global systems are being asked to navigate unprecedented levels of volatility, uncertainty, and rapid change while simultaneously designing learning environments capable of preparing students for complex futures (Fullan, 2021; Hargreaves and Shirley, 2022). Yet even well-designed strategic initiatives often fail to achieve their intended impact, not because stakeholders resist innovation, but because leaders struggle to communicate new ideas in ways that are comprehensible, trustworthy, and meaningfully differentiated from existing practices. Research on organizational learning and educational change suggests that when leaders introduce unfamiliar initiatives, stakeholders interpret these ideas through existing beliefs, professional norms, and prior experiences, often translating reforms into familiar practices that feel consistent with what they are already doing (Sonenshein, 2010; Spillane et al., 2002). Sensemaking scholarship (Weick, 1995) further demonstrates that when actors rely on pre-existing cognitive frames to interpret change efforts, this frequently leads to misunderstandings, superficial compliance, or the claim that the proposed change is no different from current practice (Maitlis and Christianson, 2014.; Weick, 1995). Such reactions appear to signal not a rejection of the innovation itself, but a communicative gap that inhibits shared understanding and collective action.

This communicative challenge is compounded by the symbolic, emotional, and relational dynamics of educational systems. Language is never neutral; it carries cultural assumptions, historical meanings, and normative expectations that shape how innovations are perceived (Grumet, 1987). Sumara et al. (2008) argue that educational consciousness is formed intersubjectively through shared stories, metaphors, and interactions, meaning that leaders attempting to introduce new visions must also work to shift the symbolic and interpretive resources available within their communities. When leaders describe innovations using language rooted in old paradigms, stakeholders make sense of them through the "cultural symbolic web" (Sumara et al., 2008, p. 221), limiting the system's capacity to imagine alternative futures and constraining the possibilities for meaningful change.

Language is more than a mechanism for transmitting information; it is a symbolic system through which meaning, identity, and possibility are constructed. Grumet (1987) argues that institutional language often obscures the relational dimensions of educational practice, while Sumara et al. (2008) describe educational consciousness as shaped through shared metaphors, narratives, and cultural symbols. When leaders attempt to describe innovation using language rooted in past paradigms, stakeholders understandably interpret new initiatives as extensions of existing practice.

In this context, innovation literacy, the ability to articulate, visualize, and narrate emerging ideas with clarity, resonance, and generative possibility, becomes a foundational leadership competency. Innovation literacy requires not only understanding the innovation itself but also developing new language, metaphors, icons, and scenarios that help stakeholders "see" and engage with what does not yet exist (Senge et al., 2015; Westley et al., 2006). Without these communicative tools, even well-intentioned reform efforts risk being absorbed into existing routines rather than catalyzing new ways of thinking and acting. This challenge is especially significant in relation to the kinds of wicked problems educational leaders are increasingly expected to address. The United Nations Sustainable Development Goals position education within a broader global agenda concerned with poverty, inequality, climate action, health, peace, justice, and sustainable communities (United Nations, 2015). These challenges are complex, interdependent, and resistant to simple technical solutions. They require leaders who can work across uncertainty, engage diverse perspectives, imagine alternative futures, and communicate new possibilities in ways that mobilize collective action. From this perspective, innovation literacy is not only a local leadership competency but also a capacity connected to the broader work of sustainability, equity, and systems change. Scenario planning and design-based professional learning offer practical structures through which leaders can rehearse this work: naming complexity, surfacing assumptions, testing possible futures, and designing language, metaphors, and symbols that help communities move toward more sustainable and just educational futures.

The *Landing the New* project was developed in response to this persistent problem of practice. Drawing on design-based professional learning using scenario planning and futures thinking, the project aimed to build leaders' communicative and imaginative capacity to articulate innovation in ways that land meaningfully with diverse audiences. Across ten months, one school year, 161 superintendents, principals, and system leaders participated in iterative cycles of design-based professional learning, introducing participants to scenario planning, collaborative design sprints, and reflective inquiry. Early insights emerged quickly: participants required explicit instruction in *scenario literacy*, the capacity to write, imagine, and analyze plausible futures, because many initially defaulted to producing descriptive case studies of current realities rather than forward-looking scenarios. This tendency revealed how entrenched institutional language and habitual meaning-making patterns can restrict leaders' ability to imagine, communicate, and operationalize innovative directions.

This paper presents the conceptual foundations, methodological approach, and emerging findings from the *Landing the New* project. It examines how design-based professional learning using scenario planning can support educational leaders in developing innovation literacy and explores the communicative, cognitive, and relational shifts that occur when leaders learn to design language, metaphors, icons, and narratives capable of moving ideas across a system. Guided by this focus, the study asked: How does design-based professional learning using scenario planning support educational leaders in developing innovation literacy, including the language, framing practices, and symbolic tools needed to communicate innovation across complex educational systems?

2 Conceptual foundations

The theoretical framework informing this study draws on three intersecting bodies of scholarship: organizational

sensemaking theory, the role of language and metaphor in educational change, and distributed approaches to leadership in complex systems. Together, these literatures establish the conceptual basis for understanding how leaders communicate innovation and why the nature of that communication matters for organizational learning and change.

2.1 Language, sensemaking, and leadership in complex systems

Educational change is fundamentally a process of collective sensemaking (Weick, 1995). Organizational scholars argue that people do not react to innovations themselves but to the meanings they construct around them (Maitlis and Christianson, 2014; Weick, 1995). Leaders, therefore, play a central role in shaping the interpretive conditions through which stakeholders understand new initiatives. When communicative cues are unclear, ambiguous, or overly aligned with past practices, stakeholders interpret innovations through existing cognitive schemas, producing confusion or superficial agreement that impedes deeper engagement (Louis and Robinson, 2012).

