Strategic Surprise and the Future of Educational R&D

Melina Uncapher, Founder and CEO of SETA-ED
Jeremy Roschelle, Co-Executive Director of Learning Sciences Research at Digital Promise

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Digital Promise
Accelerating Innovation in Education
Empirical Education
IES Institute of Education Sciences

Abstract

For decades, education R&D has delivered mostly incremental change, consistent with Tyack and Cuban's observation in Tinkering Towards Utopia (1995) that systems tend to assimilate new technologies. Some innovation initiatives aim to **engineer "planned serendipity"**—structuring teams and infrastructure so that unexpected insights are more likely to arise and propagate (Michael H. Levine, personal communication, 2025). Today's environment is different: generative AI, platform-level data, and new research infrastructures are creating **strategic surprises**–rapid shifts that outpace traditional sensing and response. We propose re-architecting education R&D for **agility, responsiveness, and breakthrough potential**. Drawing on ARPA-style (federal Advanced Research Projects Agencies) (NASEM, 2017) models (and our work with SEERNet and Advanced Education Research and Development Fund (AERDF), we contrast legacy approaches with a **surprise-ready architecture** along four dimensions: (1) framing commitments, (2) problem definition, (3) project/talent model, and (4) focal outcomes. We illustrate with six "ripe problem" examples that compress the observe–orient–decide–act loop in schools, and we conclude with role-specific recommendations for researchers, developers, funders, and systems leaders. Our goal is a field that not only studies change, but **orchestrates** the conditions—capable people and enabling environments—under which transformative learning improvements can emerge.

Who this paper is for—at a glance:

- Researchers: to frame solvable challenge problems and contribute to shared infrastructures.
- Developers: to build instrumentation that supports learning processes and rapid A/B testing/learning cycles.
- Funders (federal, state, philanthropic): to curate performer communities, Scientific and Engineering Technical Assistance (SETA)-style support, and milestone-based portfolios.
- Systems leaders (policy, district, platform, agency): to make R&D participation a strategic advantage by offering authentic testbeds and valuing co-design.

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Introduction

The future of educational research and development (R&D) demands bold thinking. Today, we face a striking paradox: while public support for research remains high and examples of success are not hard to find, the dominant model of R&D continues to fall short of driving transformative impact. Field-initiated research grants, designed for rigor and autonomy, too often result in slow cycles, weak uptake, and limited relevance to urgent problems of practice.

In 1957, the launch of Sputnik shocked the United States into action. The U.S. responded with the creation of institutions like NASA and Defense Advanced Research Projects Agency (DARPA), fundamentally reshaping the nation's approach to science and technology—and yielding capabilities once thought impossible. Education has seen many changes since then, but now is the time for something equally dramatic.

Today, education is entering a period defined not by incremental change, but by strategic surprise *(Note: we use strategic surprise to mean* ***an exogenous or emergent shift that outpaces prevailing sensing and response cycles****, creating new constraints or affordances that require rapid reorientation, e.g., a general purpose technology "arrives," a policy shock, a demographic shift)*. Generative AI, new research infrastructures, data abundance, and disrupted funding models all challenge the core assumptions of how we organize and execute R&D. In such a moment, a crisis is a terrible thing to waste.

In this paper, we propose a radical alternative: re-architecting education R&D for agility, responsiveness, and breakthrough potential. Drawing inspiration from ARPA models in other domains, and grounded in our direct experience with initiatives like SEERNet and AERDF, we explore how the education sector might orchestrate new conditions under which talent and infrastructure can flourish together. In particular, we will contrast legacy models vs. strategic-surprise-ready models along four main dimensions: framing commitments, problem definition, talent model, and focal outcomes (see also **Table on the next page**).

Contrasting Legacy Research/R&D Models with Strategic-Surprise-Ready Models

Dimension	Legacy Educational R&D Architecture	Strategic-Surprise-Ready R&D Architecture
Orientation to Change	Slow, linear improvement	Preparedness for discontinuity and emergence
Assumptions about Stability	Stable systems, predictable needs	Unstable systems, shifting epistemologies
Problem Definition	Researcher-initiated, often retrospective	Problem-focused, co-defined with practitioners, forward-scanning
Data Assumptions	Scarcity: data is expensive, access is limited	Abundance: data flows are continuous, platform-mediated, and multi-modal
Talent Model	Individual PIs with domain expertise	Cross-sector performer teams with technical, contextual, and engineering fluency
Time Horizon	3–5 year project grants	Iterative sprints with adaptive planning, milestones re-evaluated
Management Model	Proposal-vetting and final report evaluation	Continuous support, coaching, performance review through SETAs
Risk Tolerance	Low—funding is conservative, success is defined by absence of failure	High—designed for tolerable failure in pursuit of transformative outcomes
Infrastructure Orientation	Research is bespoke and institution-bound	Research is platform-enabled and network-oriented
Innovation Modality	Improvement of existing practices, often marginal	Invention of new modalities, interfaces, and norms
Success Metrics	Academic publications, statistical significance	Practical utility, adoption, acceleration, transformation, stealth assessment (embedded, unobtrusive inference of learning), platform-level telemetry encodings that capture key learning processes for reuse across studies
Relationship to Practitioners	Occasional collaboration, often at implementation phase	Embedded co-design, real-time iteration with educators and learners
View of Technology	Supplementary to pedagogy	Constitutive of new learning systems and learner agency

Our Driving Question: Strategic Surprise

We seek to avoid repackaging old wine into new bottles. To stimulate more deeply rethinking how educational research could be organized, we ask:

> **What would an R&D system look like if it were organized not just to achieve scientific rigor and administrative efficiency, but instead primarily focused on detecting, absorbing, and generating strategic surprise?**

We use "strategic surprise" in the DARPA sense: anticipating and, at times, catalyzing discontinuous advances that change what is possible. For a concise origin story of the term and its early organizational implications, see Mickey McManus's podcast episode on strategic surprise (McManus, 2023). We ask this question because education now exists in surprising times, and we worry that we may not be leveraging latent opportunities to support students in novel ways. If educational research responds to surprise only through normative, paradigmatic studies, then *transformative potential* may not be harnessed. We want to imagine an R&D system that could better harness such potential.

