

Diegetic Data Stories for Climate Communication

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Introduction. Understanding climate data requires scientific knowledge and data literacy, and an audience's willingness to engage with data is itself a barrier. We ask how we might design data stories that make people want to understand climate data, especially non-experts who do not arrive already curious. We adapt dramatic-writing craft for data stories in which both data and character actions motivate the story.

Approach. Through research through design, we analyzed our own design moves in two practice cases of climate data comics co-created by a cross-disciplinary group with climate scientists: *Pasta or Disaster*, on permafrost, and *The Monster Eats Algae*, on eutrophication in freshwater.

Contribution. We contribute two things: 1) the framing of *diegetic data stories*, in which empirically grounded data, visualizations, and scientific arguments are told from within a storyworld rather than through captions, sidebars, or narration addressed to the reader; 2) a two-axis design vocabulary of seven named strategies. *Structural* strategies shape a story's plot, conflict, and characters: *Misconception-as-Conflict*, *Detection-as-Plot* and *Instrument-as-Character*. *Explanation* strategies anchor a single scientific concept in a concrete in-world event: *Real-Event Grounding*, *In-world Experiment as Demonstration*, *In-world Visualization Production*, and *Felt-Phenomenon Anchor*.

Conclusion. We offer them as transferable design strategies for climate data communicators, and suggest matching a story's structure to what makes a phenomenon hard to see. The strategies are drawn from two practice cases and have not yet been tested with readers.

Materials. The permafrost comic is available at <https://dc4cc.github.io>; the freshwater comic will be made available on the same site.

Additional Key Words and Phrases: Data Comics, Diegetic Data Stories, Data-Driven Storytelling, Climate Communication

1 Introduction

We present two practice cases of climate data comics co-created by visualization designers and climate scientists, and use them to articulate seven design strategies for what we call *diegetic data stories* for communicating science and data in climate. Data stories commonly explain through devices that address the reader from outside the story, such as captions, sidebars, a narrator, or an inset chart [7, 48]; in narratology these are *extradiegetic* [21]. Inspired by narratology's *diegetic* [21, 45], meaning internal to the story's world, a *diegetic data story* is a data story whose data, instruments, and scientific argument are empirically grounded but unfold inside a storyworld as in-world events, characters, and conflicts rather than as external annotations.

Climate change is a planetary problem, but societies respond to it through culture, identity, and local meaning [1, 29]. Engaging publics is therefore central, yet the threshold for that engagement is unusually high: understanding climate data requires both scientific knowledge that may span physics, chemistry, biology, and earth-system dynamics, and the data literacy to interpret figures, models, and uncertainty. Decades of science-communication scholarship have argued that supplying more or better information alone, the so-called *deficit model*, is inadequate as a general account of how publics relate to science [11, 27, 60]. He et al. [23] reinforce this empirically with their concept of *information receptivity*: an audience's willingness to engage with data is itself a blind spot, distinct from data literacy, and some audiences remain actively *information-avoidant*, resisting data whether presented raw or as visualizations. The harder design challenge is to engage the motivation to want to understand in the first place [23]. We therefore ask: *how might*

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we design data stories that make people want to understand climate data, especially non-experts who do not arrive already curious?

In our practice, we have been developing data comics to communicate topics in climate change in collaboration with climate scientists. In this paper, we draw on two projects as case studies to describe how we came to borrow narrative elements from traditional dramatic-writing craft to design data stories that aim to engage curiosity ahead of explanation [14, 36, 51]. Screenwriting and dramatic-writing traditions have, over more than a century, accumulated craft for keeping audiences engaged when their engagement is not guaranteed: how characters' wants and conflicts pull readers through a story [14], how scenes pace the disclosure of information so that questions open before they answer [36], and how action rather than exposition carries meaning [51]. The baseline challenge these traditions were built to address, holding a non-captive audience long enough for an idea to land, is also the challenge climate-data communication faces. We borrow from this vocabulary while adapting it for a context where both data and character action motivate the story.

Concretely, the two cases unfold as follows. The first comic, on permafrost thaw, foregrounds *Misconception-as-Conflict* on the structural axis: the counter-intuitive fact that latent heat keeps observed permafrost temperatures flat as the ground thaws is cast as a dramatic disagreement between characters; that disagreement is resolved by an *In-world Experiment as Demonstration* when a family cooks pasta with melted snow on a camp stove, an everyday scene that doubles as the scientific demonstration. The second comic, on freshwater eutrophication, foregrounds *Detection-as-Plot* together with *Instrument-as-Character*: the data investigation drives the plot as a detective story among lake-resident animal characters, each measurement instrument is personified as a character the reader meets before its data, and a chlorophyll-a concentration map is delivered diegetically as an in-frame painting rather than an external chart.

The work is offered as Research Through Design (RtD) [18, 65] (Section 3) across two data comic projects (permafrost, 2023–2024; freshwater, 2025–2026). The contributions of this paper are:

- the framing of *diegetic data stories* as a working concept for data communication;
- a two-axis design vocabulary distinguishing *structural* from *explanation* strategies with seven named strategies on those two axes, articulated as adaptations of dramatic-writing craft for science communication.

This is design knowledge from two comics, reported by their makers; we make no claim about how readers receive them, which is the study we plan next.

2 Related Work

The work occupies a niche at the intersection of three conversations: climate communication with storytelling and data comics, diegetic visualization, and dramatic-writing theory adapted from the screenplay tradition.

2.1 Climate Communication with Storytelling and Data Comics

A substantial body of work argues that storytelling is central to how climate science reaches publics. Prior studies show that nonexpert audiences often engage science through narrative rather than exposition [13]; that climate change is difficult to communicate because it is psychologically distant, invisible, and complex [41]; and that it rarely triggers moral intuitions because it is abstract and its victims are distant in time and space [34]. Place-based climate communication further shows how culture, identity, local experience, imagery, and recognizable landscapes shape public understanding and response [1, 31, 42, 49].

This paper also builds on data-driven storytelling and data comics. Narrative visualization has been systematized through work on narrative visualization genres [48] and data-driven storytelling practices [44]. Within comics, data comics have been formalized as design patterns that combine the spatial overview of infographics with the sequential structure of video [7], with empirical work showing benefits for engagement and comprehension [57]. Comics have become an increasingly prominent form of science communication [16]. Climate-related comics include long-form first-person climate narratives [52], data comics on climate negotiations [38], comic narratives for climate action [32], and an analysis of climate-change representation in comics [26]. A previous report on the permafrost project at the International Conference on Permafrost [55] documented that comic and its creation team; the present paper abstracts across two cases, permafrost thaw in Banff and Yoho and freshwater eutrophication in Manitoba, to extract a set of named, transferable strategies and articulate them in the language of dramatic writing. Early exploration in data comics research has largely built vocabulary at the compositional level (panels, captions, and embedded visualizations) [5, 7, 56, 64] and tested its effectiveness [57]. Our cases suggest that data stories also need vocabulary one layer up, at the level of premise, conflict, and character, where much of the explanatory work happens.