Language is thus both a constraint and a catalyst for innovation. Grumet's (1987) analysis of the politics of personal and impersonal knowledge highlights how educational systems rely on standardized language forms that obscure relational and experiential meaning. Sumara et al. (2008) similarly describe educational consciousness as an intersubjective phenomenon shaped by "the cultural symbolic web" (p. 221) in which metaphors, stories, and shared practices form the boundaries of what is thinkable. When leaders deploy old metaphors to describe new ideas, the system defaults to old interpretations.

Innovation requires linguistic disruption. Leaders must create new metaphors, icons, and discursive structures that enable others to imagine a future that does not yet exist (Senge et al., 2015; Westley et al., 2006). This work is especially critical during periods of uncertainty, where sensemaking becomes fragmented and organizational members rely more heavily on leaders' symbolic communication (Snowden and Boone, 2007). In this context, innovation literacy, leaders' capacity to use language, narrative, and visualization to make innovation comprehensible and compelling, becomes essential.

2.2 Scenario planning as a tool for foresight, De-biasing, and communicative innovation

Scenario planning is a long-established method for helping organizations explore plausible futures, consider emerging conditions, and test assumptions about strategic direction (Chermack, 2021; Schoemaker, 1995; Schwartz, 1996). In contrast to forecasting, which seeks to predict, scenarios allow leaders to imagine multiple trajectories, thereby expanding cognitive flexibility and reducing the constraints of presentism (Candy, 2010).

This use of scenario planning aligns closely with Miller's (2007) concept of futures literacy. Miller argues that futures literacy involves developing the capacity to understand, question, and use the future in more sophisticated ways. Rather than treating the future as something to predict, futures literacy invites individuals and organizations to examine the stories, assumptions, and anticipatory frameworks through which they imagine what may be possible. Miller's hybrid strategic scenario method is especially relevant to this study because it positions scenario work as a learning process through which participants can expand their capacity to imagine multiple futures, surface assumptions, and develop more generative forms of strategic conversation.

Innovation literacy, as developed in this study, is related to but distinct from futures literacy. Futures literacy supports leaders in using the future to rethink the present; innovation literacy focuses on how leaders communicate, symbolize, and narrate emerging possibilities so that others can understand and participate in change. In educational leadership contexts, this distinction matters because leaders are not only required to imagine alternative futures but also to make those futures communicable across diverse stakeholder groups. Scenario planning, therefore, functions as a bridge between futures literacy and innovation literacy: it expands leaders' anticipatory imagination while also creating the conditions for new language, metaphors, icons, and narratives to emerge.

Rousseau's (2020) work on decision-making in uncertain environments emphasizes the importance of situating conversations to reduce bias, surface assumptions, and enable more generative thinking. Scenario planning aligns with this purpose by creating a structured yet imaginative space where leaders can explore possibilities free from the gravitational pull of current constraints. The research revealed that scenario literacy cannot be assumed. Leaders initially struggled to distinguish between a case study, a descriptive analysis of current conditions, and a scenario, a plausible narrative of an alternative future. This finding echoes research demonstrating that leaders often default to incremental rather than transformational thinking when cognitive structures are not intentionally disrupted (Kahneman, 2011; Sharpe and Hodgson, 2018). Scenario planning provides a pedagogical and cognitive scaffold that helps leaders suspend habitual interpretations and develop the imaginative capacity to articulate new ideas. As leaders in the *Landing the New* project learned to hold multiple futures in view, they began generating new metaphors, language, and visual icons, suggesting that scenario planning can catalyze communicative innovation and expand leaders' symbolic repertoire.

2.3 Design-based professional learning as a structure for innovating leadership practice

Design-based professional learning (DBPL) offers a coherent structure for developing innovation literacy. Brown and Friesen (2022) define DBPL as iterative, inquiry-driven, and context-responsive, aligning closely with the complex and emergent nature of contemporary educational leadership. The Design Council's (2025) Double Diamond model supports structured cycles of divergent (discover and develop) and convergent (define and deliver) thinking, allowing leaders to experiment, test prototypes, and refine ideas over time.

This approach is reinforced by broader design-based research literature, which emphasizes that innovation emerges through cycles of problem identification, ideation, prototyping, testing, and refinement (Easterday et al., 2014; McKenney and Reeves, 2019; Sandoval, 2014). These iterative cycles not only support learning but also help leaders develop communicative artifacts such as language banks, icons, metaphors, and narratives that are capable of moving ideas across a system.

Within this design-based frame, scenario planning becomes a generative tool. Scenarios support divergent thinking by expanding the range of perceived possibilities, while communicative artifacts serve as convergent tools that consolidate and represent shared meaning. Together, they form a coherent structure that enables leaders to develop the communicative capacity necessary to advance innovation.

Through this integration, the Landing the New project positions innovation literacy not as an innate leadership trait but as a learnable, designable capacity. Leaders developed new tools to articulate the future, supported by structured inquiry, creative experimentation, and collaborative meaning-making.

3 Methods

This study examined how design-based professional learning using scenario planning supported the development of innovation literacy among educational leaders. Given the exploratory and practice-oriented nature of the research, a design-based research design was employed to investigate how leaders made sense of innovation, developed shared communicative tools, and applied these tools within authentic leadership contexts. The methodological approach prioritized capturing both the processes of learning and design and the artifacts produced through those processes, allowing the study to explore how professional learning experiences translated into new forms of language, symbols, and narratives used to communicate innovation. The following sections describe the research design, participant context, professional learning structure, and data sources used to examine these dynamics.

3.1 Research design

This study employed a design-based research (DBR) methodology. DBR was selected because it supports the iterative development, implementation, and refinement of learning designs within authentic practice settings (Easterday et al., 2014; McKenney and Reeves, 2019; Sandoval, 2014). Its dual aim of improving practice while generating theoretical insight aligns with the Landing the New project, which sought to build leaders' communicative capacity and to theorize how scenarios and language creation contribute to system innovation. The study unfolded through iterative cycles of design, enactment, analysis, and redesign, consistent with DBR methodology. Design-based professional learning using scenario planning served as the intervention examined in this study. Figure 1 provides an illustration of how the structure of the professional learning was designed to include scenario planning as the intervention during the ten months.