2.2 Narrative Visualization toward Diegesis

In narrative theory, Genette [21] formalized the term *diegetic*, distinguishing events inside the narrated storyworld from the extradiegetic narration that frames them; Ryan [45] later recast this distinction around the storyworld. Visualization research has gradually adopted related distinctions. Building on Segel and Heer’s account of author-driven narrative flow and reader-driven exploration [48], prior work shows how visualization design can frame interpretation [25], shift attitudes [43], borrow structures from cinematography and the visual narrative grammar of comics [2], and support argumentation, framing, empathy, emotion, and engagement [6]. Those narrative design patterns are rhetorical moves addressed to the reader, such as concretizing an abstraction, placing data in a familiar setting, or breaking the fourth wall; our strategies work one level in, specifying how the storyworld itself is built so that the concretizing happens as an event the characters live through.

Two related strands move visualization closer to lived or represented worlds. One treats bodies as carriers of data, studying anthropomorphic and personal representations as ways to support empathy, attitude change, and audience connection, with mixed empirical results so far [9, 33, 40]. The other treats space as a carrier of data: situated and embedded visualizations place data near, or spatially aligned with, its referent [59], across AR, situated analytics, immersive analytics, and data physicalization [10, 15, 28, 35, 58]. Recent work on diegetic visualization in games similarly examines data displays embedded within virtual worlds [50]. Yet in much of this work, data remains recognizable as a chart, readout, or display, even when relocated into the physical or virtual environment it describes.

We extend this lineage by moving from spatial embedding to storyworld integration. Rather than only placing data near its referent, our diegetic data stories place climate phenomena within the same *storyworld*, reframing them as in-world events, characters, conflicts, and explanatory encounters. Diegesis here is not only a spatial property of where data appears, but also a narrative property of plot, cast, and concept anchoring.

2.3 Engaging Storytelling Strategies from the Screenplay Tradition

We draw on dramatic-writing craft for stage and screen rather than on novel writing or interactive narrative, because the design problem is closely matched: data comics, like screenplays, are short, visual, beat-paced, and designed for an audience whose engagement is not given in advance.

Screenplay structure descends from Aristotle’s *Poetics* [4], through Freytag’s nineteenth-century pyramid [19] (introduction, rise, climax, return or fall, catastrophe), to Field’s *Screenplay* [17], which formalized the three-act paradigm for film. Parallel lineages include the hero’s journey, which grew out of Campbell’s comparative-mythology account of the monomyth [12], and beat-level production tools.

From this literature, we draw on three books at different depths. Egri’s *The Art of Dramatic Writing* [14] treats premise (the argument the storyworld proves), character (including its orchestration), and conflict as the load-bearing elements of any dramatic work, and provides the deepest theoretical grounding for our structural strategies. McKee’s *Story* [36] synthesizes contemporary screenplay craft: the Crime genre and its Detective subgenre, the controlling idea, the inciting incident, and the scene as the unit in which a value turns. Snyder’s *Save the Cat* [51] packages a fifteen-beat structure and ten-genre typology; we used it as a production scaffold for the freshwater comic but treat it here as a tool rather than a theoretical anchor (see Section 4). The three together cover first principles (Egri), genre and scene craft (McKee), and production-level pacing (Snyder).

Within visualization, borrowing from dramatic and cinematic craft has precedent. Yang et al. mapped Freytag’s pyramid onto data stories as a design space of narrative patterns [63], and Xu et al. derived guidelines for the openings of data videos from six cinematic opening styles [62] and for their endings from the endings of films [61]. Those studies adapt an arc shape and the craft of a data video’s first and last moments; we adapt story-level craft, premise, conflict, and character, which organizes a data story as a whole.

Our paper borrows named concepts from these traditions to articulate what our practice was already doing, and adapts them for diegetic data stories where the data, rather than character action alone, must motivate the story.

3 Method: Research Through Design across Two Designer–Scientist Collaborations

We use *Research Through Design (RtD)* [18, 65] as the methodological frame for this paper: two data comics, one completed (*Pasta or Disaster*, on permafrost thaw in Banff and Yoho, 2023–2024) and one whose story is complete but whose drawing is still in progress (*The Monster Eats Algae*, on freshwater eutrophication in Manitoba, 2025–2026), are treated as research artifacts whose construction we now analyze retrospectively to extract transferable design knowledge. Each project assembled a designer–researcher team and a climate-scientist team; the permafrost project took about six months from data framing to a published comic, and the freshwater project has run for a similar period and is now in its drawing phase. The analysis is thus a retrospective form of RtD, and the two cases play different roles in it. The permafrost comic was made as a science-communication project and is analyzed in hindsight. The freshwater comic was drafted with these dramatic-writing concepts already in hand, so several strategies were used during its design rather than named afterward, making it a first test of whether they carry over to a new phenomenon (Section 7). The form of knowledge we aim for is what Höök and Löwgren call *intermediate-level design knowledge*, specifically strong concepts, which sit between specific design instances and general theory and are generative across future projects [24]. We complement this with Schön’s *reflective practice* [47], in which practitioners reflect on their knowing-in-practice, here retrospectively across the two projects. The lead designer is a complete-member participant in both projects, an orientation also at home in analytic autoethnography [3] and in recent autoethnographic work in visualization [20]; we draw on that tradition for the reflexive positioning of the designer-as-researcher.

During each project, we drew on dramatic-writing and screenplay craft (Section 2) as we encountered specific narrative challenges: how to give a counter-intuitive concept dramatic weight, how to introduce measurement instruments without flattening them into footnotes, how to pace the disclosure of a scientific argument across panels. These techniques gave

Table 1. Seven diegetic-data-story strategies on two axes. The *structural* axis (top three rows) captures design moves that shape the whole story’s plot, conflict, and character architecture. The *explanation* axis (bottom four rows) captures local moves that anchor a single scientific concept in a concrete, in-world event, object, or scene, rather than via captions, sidebars, or annotated charts. The two cases are Permafrost (*Pasta or Disaster*) and Freshwater (*The Monster Eats Algae*). Each strategy is named at the moment it appears in the comic in Sections 5.1–5.2.

Strategy	Definition	Cases	Screenwriting inspiration
Axis A: Structural			
<i>Misconception-as-Conflict</i>	The misconception or misreading is voiced by a character and resolved on stage by an explainer character.	Permafrost	Egri [14]: <i>premise, unity of opposites</i> ; McKee [36]: Education Plot
<i>Detection-as-Plot</i>	The data investigation itself is the engine of the story; each measurement is a clue, sampling is field investigation, visualizations are evidence assembly.	Freshwater	McKee [36]: Crime genre, Detective subgenre; Snyder [51]: Whydunit
<i>Instrument-as-Character</i>	Each measurement modality is embodied as a character with profession, personality, and limits.	Freshwater	Egri [14]: orchestration of opposites
Axis B: Explanation			
<i>Real-Event Grounding</i>	Ground the storyworld in real, documented events, named in the panels or restaged without names.	Permafrost, Freshwater	Snyder [51]: Opening Image; McKee [36]: Inciting Incident
<i>In-world Experiment as Demonstration</i>	A scientific principle is shown through a relatable in-world physical experiment that doubles as a normal scene activity.	Permafrost, Freshwater	McKee [36]: show-don’t-tell, dramatic exposition without didactic dialogue
<i>In-world Visualization Production</i>	Visualizations are produced by characters in-frame using available materials, not via sidebars or captions.	Permafrost, Freshwater	Diegetic vs. extradiegetic distinction [21]; McKee [36] on extradiegetic narration as a risk
<i>Felt-Phenomenon Anchor</i>	Harm or mechanism is given an embodied, sensory form in the storyworld before, or instead of, being stated as a number.	Permafrost, Freshwater	Snyder [51]: Set-up, the beat in which the hero must first make the audience care; McKee [36]: making the mental physical

us a working vocabulary, much of which we name only now; at each design moment a strategy crystallized, and these inline design rationales are the from-inside record that RtD treats as evidence of design knowledge in formation.

3.1 Author Positionality, Evidence Base, and Scope

A reflexive account requires that the reader knows who is doing the reflecting. The lead designer is trained as a data comic creator, graphic designer, and data visualization researcher, and brings no formal training in climate science, no fieldwork, and no lived experience of the depicted places. The scientist-collaborators were involved from the outset of each project: contributing to the scientific content, providing the data, explaining the underlying science, joining story-design discussions with the designer, and verifying the comics’ scientific content. Disciplinary location is HCI research at the boundary of creative practice, which shapes what was noticed and what was under-weighted.

4 Strategy Catalog and Two-Axis Framework

Before walking through the two cases, we lay out the strategy framework they exemplify. We organize seven diegetic-data-story strategies on two coordinated axes that any such story can use simultaneously (Table 1). *Axis A—structural* captures design moves that shape the whole story: its plot, conflict, and character architecture. *Axis B—explanation* captures local moves that anchor a scientific concept in a concrete, in-world event, object, or scene, rather than via captions, sidebars, or annotated charts. The two axes are independent in principle but mutually reinforcing in practice: a strong *Axis-A* frame needs *Axis-B* local devices to actually transmit science, and a sequence of *Axis-B* moves without an *Axis-A* frame becomes a string of demonstrations without dramatic stakes.

The rightmost column of Table 1 lists inspirations from screenwriting; we rework each concept for data stories in which the data, not character action alone, motivate the plot. Egri [14] supplies the story-level moves on *Axis A*. His *premise* is the argument a story is built to prove; it becomes the working material of *Misconception-as-Conflict*. His *orchestration* assembles a cast of deliberately contrasting perspectives so that conflict arises from within; it becomes the working material of *Instrument-as-Character*. McKee [36] supplies the genre craft. The Crime genre and the Education Plot, which arcs a protagonist’s view of life from negative to positive, give us genre templates; his rule that every scene must turn at least one value in a character’s life shapes our pacing; and his principle of *show-don’t-tell*, meaning dramatized in action rather than told in exposition, licenses the whole of *Axis B*. His description of screenwriting as the art of making the mental physical, giving inner conflict a visual correlative instead of describing it in dialogue [36], is the second source of *Felt-Phenomenon Anchor*. Two more of his terms sit in the table. His *Inciting Incident*, the first major event of a story, which upsets the balance of the protagonist’s world and sets everything after it in motion, is what a real, documented event supplies in *Real-Event Grounding*. And his warning against telling narration, which in his words eliminates the audience’s curiosity, together with his test for it, whether the story would still be well told with the voice-over stripped out, is the warrant for *In-world Visualization Production*: a caption or sidebar that the story cannot do without is telling narration by another name. Snyder [51] supplies the production tools. His *Opening Image*, the first of his fifteen beats, sets the tone and scope of a story and shows a “before” snapshot of its world, and his *Set-up*, the beat in which the hero must first make the audience care, follows it; the two beats name the moments that recur in our practice as *Real-Event Grounding* and *Felt-Phenomenon Anchor*. Snyder’s fifteen-beat sheet [51], which pins each of fifteen beats to a script page, served as the practical scaffold during freshwater drafting. The two case sections that follow walk through each strategy as it appears in the comic.

5 Two Cases and Diegetic Strategies

5.1 Case 1 — Permafrost: *Pasta or Disaster*

The first practice case is a watercolor-and-pencil comic, *Pasta or Disaster*¹, set in Western Canada in 2023, following a family hike across the Alberta–British Columbia continental divide. Father James, daughter Maya, and son Alex come upon Abbot Pass Hut, a 1922 climbing shelter that a trailhead brochure describes as having been dismantled in 2022 because permafrost thaw and slope erosion had made it unsafe [39, 55]. This opening is *Real-Event Grounding* (Figure 1): the cabin is a real heritage object whose loss has been documented in local news [39], and opening the comic on a trailhead brochure that cites it grounds the abstract category “permafrost” in a specific Canadian place that readers may have walked past, letting the science enter through an event that has *already happened* rather than through a hypothetical. We chose Banff and Yoho because they carry, for Canadian readers, the resonance of national-park hiking

¹Online at <https://dc4cc.github.io/permafrost.html>.

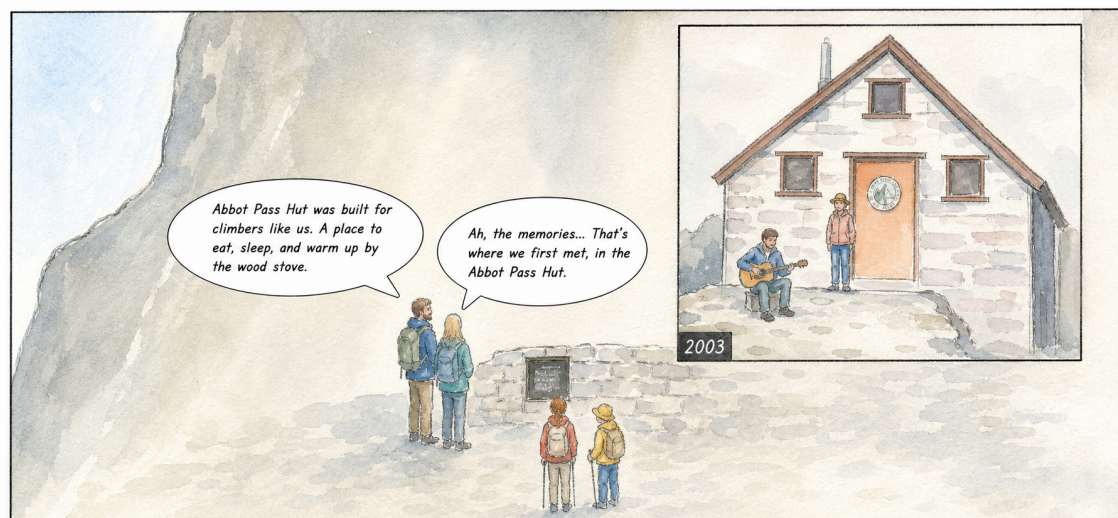


Fig. 1. *Real-Event Grounding* in *Pasta or Disaster*. The family encounters the empty foundation of Abbot Pass Hut, with a flashback panel showing the original 1922 cabin and in-comic text confirming its 2022 dismantling due to permafrost-driven erosion. Image by Zezhong Wang, licensed under CC BY-NC-ND 4.0, accessible at <https://dc4cc.github.io>.

weekends; Abbot Pass Hut itself is a piece of climate-affected built heritage, keeping the news anchor and the scientific stakes in the same geography.