Table 1 illustrates the central design conjecture that guided this study: structured engagement in design-based professional learning through scenario building will support educational leaders in developing more generative language, stronger framing practices, richer shared sensemaking, and increased narrative alignment in relation to complex educational futures. This broad conjecture is expressed through specific design features, including co-constructed future scenarios, context-mirror scenarios, practice-response scenarios, future-oriented prompts, facilitated reflection, and collaborative artifacts. These design features are expected to support mediating processes such as surfacing assumptions, reframing leadership challenges, negotiating shared interpretations, developing common terms or metaphors, and rehearsing adaptive responses. Over iterative cycles, these mediating processes are expected to contribute to observable changes in educational leaders' language, framing practices, shared sensemaking, and narrative alignment.

3.2 Participants and context

Participants included 161 educational leaders representing six leadership cohorts from four of the six provincial education zones across Alberta, Canada. The cohorts were established through existing regional and system leadership networks and were organized as professional learning groups rather than as randomly assigned comparison groups. Each cohort brought together educational leaders engaged in system-level innovation work, including superintendents, assistant superintendents, directors of learning, principals, assistant principals, and select teacher leaders. Participants were involved in systems experiencing curriculum reform, shifting reporting practices, or broader strategic renewal, contexts that heightened the need for communicative clarity and innovation literacy.

The leadership cohorts participated in a ten-month professional learning program focused on scenario planning, futures thinking, and iterative design cycles. The study focuses on these cohorts because they participated in the full design-based professional learning intervention and were positioned to apply emerging communicative tools within authentic system leadership contexts. Participation was voluntary and supported through existing leadership networks.

3.3 Professional learning design

The *Landing the New* professional learning series occurred across one school year and was structured using the Design Council's (2025) Double Diamond model. Each cycle included four phases:

1. Discover: Leaders explored current communicative practices, examined stakeholder perceptions, and surfaced assumptions about innovation, trust, and disruption.
2. Define: Groups co-developed shared definitions of key constructs (e.g., innovation, trust, disruption) to address the variation in interpretive frameworks revealed early in the process.
3. Develop: Leaders engaged in scenario planning, futures thinking, and design sprints to generate plausible future

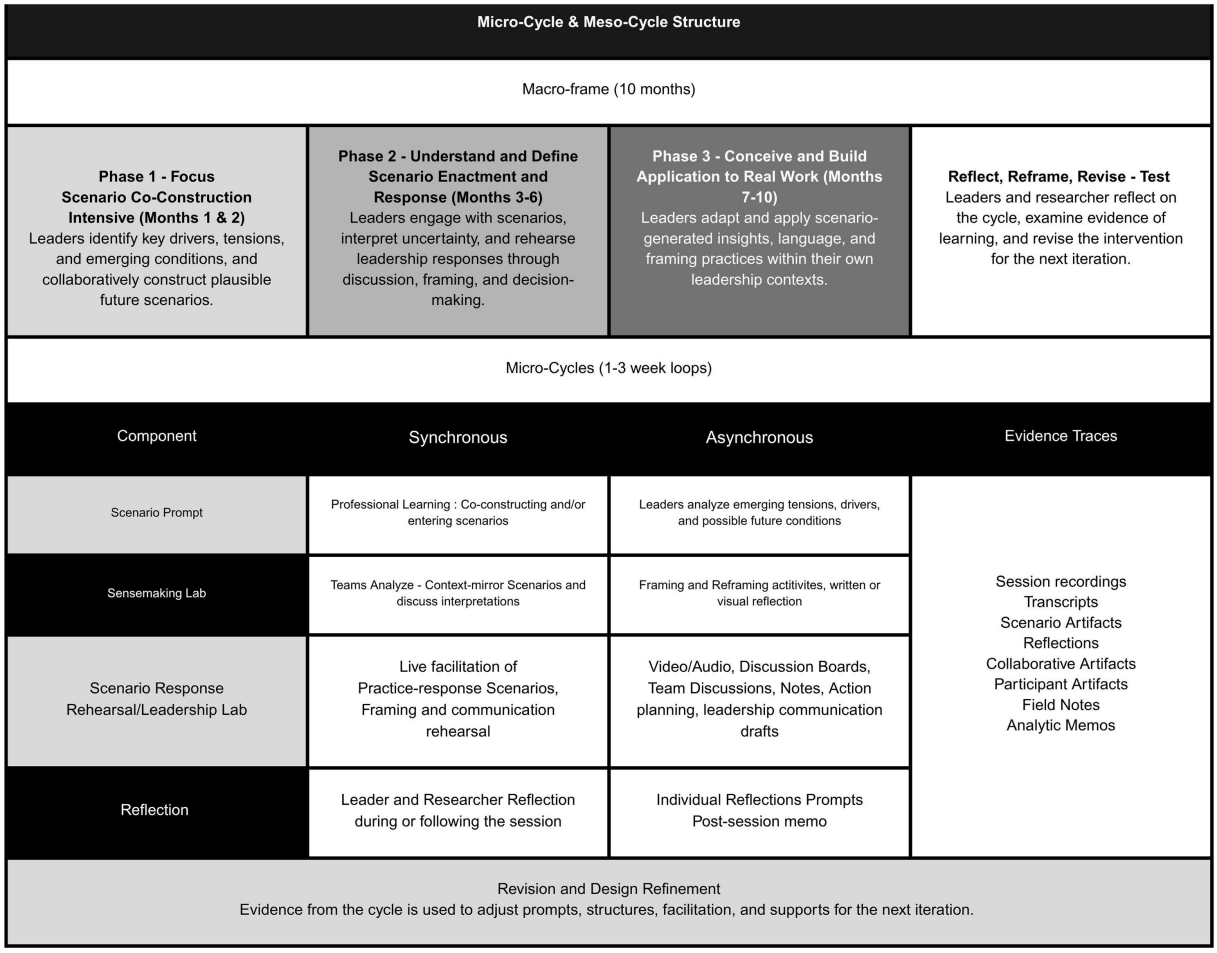

FIGURE 1
Macro-, meso-, and micro-cycle structure of the design-based professional learning intervention. This figure illustrates how the design-based professional learning intervention is organized across nested macro-, meso-, and micro-cycles within the broader DBR process.