Daughter Maya, who has studied permafrost in school, picks up a stick and draws a line chart of borehole temperatures from 1980 to 2016, redrawn from published borehole records [8], directly on the snow, which is the first instance of *In-world Visualization Production* (Figure 2), in which the visualization is something a character makes *inside* the storyworld using materials at hand, not something handed to the reader as an external sidebar.

James points to two warm-permafrost boreholes that are nearly flat near 0°C and concludes that there is nothing to worry about, which is the misreading the public is most likely to draw. The dramatic question is set, and we name the resulting structural choice *Misconception-as-Conflict*: the public's likely misreading of the data is voiced by a character and resolved on stage by an explainer character. Placing the role with the father James turned the misconception into a structural element of the story rather than a hazard to eliminate; Egri's *unity of opposites* [14], two characters bound by a strong tie yet opposed in position, names a related move from the dramatic-writing side, and casting the father rather than the daughter as the misreader lets the story subvert the usual adult-teaches-child register.

The resolution arrives diegetically. Over a camp-stove lunch of pasta and frozen meatballs being cooked in snowmelt, Maya inserts a thermometer into the pasta pot; the temperature climbs to 0°C , holds flat while the snow finishes melting, and only then climbs again. This is *In-world Experiment as Demonstration*: a counter-intuitive scientific principle, latent heat, is shown through a relatable in-world physical experiment that doubles as a normal scene activity, the same pot serving as both lunch preparation and the latent-heat instrument (Figure 3); McKee's *show-don't-tell* principle [36] is the dramatic warrant.

Maya names the mechanism, identifies it as the same physics hiding the warming signal in James's two flat lines, and the conflict is resolved without a single sidebar. Moments later a landslide cascades down a nearby slope; the harm of thawing permafrost is felt by the family before, and instead of, being stated as a number, which is the move we

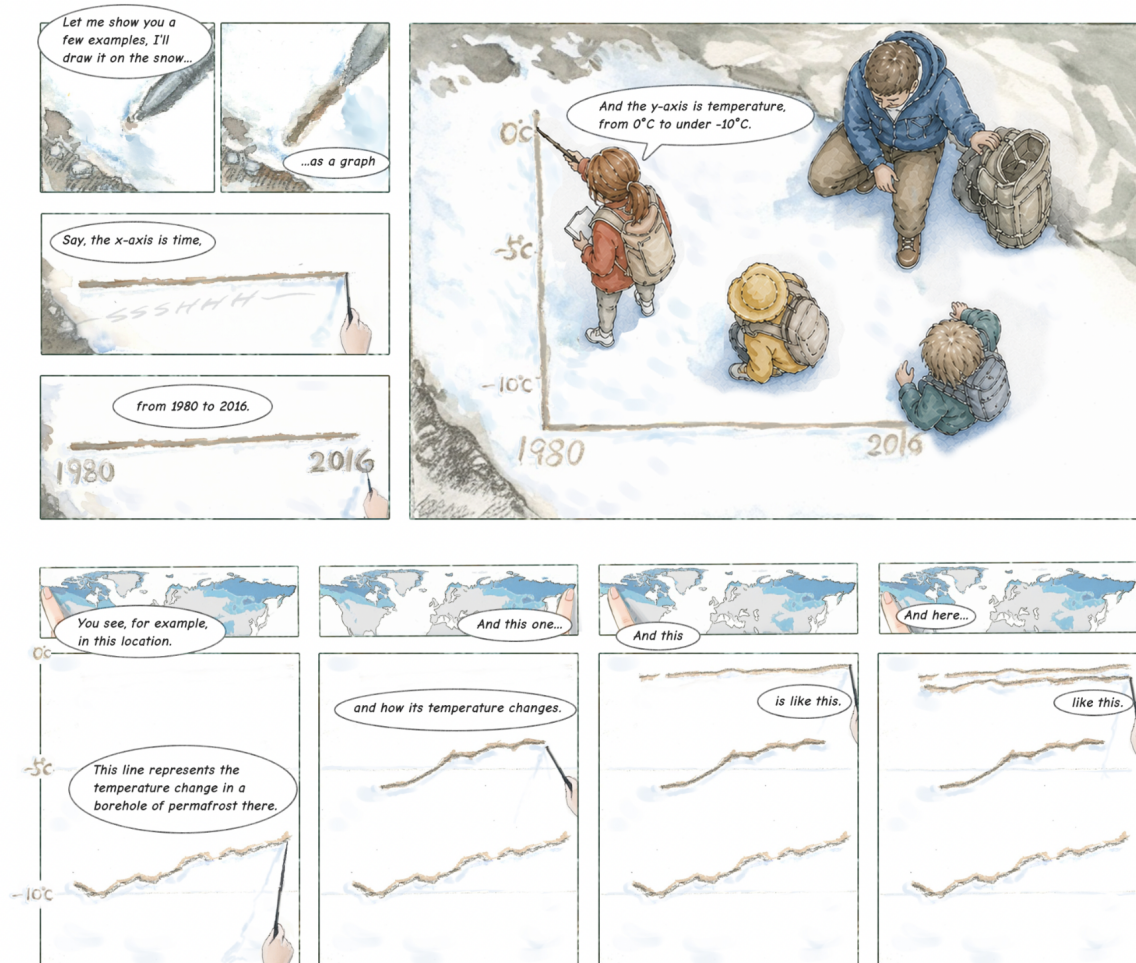


Fig. 2. *In-world Visualization Production*: Maya draws a borehole-temperature line chart in the snow with a stick, axes labeled in-world (1980 to 2016 on the x-axis, 0°C to -10°C on the y-axis); the family reads the chart from inside the storyworld rather than through a sidebar. Data after Biskaborn et al. [8]. Image by Zezhong Wang, licensed under CC BY-NC-ND 4.0, accessible at <https://dc4cc.github.io>.

call *Felt-Phenomenon Anchor*, adapting Snyder's *Set-up*, the beat in which the hero must first make the audience care before anything is explained. Here it is the phenomenon, not a hero, that the audience is made to feel first [51]. James, shaken, draws his own analogy: just as the frozen meatballs are thawing inside the pot without any visible cue, permafrost is changing inside the mountain. The analogy carries the other half of the anchor, McKee's principle that screenwriting is the art of making the mental physical [36]. Where McKee gives a character's inner conflict a visual correlative instead of describing it in dialogue, the comic does the same for an invisible mechanism: a pot of meatballs the family can watch thaw stands in for the ground inside the mountain. The comic closes with the family discussing monitoring and education, and Alex announcing that he might make a comic himself.