TABLE 1 Conjecture mapping overview for design-based professional learning using scenarios as an intervention.

Theoretical Commitments	Design Features	Mediating Processes	Expected Outcomes	Evidence Sources
Innovation literacy; scenario planning; complexity-informed leadership learning, sensemaking and framing	Co-constructed future scenarios; context-mirror scenarios; practice-response scenarios; future-oriented prompts; facilitated reflection; collaborative artifacts	Surfacing assumptions; reframing challenges; negotiating shared interpretations; developing shared language; strengthening shared sensemaking; building narrative alignment; rehearsing adaptive responses	Changes in educational leaders' language, framing practices, shared sensemaking, and narrative alignment; emerging design principles; mechanism-level explanations for how the intervention supports leadership learning	Session transcripts; scenario artifacts; participant reflections; interviews/focus groups; researcher field notes; analytic memos; cycle revision documents; participant feedback

scenarios. This phase required explicit instruction in scenario literacy, as leaders initially struggled to differentiate between descriptive case studies and imaginative futures.

4. Deliver: Participants created communicative prototypes, including language banks, icons, metaphors, and strategic narratives intended to support the articulation of emerging innovations within their systems.

The superintendent cohort participated in monthly professional learning sessions over a ten-month period. This sustained structure allowed leaders to revisit scenario-planning tasks, refine shared definitions, test emerging language, and develop communicative artifacts across multiple cycles. The repeated monthly design was important because innovation literacy did not appear to develop through a single exposure to scenario planning. Rather, leaders required ongoing opportunities to distinguish scenarios from case descriptions, surface

assumptions, examine stakeholder interpretations, and translate insights into metaphors, icons, language banks, and narratives that could be used in their leadership contexts. In this way, the ten-month structure created an immersive professional learning environment in which scenario and innovation literacy could develop iteratively.

Sessions ranged from half-day to full-day engagements and included individual reflection, small-group collaboration, whole-group dialogue, and facilitator-led instruction.

3.4 Data sources

Consistent with DBR and qualitative research traditions, data were collected from multiple sources to support triangulation:

- Innovation artifacts: scenario drafts, visual icons, metaphors, language banks, and strategic narratives created during design sprints.
- Leader reflections and journals: written reflections documenting evolving understanding, communicative challenges, and insights generated during scenario planning.
- Facilitator field notes: analytic memos capturing observations of group dynamics, sensemaking patterns, misunderstandings, and breakthroughs during sessions.
- Session transcripts: audio-recorded discussions (where permitted) documenting leaders' language use, interpretive struggles, and evolving communicative practices.
- Pre/post self-assessments: leader ratings of innovation confidence, scenario literacy, and communicative efficacy. Participants completed the pre-self-assessment before the design-based professional learning series began and completed the post-self-assessment after the final session, using the same rating items to allow descriptive comparison of perceived change over time.
- Stakeholder feedback: comments and reactions from staff and community members who were shown early prototypes of icons, metaphors, or narratives.

Together, these sources provided a rich dataset capturing both the process and the products of leaders' learning.

3.5 Data analysis

Data were analyzed using iterative, abductive thematic analysis, consistent with DBR's emphasis on linking emerging patterns to theoretical constructs (Timmermans and Tavory, 2012). Analysis included:

1. Open coding: identifying recurring ideas related to communicative clarity, innovation literacy, scenario construction, language creation, and leadership efficacy.
2. Axial coding: connecting codes to broader constructs such as sensemaking, futures thinking, complexity leadership, trust, and disruption.
3. Cross-case analysis: examining similarities and differences across leadership groups and between system leaders.
4. Artifact analysis: applying multimodal analysis to icons, metaphors, and narratives to understand how communicative tools developed and functioned.

Analytical memos and researcher reflections supported theory generation and informed the refinement of subsequent professional learning cycles, consistent with DBR methodology. Pre- and post-self-assessments were analyzed descriptively to identify directional changes in participants' perceived clarity, confidence, and efficacy in communicating innovation. These descriptive patterns were then interpreted alongside reflective journals, facilitator field notes, and participant artifacts to examine how reported changes corresponded with shifts in language use, metaphor creation, and communicative practice.

3.6 Ethical considerations

Ethical approval for the study was secured through the University of Calgary, Conjoint Faculties Research and Ethics Board. Participants provided informed consent, and all data were anonymized through pseudonyms or general descriptors (e.g., "superintendent," "principal," "leadership cohort"). Identifying details were removed from scenario drafts, journals, and artifacts. Participants were invited to review excerpts of their contributions before publication to ensure accuracy and consent to dissemination.

3.7 Positionality and researcher reflexivity

Researcher positionality and reflexivity were central to the methodological design of this study. The lead researcher was not external to the design process but was actively involved in shaping, facilitating, documenting, and interpreting the design-based professional learning intervention. This researcher-facilitator role provided close insight into how the intervention was enacted, how participants responded to scenario-planning tasks, and how language, metaphors, icons, and shared frames developed across the professional learning process. At the same time, this proximity required careful attention to the assumptions, commitments, and interpretive tendencies the researcher brought to the work.

The lead researcher entered the study as a practitioner-researcher with prior experience in educational leadership, system-level professional learning, and innovation-oriented school improvement. This background informed the design of the intervention and supported responsiveness to participants' leadership contexts. However, it also created the possibility that familiar leadership patterns, professional commitments, or expectations about the value of scenario planning could shape interpretation. To address this, reflexive memoing was used throughout the study to document design decisions, facilitation moves, emerging interpretations, and questions about the researcher's influence on the learning environment. These memos helped distinguish observations grounded in participant

data from interpretations shaped by the researcher's own professional knowledge.