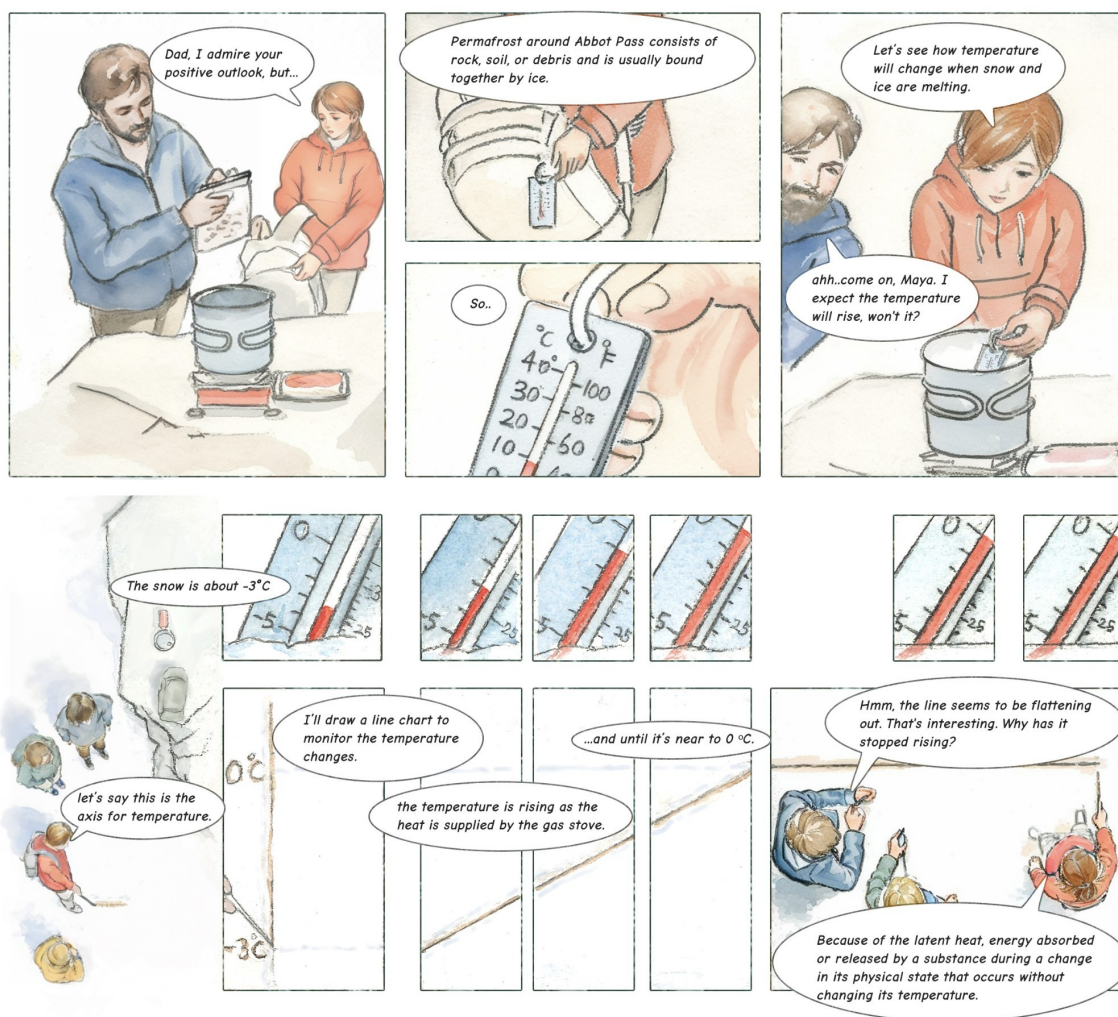


Fig. 3. *In-world Experiment as Demonstration in Pasta or Disaster*. Top: over a camp-stove lunch, Maya puts a thermometer into the pot of melting snow, and James bets that the temperature will simply rise. Bottom: the thermometer climbs from about -3°C and stops near 0°C while the snow is still melting; Maya plots the readings as a line chart in the snow, and the flattening line raises the question that latent heat answers. Image by Zezhong Wang, licensed under [CC BY-NC-ND 4.0](https://creativecommons.org/licenses/by-nc-nd/4.0/), accessible at <https://dc4cc.github.io>.

5.2 Case 2 – Freshwater: *The Monster Eats Algae*

The second practice case, *The Monster Eats Algae*, sits in the Manitoba Great Lakes (Lake Manitoba, Lake Winnipeg, Lake Winnipegosis). The strategies in this section describe the drafted artifact: they are drawn from the comic's current script and drafts, and panel-level details may still change before release. The phenomenon is eutrophication, a change in lake chemistry driven by nutrient runoff and amplified by climate-driven flooding, largely unseen until it surfaces as recurring blooms [37, 46]. The freshwater comic also uses *Real-Event Grounding*. In the region, toxic blooms have killed cattle drinking from a contaminated dugout [53] and covered Lake Winnipeg beaches [54]. The story restages