Several strategies were used to support credibility and confirmability. Claims were checked across multiple data sources, including scenario artifacts, participant reflections, field notes, session transcripts, self-assessments, and stakeholder feedback. Participant excerpts were reviewed where appropriate to support accuracy and ethical representation. Analytic attention was also given to moments of tension, confusion, or incomplete uptake, rather than only to examples that confirmed the value of the intervention. In this way, the researcher-facilitator role was treated not as a neutral position but as a situated and reflexive part of the design-based research process.

4 Findings

Analysis of data across the six leadership groups revealed four interconnected themes: (1) leaders initially lacked scenario literacy and defaulted to case-based thinking; (2) shared definitions of trust, disruption, and innovation were necessary for collective sensemaking; (3) scenario planning catalyzed new language, metaphors, and visual icons that enhanced communicative clarity; and (4) participants reported increased communicative efficacy and confidence as they engaged in iterative design.

4.1 Theme 1: leaders need explicit instruction in scenario literacy

Across the six leadership groups, participants initially struggled to write scenarios. Rather than imagining plausible futures, most created case studies describing their current contexts or past challenges. This pattern occurred even when prompts explicitly invited future-oriented thinking. Participants justified current conditions, narrated problems, or sought to describe the "right answer," revealing cognitive entrenchment shaped by habitual patterns of educational sensemaking.

This observation aligns with research demonstrating that leaders tend to rely on existing schemas when facing ambiguity (Kahneman, 2011; Weick, 1995). As one principal noted, "*It feels safer to describe what is already happening. I'm not sure how to imagine forward without losing track of reality.*" A superintendent expressed similar hesitation: "*I keep slipping back into explaining our past. I don't think I've ever been asked to imagine leadership decisions in a future we haven't lived yet.*"

Consistent with Penner's earlier findings, explicit teaching on the structure and purpose of scenarios was required before leaders could meaningfully engage in futures thinking. Once this support was provided, participants were better able to suspend present constraints and explore alternative pathways. Scenario literacy thus emerged as a foundational precursor to innovation literacy.

4.2 Theme 2: shared definitions of trust, disruption, and innovation enabled deeper sensemaking

System- and school-based leaders varied widely in their interpretations of core concepts such as *trust*, *disruption*, and *innovation*. Some viewed disruption as inherently harmful, equating it with destabilization or conflict; others saw it as generative, associating it with creativity and progress. Similarly, trust was alternately described as interpersonal warmth, procedural clarity, or compliance.

This conceptual fragmentation limited early scenario planning, as leaders used the same terms to describe fundamentally different ideas. As Penner (2025a[1], b[2]) observed, "*definitions of trust, disruption, and innovation were quite varied,*"(p. 4) requiring facilitation to create shared meaning across participants.

Once common definitions were co-constructed, the quality of scenario writing and discussion shifted substantially. Leaders began to articulate futures that reflected multiple stakeholder perspectives rather than defaulting to teacher-focused or problem-centric narratives. For example, one assistant superintendent reflected, "*Before we clarified what innovation meant for us, I realized I was describing improvement—not innovation. The language helped me see the difference.*"

This process underscores the role of language in shaping collective consciousness (Sumara et al., 2008) and highlights the importance of establishing shared conceptual anchors before engaging in futures work.

4.3 Theme 3: scenario planning catalyzed the creation of New language, metaphors, and visual icons

As system- and school-based leaders became more comfortable with scenario writing, the process began to generate new metaphors, icons, and linguistic structures that helped articulate emerging innovations. For many, this represented a significant cognitive and communicative shift.

Leaders reported that scenario planning helped them "see" innovations more clearly and describe them with language that felt more accessible and compelling. One participant shared, "*We realized we didn't have words for what we were trying to build. The scenarios helped us find those words.*"

Visual icons emerged organically as communicative tools that encapsulated strategic ideas. Icons served as both sensemaking devices and shared reference points, reducing cognitive load for stakeholders, echoing research on the power of visual representation in organizational learning (Eppler and Platts, 2009). For example, after engaging with the trust–disruption quadrant, one leadership team developed an icon representing

[1]Consciousness and leadership innovation [Unpublished manuscript]. Werklund School of Education, University of Calgary, Penner, A.

[2]Using scenarios to explore consciousness and create language to support leadership innovation [Unpublished manuscript]. Werklund School of Education, University of Calgary, Penner, A.

"bridging the future," which later became part of their strategic communication materials.

These findings affirm that language and symbolism are not outputs but mechanisms of innovation. Scenario design enabled leaders to generate communicative artifacts that made abstract ideas tangible and shareable.

Figures 2, 3 illustrate how language shifted over time in the leadership contexts. In both examples, early language was descriptive and practice-bound, while later language became more conceptual, precise, and communicative. These artifacts illustrate how leaders moved from naming existing practices toward developing shared language that could support stakeholder understanding and future-oriented action. A superintendent reflected that, "*looking back through my reflections, I can see through my language shifts where my thinking started to be reflected. I moved from my old way of speaking to a new language that shows more clearly where I want to lead my team.*"

4.4 Theme 4: leaders reported increased communicative confidence and innovation literacy

Pre– and self-assessments, as well as reflective journals, indicated that system- and school-based leaders experienced increased clarity ($n = 158$; 98.1%), confidence ($n = 160$; 99.4%), and efficacy in communicating innovation ($n = 157$; 97.5%). All participants ($n = 161$; 100%) reported that the iterative design