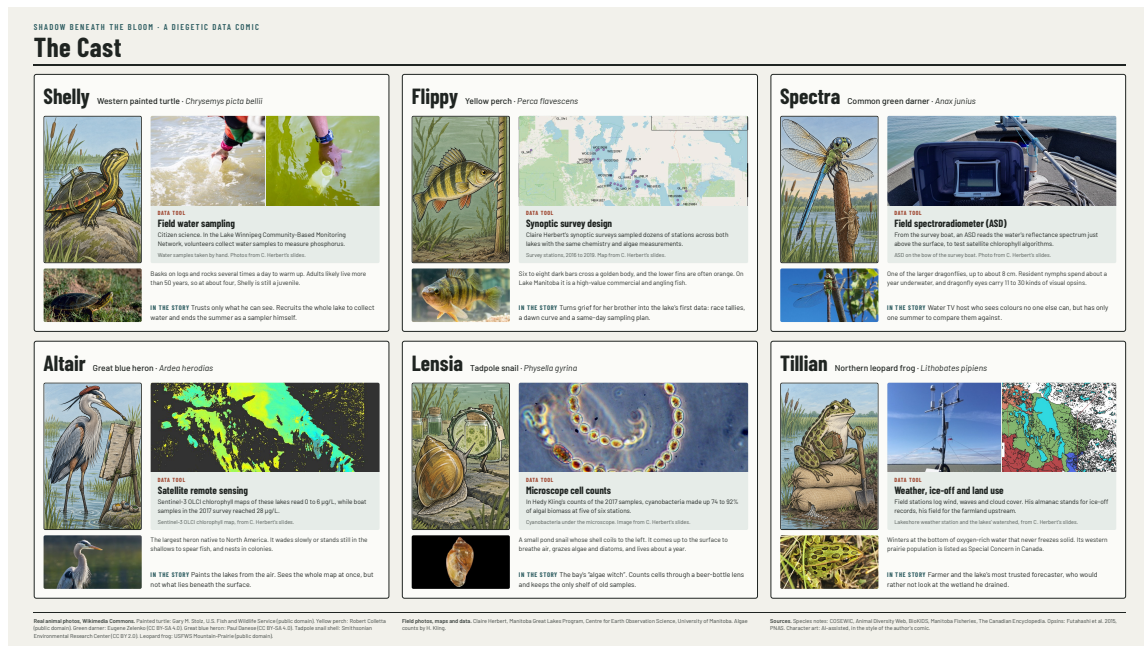


Fig. 4. The cast of *The Monster Eats Algae*. Each animal of the lake is paired with one real way of measuring the Manitoba Great Lakes: Shelly (Western Painted Turtle), field water sampling; Flippy (Yellow Perch), synoptic survey design; Spectra (Common Green Darner), a field spectroradiometer; Altair (Great Blue Heron), satellite remote sensing; Lensia (Tadpole Snail), microscope cell counts; Tillian (Northern Leopard Frog), weather, ice-off, and land use. Cast sheet by Zezhong Wang, licensed under [CC BY-NC-ND 4.0](#); the embedded photographs, maps, and data keep the sources and licenses credited at the bottom of the sheet.

these documented events as things the resident characters live through, a fish kill at dawn above all, without headlines or place names: the grounding lies in the fidelity of what happens, not in a citable reference.

The story is set in a bay of the lake where fish begin to die at dawn and the residents blame a monster from a television show. A young turtle who trusts only what he can see and a young perch who has just lost her brother become the detectives, recruiting neighbours who each see only part of the lake, and we name the central design move *Instrument-as-Character* (Figures 4 and 5): each measurement modality is embodied as a character with profession, personality, and limits, so the reader meets the *person* before the *measurement*. Altair, a Great Blue Heron who paints landscapes from above, carries the satellite-imagery perspective; Lensia, a Tadpole Snail at the bottom of the plant beds, carries water-sample microscopy; Spectra, a Common Green Darner, carries the field spectroradiometer that reads the water's color from the survey boat; Tillian, a Northern Leopard Frog who farms the land upstream, keeps the weather, ice-off, and land-use records and embodies the agricultural runoff behind the bloom; Shelly, a Western Painted Turtle, carries citizen-science water sampling; and Flippy, a Yellow Perch, carries the synoptic survey design that samples stations across the lakes. Egri's principle of *orchestration* [14] names the resulting cast: a set of sharply contrasting, non-substitutable perspectives that together generate the conflict the story will resolve.

Once each instrument has a character, the plot stops being expository and starts being investigative. We name this structural choice *Detection-as-Plot*: the data investigation itself is the engine of the story, in the sense McKee [36] gives to the Detective subgenre of the Crime genre and Snyder [51] gives to the *Whydunit* genre, in which the dramatic Visualising Climate 2026

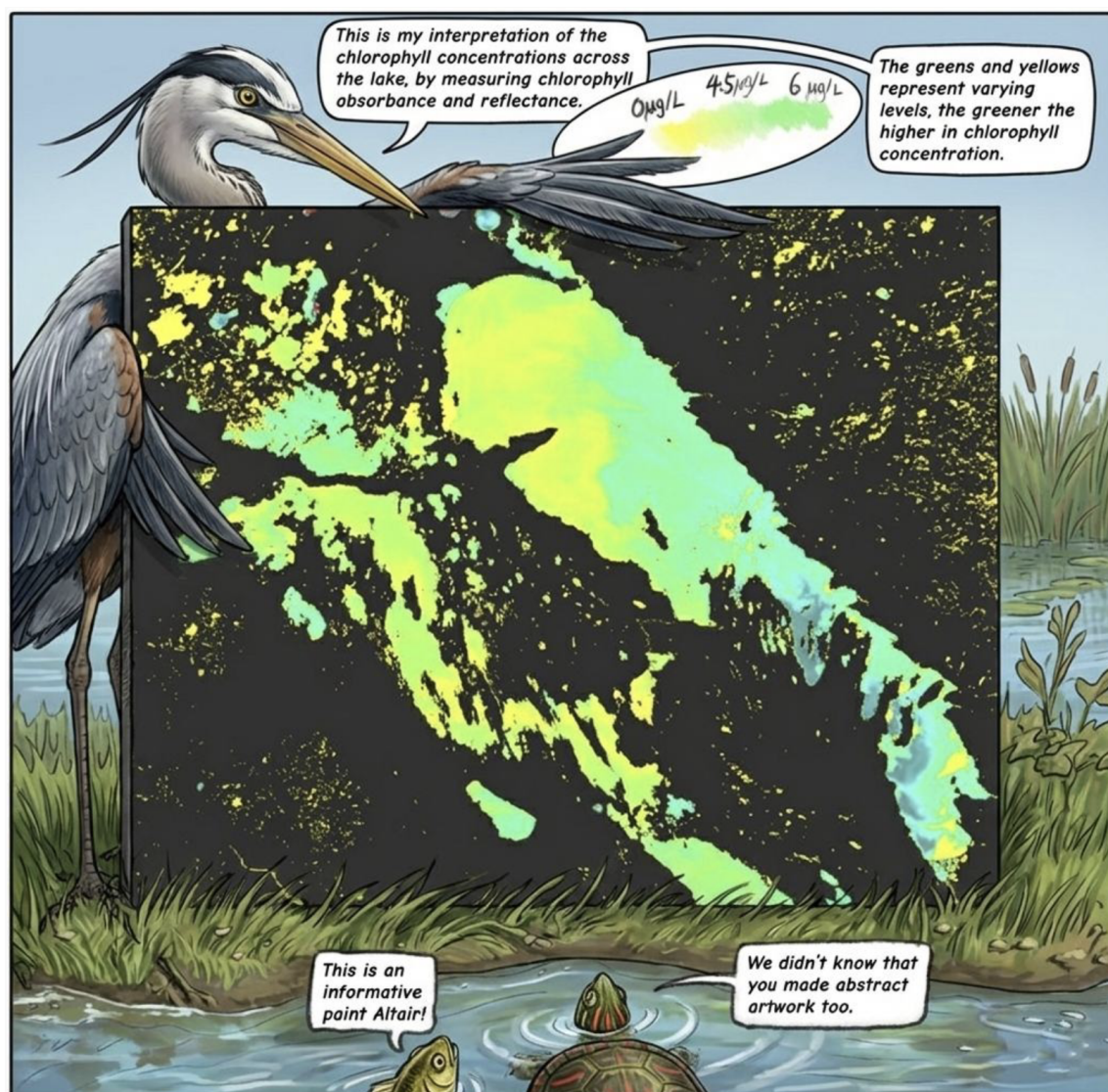


Fig. 5. *Instrument-as-Character* in *The Monster Eats Algae*. Altair, a Great Blue Heron, reveals her painted heatmap of chlorophyll-a concentrations across the lake; the heron's aerial vantage embodies the satellite-imagery instrument, so the reader meets the *person* before the *measurement*. Image by Zezhong Wang, licensed under [CC BY-NC-ND 4.0](https://creativecommons.org/licenses/by-nc-nd/4.0/).

engine is the question of *why* something happened rather than *who* did it. The reader is recruited as the implicit detective; the methodological question of what is causing the bloom, and what evidence will settle it, becomes the controlling idea the story argues, namely that for a phenomenon as distributed as eutrophication, no single instrument is sufficient on its own. The mystery resolves only when the perspectives are triangulated, so the resolution of the plot is also the methodological argument of the comic.

The data themselves enter the storyworld as *In-world Visualization Production* at three escalating fidelities. First, Altair the heron paints chlorophyll-a concentration as a bird's-eye-view painting of the lake from above (Figure 5); the painting is the heatmap, and its color scale is bound to the painter's craft so that limits of remote-sensing accuracy, such as cloud cover and spectral confusions, are visible as limits of the painter's voice. Second, Spectra the dragonfly reads the color of the water through her compound eyes, as the field spectroradiometer reads its reflectance spectrum, so the spectral data are delivered as her phenomenology rather than as an external instrument diagram. Third, the characters physically construct a multivariate chart on the lake bed using objects of the world: water plants tied with colored threads function as species-composition bars, and a translucent fishing line dropped across the painting acts as a labeled biomass scale. The visualizations are built by the characters in the storyworld.

Two further explanation strategies anchor specific scientific concepts in the action. The harm of cyanobacterial blooms is named only after the reader has felt it: fish surface gasping at dawn and a young perch is overcome in bloom water before the comic uses the word "toxin". This is the *Felt-Phenomenon Anchor*: harm is given an embodied, sensory form before, or instead of, being stated as a number. The mechanism of nutrient release arrives the same way. A single decomposing leaf, dropped through a panel, performs *In-world Experiment as Demonstration*: as leaves and other plant matter fall into the water, they decompose and release the phosphorus and nitrogen that drive blooms. Tillian's later confession that fertilizer from his farm has found its way into the lake performs the same kind of work for non-point-source agricultural runoff: the causal mechanism arrives as ethical disclosure rather than as a sidebar diagram.

The unifying commitment is again to keep the explanatory work inside the storyworld; three design decisions follow. *Why a mystery*. The detective framing licenses a long-form data investigation by giving the reader a question they want answered. *Why animal characters*. They carry place (the lake's residents make the lake itself the storyworld) and map onto the instruments without putting human technicians on screen. *Why this instrument-character mapping*. Each pairing has narrative resonance: a heron's height and stillness are how a satellite "sees"; a snail's slowness and proximity to the substrate are how water-sample microscopy operates; a turtle who recruits the whole lake to collect water is how citizen-science sampling spreads across volunteers; a perch's same-day sampling plan is how a synoptic survey measures many stations at once; a farmer who is also the lake's forecaster keeps the weather and land-use records that tie the bloom to the land upstream; a dragonfly's compound eyes see across wavelengths the way a spectroradiometer does.

6 Discussion

6.1 From Dramatic Elements to Epistemic Structure

Our cases suggest that premise, conflict, and character can be reworked for data stories as structures for explanation. Egri [14] treats premise, character, and conflict as the core materials of dramatic writing, and argues that a well-constructed premise already contains character, conflict, and conclusion. In diegetic data stories, these elements are redirected toward an epistemic task: helping readers understand what scientific claim is being made, why it is difficult to see, and what evidence makes it knowable. This follows our framing of diegetic data stories as stories in which data, instruments, and scientific arguments unfold inside a storyworld as in-world events, characters, and conflicts.

We locate the boundary between diegetic and extradiegetic data stories at Genette's line [21] between the storyworld and the annotation that frames it. Operationally, a data element is diegetic when it exists in the story as an event, object, or action that characters perceive and/or act on (Maya drawing the borehole chart in the snow; the heron's painted

map), and extradiegetic when it is an author-to-reader device (a caption, sidebar, inset chart, or narrator's label) that the characters cannot see. The distinction is a gradient: a single panel can carry both an in-world chart and a reader-facing axis label. We therefore use *diegetic data story* to name the degree to which explanation is carried inside the storyworld, and our **Axis-B** strategies mark moves toward that end.

The distinction matters for our research question. An extradiegetic device presupposes a reader who is already willing to read data: a caption or sidebar steps out of the story and asks the reader to switch into study mode, and a reader who is not yet curious can simply skip it. A diegetic device rides on the pull of the story instead: the reader reaches the chart in the snow because they want to know what the family will find there, so wanting to know what happens next and wanting to understand the data become one act. Whether readers experience it that way is the empirical question we leave to the reception study.

Premise becomes a scientific proposition made narratable. In the permafrost case, the premise is that stable observed temperatures can conceal ongoing thaw because latent heat absorbs energy during phase change. In the freshwater case, the premise is that eutrophication becomes legible only through distributed evidence from satellite imagery, water-sample microscopy, spectral imaging, and citizen-science observation. The premise therefore identifies the explanatory difficulty the story must make perceptible.

Conflict is similarly transformed: it emerges from the gap between surface interpretation and scientific explanation. The permafrost comic turns a likely misconception, that a flat temperature line means no change, into a disagreement on stage. The freshwater comic turns incomplete evidence into a detective structure, where each clue is necessary but insufficient alone. Conflict therefore gives narrative form to an epistemic problem: what the reader initially sees is not enough to understand what is happening.

Character also becomes epistemic. Characters remain narrative agents, but they also embody positions in the explanation: the reader surrogate who misreads, the explainer who reframes, the witness who feels the phenomenon, or the instrument-character that stands for a measurement modality. This aligns with our two-axis framework, where structural strategies shape plot, conflict, and character architecture, while explanation strategies anchor concepts in concrete in-world events, objects, or scenes. In this sense, dramatic structure organizes the conditions under which explanation becomes meaningful.