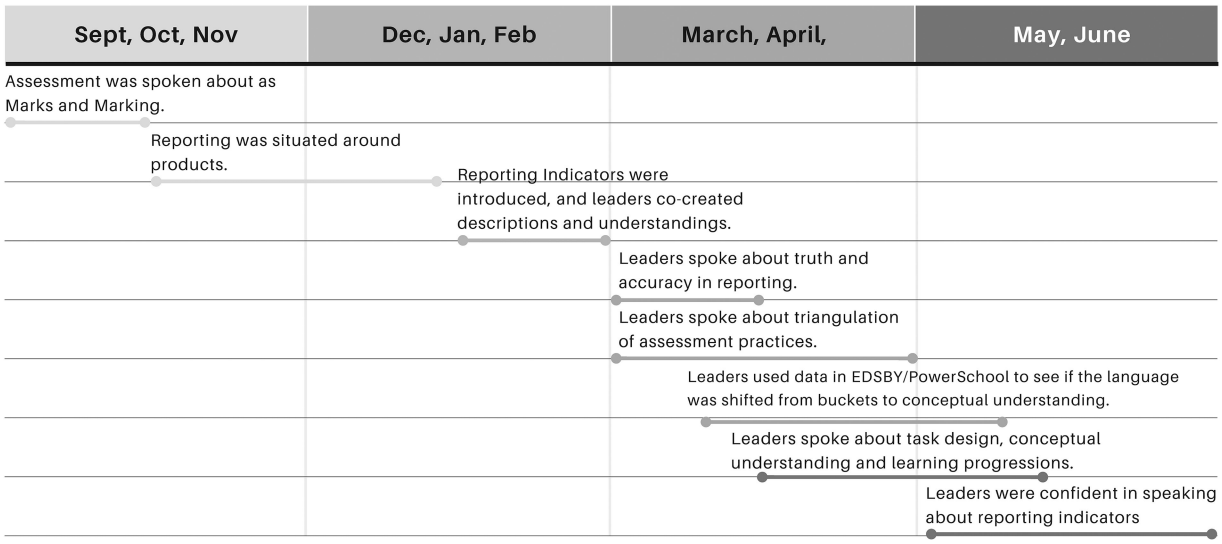

FIGURE 2
Shifts in assessment and reporting language.

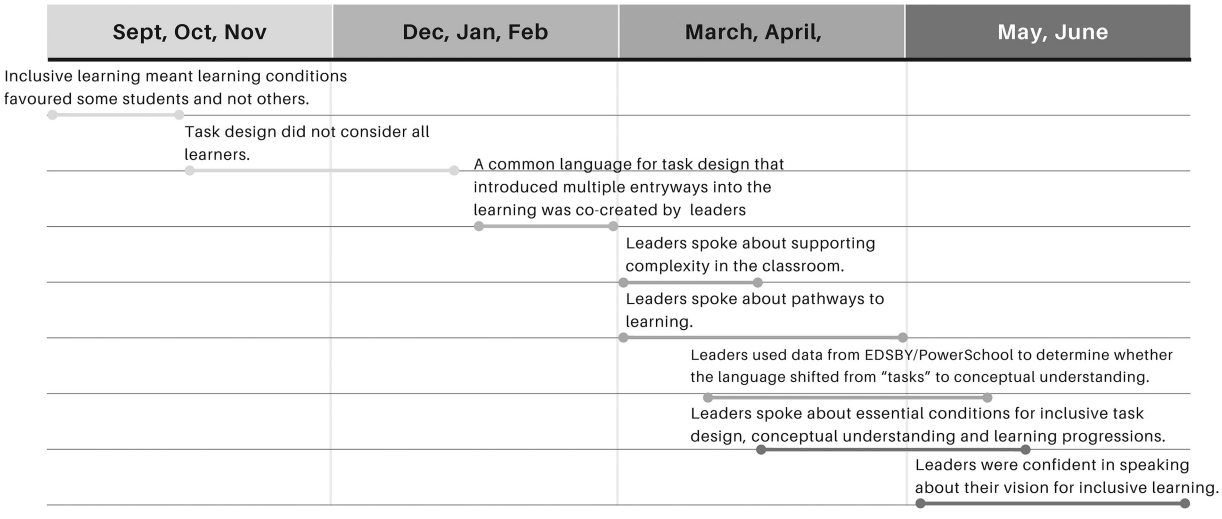

FIGURE 3
Shifts in language to support inclusive classrooms.

cycles helped them move beyond technical explanations toward more narrative, relational forms of communication.

A superintendent captured this shift: "*I used to describe our initiative in operational terms. Now I speak in stories, metaphors, and visuals. People understand it faster, and they remember it.*" Another noted, "*I finally feel like I have the language to differentiate the new from the old.*"

Participants also reported that developing innovation literacy made them more attuned to stakeholder perspectives and better able to frame innovation in ways that resonated across their communities. This finding aligns with complexity leadership theory, which emphasizes the importance of enabling adaptive sensemaking in dynamic systems (Uhl-Bien and Arena, 2018).

4.5 Summary

Taken together, these findings suggest that design-based professional learning using scenario planning enables leaders to expand their communicative repertoire, develop shared meaning, and enhance their ability to articulate innovation. Scenario literacy served as the gateway to innovation literacy, allowing leaders to imagine alternative futures, surface assumptions, and generate new language to move ideas across a system.

5 Discussion

The purpose of this study was to examine how scenario planning and design-based professional learning contribute to educational leaders' innovation literacy, the communicative and imaginative capacity to articulate, visualize, and advance future-oriented ideas. Findings from the *Landing the New* project demonstrate that leaders' ability to communicate innovation is neither intuitive nor incidental; rather, it is a learnable practice that requires explicit instruction, intentional scaffolding, and iterative design cycles. Four key insights emerge from the findings, each linked to broader theoretical conversations in leadership, sensemaking, and futures thinking.

5.1 Scenario literacy as a precursor to innovation literacy

A central insight from this study is that system- and school-based leaders initially struggled to engage in scenario writing, frequently reverting to case-based descriptions of present circumstances. This pattern aligns with research suggesting that under conditions of uncertainty, individuals default to familiar cognitive frames, limiting their ability to imagine alternative futures (Kahneman, 2011; Weick, 1995). Scenario planning interrupts this tendency by creating structured conditions that encourage leaders to suspend presentism, surface assumptions, and explore multiple plausible trajectories (Chermack, 2021; Schwartz, 1996).