6.2 Matching Story Structures to Climate Phenomena

The two cases suggest that diegetic data stories should begin from the phenomenon's explanatory problem, not only from its topic. Permafrost thaw is counter-intuitive: stable temperatures may suggest that nothing is changing, even while the ground continues to thaw. Freshwater eutrophication is methodologically distributed: it becomes legible only through multiple forms of evidence, including satellite imagery, water-sample microscopy, spectral imaging, and citizen-science observation. These different problems require different story structures.

For counter-intuitive phenomena, *Misconception-as-Conflict* was useful because it stages a plausible wrong reading before resolving it. In the permafrost comic, the mistaken reading of a flat temperature line becomes a disagreement on stage, making the later explanation feel necessary rather than imposed.

For distributed phenomena, *Detection-as-Plot* and *Instrument-as-Character* were the better fit. In the freshwater comic, each instrument-character contributes partial evidence, and the explanation emerges through triangulation. The detective structure therefore matches the scientific problem: no single measurement is sufficient.

This distinction also clarifies the two-axis framework. Structural strategies are phenomenon-sensitive: they shape the whole story around misconception, investigation, or evidence assembly. Explanation strategies travel more freely:

Real-Event Grounding, *Felt-Phenomenon Anchor*, *In-world Experiment as Demonstration*, and *In-world Visualization Production* can support different structural frames. Thus, the key design question is not only “What story makes this data engaging?” but “What explanatory obstacle does this phenomenon create, and what story structure makes that obstacle experienceable?”

6.3 Implications and Future Work

We end the discussion with three implications and invitations. First, the seven strategies are offered as transferable narrative strategies. Communicators with other counter-intuitive concepts (threshold non-linearities, aerosol cooling, lag effects) might begin from *Misconception-as-Conflict*; those with methodologically distributed phenomena (carbon-cycle attribution, cryospheric mass balance) might begin from *Detection-as-Plot* and *Instrument-as-Character*. Climate is a natural fit because phenomena are place-based and act on the humans, animals, and plants that live there; the framework should extend to health, urban planning, and ecology. *Real-Event Grounding* admits two visibility choices that realize the same imperative: permafrost names a single real event in the panels, while freshwater restages its real events without naming them. Naming invites the reader to recognize the place; leaving it ambient invites the reader to trust the world.

For visualization and data-storytelling research, this shifts attention from compositional form to story-level architecture. Prior data-comics work has often focused on panels, captions, charts, and visual sequence [7, 56, 64]. The persuasive aim of climate communication includes data comprehension, attitude, and action change, and this is hard because people tend to read climate evidence in line with their cultural group’s values, so that polarization is greatest among the most science-literate [30]. We learn from drama, which works around this resistance: storytellers let the storyworld prove their premise; they do not assert it, an effect psychology attributes to *narrative transportation*, readers’ absorption into a story [22].

Second, beyond *Whydunit* for *Detection-as-Plot*, Snyder [51] offers further genre candidates, including *Golden Fleece*, *Dude with a Problem*, and *Rites of Passage*. Each genre may suggest a different way of structuring data, evidence, and character action, but each remains a candidate strategy waiting to be tested in practice.

Third, the natural follow-on study is reception. Long use of the underlying dramatic strategies (premise, conflict, character orchestration) [14, 36] shows that they hold a reader, not that they convey a scientific phenomenon such as latent heat correctly. Whether the strategies as we describe them produce the reading experience we hope for is an empirical question about audiences, not authors; we do not answer it here, but it is the study to be done next. Future work can explore research questions such as: Does carrying the explanation inside the storyworld change what readers understand about a phenomenon, compared with the same data presented through captions and sidebars? When an in-world visualization keeps its encoding, as the snow chart does, and when it dissolves into the storyworld, as the heron’s painting does, what can readers still read off it? Does staging a likely misreading as a conflict on stage change the misreading that readers themselves carry away? And does meeting an instrument as a character change how readers judge the limits of its evidence?

7 Limitations and Reflexivity

This paper is intentionally a qualitative account: a self-reflective account of the design, reported by the creation team, focused on the inspiration and design rationale behind two diegetic data comic projects. This stance carries the limits of practice-based evidence. First, the corpus is two cases, made by a lead designer and data visualization researchers

in dialogue with climate scientists. Our contribution therefore sits at the level of *design knowledge*: the seven named strategies in Section 4 are products of reflection on these two projects.

Our claim about generativity is deliberately bounded. The vocabulary was applied across two independently developed comics on different phenomena (permafrost and freshwater), with *Real-Event Grounding* recurring in both, and the screenwriting scaffolds behind these strategies (such as Snyder’s beat sheet) actively shaped freshwater drafting rather than only labeling a finished artifact: modest evidence that the strategies can carry design forward, not merely describe it in hindsight. That evidence is uneven across the seven strategies: some, such as *Detection-as-Plot* and *Instrument-as-Character*, actively guided freshwater drafting, while others are retrospective names for moves we recognized only afterward. We present them as a generative scaffold demonstrated within our own practice and offered for others to test. We have only begun to explore diegetic data visualization in data storytelling and visual storytelling, and we invite the storytelling, data storytelling, and climate communication communities to contribute to this collection of strategies for diegetic data stories.

Second, we make no empirical claim about audience reception. A reception study with target audiences, including comparison against conventional expository data comics, is the natural follow-on to this work. Finally, as a self-report by the creation team, the account carries reflexive bias; Section 3 states the positionality from which we report.

8 Conclusion

We presented two practice cases of climate data comics and used them to articulate a small design vocabulary for *diegetic data stories*: a two-axis distinction between structural strategies and explanation strategies, and seven named strategies on those two axes. The strategies adapt traditional screenwriting and dramatic-writing craft for cases in which data, rather than character action alone, motivate the story. The strategies are not tied to permafrost or to lakes. We expect that other phenomena that are counter-intuitive or distributed, in climate or in health, urban planning, and ecology, can be staged the same way, and our wager is that audiences who would not read a chart will still follow a character; whether they do is the reception study we plan next. We invite the storytelling, data storytelling, and climate communication communities to take these strategies into their own data stories, to extend the corpus, and to discover what a storyworld can be made to prove.

Research Material Statements

The permafrost comic, *Pasta or Disaster*, is at <https://dc4cc.github.io>; the freshwater comic, *The Monster Eats Algae*, has a complete story with drawing still in progress, and the finished comic will be made available on the same site.

Authorship

Zezhong Wang: Conceptualization, Methodology, Investigation, Visualization, Writing – Original Draft, Writing – Review & Editing. **Sheelagh Carpendale:** Methodology, Supervision, Funding Acquisition.

During the preparation of this work, the authors used Stable Diffusion with ControlNet (2023–2024) and a range of newer image-generation models (2025–2026) for composition reference and image-to-image refinement in the production of the two comics, and used a large-language-model assistant during 2025–2026 to check grammar and typos in late drafting. After using these tools, the authors reviewed and edited the content as needed and take full responsibility for the publication’s content.

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Conflicts of Interest

The authors declare that there are no competing interests.

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