In this study, explicit instruction in scenario literacy was foundational, as was the iterative design of revisiting scenarios in subsequent sessions. Leaders required time and facilitation to understand the distinction between case studies and scenarios and to practice imagining futures unencumbered by current constraints. Once supported in this way, participants began to engage more deeply with futures thinking and were able to differentiate between improvement and innovation, an essential communicative distinction noted in organizational learning research (Hargreaves and Shirley, 2022; Westley et al., 2006).

Scenario literacy appeared to function not only as a foresight tool but also as a developmental learning process that extends leaders' communicative repertoires and supports sensemaking at both school and system levels.

5.2 Language creation as a mechanism for shifting collective consciousness

Findings reinforce the theoretical claim that language plays a central role in shaping leaders' and stakeholders' interpretations of innovation. Consistent with Sumara et al.'s (2008) description of the "cultural symbolic web" (p. 221), leaders' interpretations of trust, disruption, and innovation varied significantly, revealing how deeply entrenched linguistic norms shape meaning-making. Without shared definitions, collaborative innovation work was limited; with shared language, scenario design became more generative.

The development of metaphors, icons, and communicative prototypes demonstrates that leaders were not simply learning *about* innovation; they were learning to create the symbolic tools necessary to make innovation intelligible to others. These symbolic artifacts contributed to what Grumet (1987) calls the shift from impersonal to personal knowledge, enabling leaders to communicate in ways that invited relational connection and shared responsibility.

The process of creating language and symbols for innovation can therefore be understood as a form of consciousness work. As leaders generated new communicative tools, they reshaped their own and their communities' perceptions of emerging futures, aligning with scholarship on narrative leadership and organizational identity formation (Maitlis and Christianson, 2014; Senge et al., 2015).

5.3 Design-Based professional learning as a scaffold for communicative experimentation

Design-based professional learning using scenario planning proved crucial for supporting leaders' iterative learning. Design-based professional learning provided a flexible yet disciplined framework for experimentation, reflection, and refinement, key processes for developing communicative tools (Brown and Friesen, 2022; Easterday et al., 2014).

The Double Diamond process, in particular, scaffolded leaders' movement between divergent and convergent thinking. During divergent phases, scenario writing expanded leaders' imaginative capacity; during convergent phases, leaders translated insights into communicative artifacts such as language banks, metaphors, and icons.

This study extends DBPL literature by demonstrating that design processes not only support instructional improvement

but also build leaders' communicative capacities. The creation of icons and metaphors, which came to function as shared reference points in several districts, illustrates how DBPL can support the development of system-level communicative infrastructure.

5.4 Communicative confidence and the development of innovation literacy

The study found notable increases in leaders' confidence and efficacy in communicating innovation. Many reported that they had rarely, if ever, been invited to design the language or visual symbols associated with leadership work. As leaders gained experience in articulating scenarios and crafting communicative prototypes, they reported greater clarity in distinguishing between innovation and improvement and greater confidence in presenting initiatives to stakeholders.

This aligns with the complexity leadership literature, which emphasizes the need for leaders to cultivate adaptive capacities, such as sensemaking, communication, and meaning-making, in dynamic contexts (Snowden and Boone, 2007; Uhl-Bien and Arena, 2018). Innovation literacy, as conceptualized in this study, encompasses these adaptive capacities and situates communication not as a secondary skill but as a primary mechanism through which innovation becomes possible.

Participants' reflections suggest that building innovation literacy enabled them to navigate the relational, symbolic, and emotional dimensions of change more effectively. Several leaders observed that using metaphors and icons reduced resistance and confusion among stakeholders, a finding supported by research on cognitive load and visual communication (Eppler and Platts, 2009).

This framework, Figure 4, was developed from the findings of this study. Analysis suggested that innovation literacy requires the interdependent development of imaginative, communicative, and symbolic capacities. These capacities did not emerge sequentially; rather, they developed together and informed one another throughout the design-based professional learning process. Innovation literacy is deliberately represented as a small icon at the centre of the framework. This positioning signals that innovation literacy is not yet widely recognized or formally taught as a leadership capacity, despite its importance for communicating and advancing change in complex educational systems. Many of the capacities that support innovation literacy, including futures thinking, metaphor creation, visual anchoring, and the design of new language, are not consistently or explicitly developed through formal leadership degrees, certification programs, or conventional professional learning. The small icon, therefore, represents both the fragility and the significance of this literacy: it is difficult to develop, easy to overlook, and essential for leaders who need to help others understand, trust, and move toward new possibilities.

Taken together, these findings answer the study's research question by showing how design-based professional learning using scenario planning supported educational leaders in developing innovation literacy. First, scenario planning strengthened leaders' imaginative capacity by helping them move beyond descriptions of current practice and rehearse plausible future-oriented possibilities. Second, the design-based professional learning structure supported leaders in developing shared language and framing practices through repeated cycles of dialogue, reflection, prototype development, and refinement. Third, the process enabled leaders to create symbolic tools, including metaphors, icons, visual anchors, language banks, and strategic narratives, that made emerging innovations more visible, memorable, and communicable across complex educational systems. In this way, scenario planning did not function only as a foresight activity; when embedded within design-based professional learning, it became a communicative and pedagogical structure for developing the imaginative, communicative, and symbolic capacities that constitute innovation literacy.

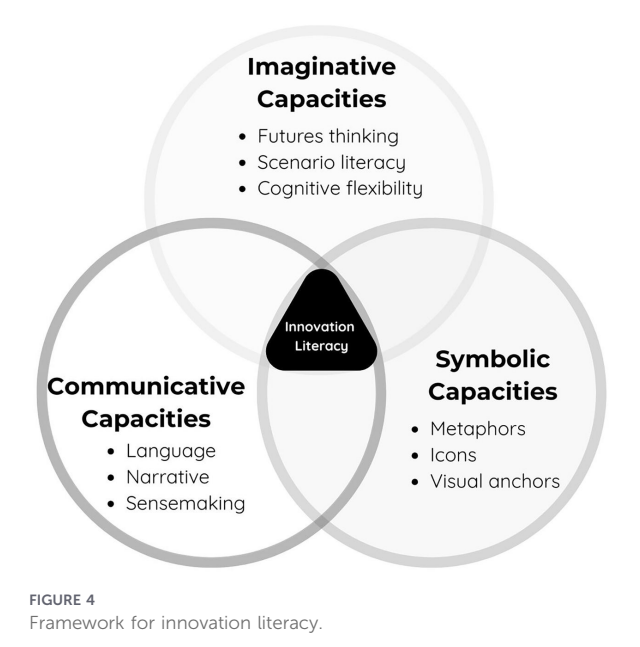

FIGURE 4
Framework for innovation literacy.

5.5 Contributions to existing scholarship

This study contributes to the fields of educational leadership, sensemaking, and futures thinking in three ways:

1. It introduces innovation literacy as a communicative and designable leadership competency, extending research on narrative leadership and organizational learning.
2. It demonstrates that scenario literacy is a necessary precursor to innovation literacy, providing insight into how futures thinking can be operationalized in leadership development.
3. It offers a design-based professional learning model for building leaders' communicative repertoire, addressing calls in international policy and research for leadership preparation that develops adaptive, imaginative, and relational capacities (OECD, 2020).
4. By linking innovation literacy to the leadership capacities needed for sustainability-oriented and future-facing educational change, the study also connects scenario-

based professional learning to broader global priorities articulated in the United Nations Sustainable Development Goals (United Nations, 2015).

5. The study also extends futures literacy scholarship into educational leadership by showing how scenario-based professional learning can move from anticipatory imagination to communicative practice. In this sense, innovation literacy contributes to futures-oriented leadership scholarship by identifying the symbolic and communicative capacities leaders need to help educational communities understand, trust, and act on emerging possibilities.

5.6 Summary

Overall, the findings highlight the importance of designing learning processes that support leaders in imagining, articulating, and communicating emerging futures. Scenario planning, when embedded within a design-based professional learning structure, fosters innovation literacy by expanding cognitive flexibility, developing shared language, and building communicative confidence. These capacities are essential for leading in complex systems and advancing meaningful innovation in contemporary educational contexts.

6 Limitations

This study has three main limitations. First, participants were drawn from leadership networks and educational contexts in Alberta, Canada, which may limit the transferability of findings to other jurisdictions or leadership settings. Second, because professional learning was facilitated as part of an authentic design-based intervention, the researcher-facilitator role shaped both the learning environment and the data-collection process.

Although the researcher-facilitator role was addressed through positionality work, reflexive memoing, triangulation, and participant review of selected excerpts, the findings remain situated within a professional learning context shaped by the researcher's design and facilitation decisions.

Third, while pre- and post-self-assessments and participant reflections provided insight into perceived growth in innovation literacy, further research is needed to examine how these communicative capacities are sustained over time and how they influence stakeholder understanding and system-level change.

7 Conclusion

This study examined how scenario planning and design-based professional learning can strengthen educational leaders' innovation literacy: the communicative, imaginative, and symbolic capacities needed to articulate and advance new ideas within complex systems. Across six leadership cohorts, educational leaders engaged in iterative cycles of scenario planning, collaborative design, reflective inquiry, and communicative experimentation. The findings demonstrate that innovation literacy is not an innate leadership trait, but a learnable and designable practice that can be developed through sustained professional learning.

The primary contribution of this study is the Innovation Literacy framework. The framework identifies three interdependent capacities required for leading innovation in complex educational environments. Imaginative capacity enables leaders to move beyond present constraints and consider plausible alternative futures. Communicative capacity enables leaders to articulate emerging ideas in language that stakeholders can understand, trust, and use. Symbolic capacity enables leaders to create metaphors, icons, and visual anchors that help new ideas become visible, memorable, and shareable across a system. Together, these capacities position innovation literacy as a practical leadership competency for making future-oriented change intelligible and actionable.

The findings also show that innovation literacy develops through scaffolded and iterative practice. Leaders required explicit instruction in scenario literacy before they could use scenarios as tools for futures thinking and communicative design. Through repeated engagement with scenario planning, leaders moved from describing current realities toward generating new language, metaphors, icons, and narratives that supported shared sensemaking. In this way, design-based professional learning created conditions for leaders to experiment with, test, and refine the communicative tools needed to advance innovation.

Taken together, the study contributes to educational leadership scholarship by foregrounding the communicative and symbolic work of innovation. As educational systems continue to confront uncertainty, complexity, and ambitious transformation agendas, leaders will need more than strategic plans or technical explanations. They will need the capacity to design the language, metaphors, and symbols that help communities imagine, understand, and move toward new futures. Future research may examine the longitudinal impact of innovation literacy on system change, explore how communicative artifacts circulate across leadership networks, and investigate how scenario-based professional learning can be scaled within leadership preparation programs.

Data availability statementThe datasets are not publicly available due to ethical restrictions and participant confidentiality. The data include qualitative reflections, field notes, transcripts, artifacts, self-assessments, and stakeholder feedback generated in identifiable educational leadership contexts. Limited de-identified excerpts may be available from the corresponding author upon reasonable request and subject to ethics approval and participant consent.. Requests to access the datasets should be directed to Adelee Penner, adelee.penner@ucalgary.ca.

Ethics statement

The studies involving humans were approved by the Conjoint Faculties Research Ethics Board (CFREB), University of Calgary. The studies were conducted in accordance with the local legislation and institutional requirements. The participants

provided their written informed consent to participate in this study.

Author contributions

AP: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Validation, Visualization, Writing – original draft, Writing – review & editing. SF: Methodology, Supervision, Validation, Writing – review & editing.

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Conflict of interest

The author(s) declared that this work was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Generative AI statement

The author(s) declared that generative AI was not used in the creation of this manuscript.

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