One surprise with transformative potential, of course, is **Generative AI**. Generative AI is an "arrival" technology (Reich, 2024) that was very rapidly adopted by students and a growing number of teachers and has been the most-talked about disruption to both K-12 and postsecondary education in decades. Generative AI disrupts because it can create the outputs that students normally create to show what they have learned; this requires re-thinking many things, and one of them is how to emphasize high-quality learning processes, not just high-scoring outputs. Generative AI is sure to continue to surprise the education sector, not only in this way but in other ways we have not yet foreseen.

We see other surprises, too. Education is shifting from **data scarcity to data abundance**. Since the pandemic, more and more education settings use online environments, and these environments collect traces of students' activity. Whole fields and conferences have emerged to make sense of such data, for example, Educational Data Mining, Learning Analytics, and Learning at Scale. Although such traces are not perfect instruments for observing learning processes, researchers have been able to measure a stunning array of features and qualities of how students learn online. Yet the traditional paradigm for research focuses more on collecting new data through expensive and time-consuming processes than it does on figuring out how to leverage abundant learning process data. Relatedly, traditional education interventions and assessments mostly happen outside of authentic teaching and learning experiences, essentially stopping the experience to intervene and assess. The widescale adoption of online learning environments allows for data to be collected *incidental* to learning, rather than outside of learning (see Cole, S., Dhaliwal, I., Sautmann, A., & Vilhuber, L. (Eds.), 2021 for guidance on privacy-protective access, handling, and analysis of large-scale data resources used for research).

In a third surprise, educational research is shifting from a cottage industry style to **infrastructure-based approaches**. Where once studies were largely conducted by isolated teams collecting bespoke datasets in limited contexts, we now see the emergence of shared research infrastructures—such as digital learning platforms, data collaboratives, and cloud-based experimentation environments—that enable larger-scale, faster, and more replicable inquiry. These infrastructures support a shift toward cumulative, community-driven science, where multiple teams can build on each other's work, test interventions across diverse contexts, and accelerate progress toward usable solutions.

We anticipate that many other opportunities may open up in the next few years, and ask how educational research could become agile in responding to surprises, rather than largely absorbing all change into traditional approaches.

Lessons from Other Fields on Adapting for Strategic Surprise

Other sectors show how to design for strategic surprise as the driving question for reframing educational research. When the Soviet launch of Sputnik stunned the United States into action in 1957, it catalyzed not only the space race but also a new paradigm for how R&D could be organized. DARPA was born from that moment—designed not merely to support the prevailing scientific consensus, but to create *strategic surprise* of our own. It was built as a response to disruption, with disruption as its goal. Other sectors have since followed suit: ARPA-E (energy) and ARPA-H (health) (see references) are contemporary adaptations, created to bring the same ethos of agility, focus, and breakthrough-orientation to other mission-critical domains. All of these initiatives had strong financial support as well as risk tolerance, which allowed new research approaches to emerge and improve.

These models build on a set of design principles that are highly instructive for educational research. For example, ARPA-E was created in response to growing global concern over climate instability and energy insecurity—challenges that demanded more than incremental advances. It operates with a flat structure, empowers visionary program directors, organizes work around tightly scoped, solvable technical problems, and supports performer communities with high-cadence, high-support iteration cycles. This has enabled ARPA-E to stimulate whole new energy ecosystems in battery storage and grid resilience—demonstrating how mission-driven R&D can accelerate from lab to impact in just a few years.

A particularly compelling illustration of how R&D can be reorganized in response to strategic surprise comes from the health sector. In early 2020, the global COVID-19 pandemic posed an urgent and complex challenge: to develop, test, manufacture, and distribute effective vaccines at unprecedented speed. In response, the U.S. government launched Operation Warp Speed (OWS), an initiative that brought together federal agencies—including the Department of Health and Human Services (HHS), the Department of Defense (DoD), and the Biomedical Advanced Research and Development Authority (BARDA)—with private sector partners. Drawing on DARPA-style principles, OWS made simultaneous, at-risk investments in multiple vaccine platforms and supported parallel manufacturing alongside clinical trials—actions that would have been infeasible under traditional NIH-led grantmaking. This portfolio approach to risk, combined with agile governance and a relentless focus on time-to-impact, enabled the first vaccines to be authorized for emergency use within 11 months—a timeline previously thought impossible (Sources: U.S. GAO overview and contemporaneous HHS/CDC testimony). The lesson for education is profound: when confronted with systemic disruption, traditional research pathways may be too slow or fragmented to meet the moment. Purpose-built, agile R&D structures—focused on bold outcomes, capable of managing uncertainty, and tightly linked to implementation pathways—can unlock transformative progress in a compressed timeframe.

We believe the time is right to import these lessons into education.

Lessons from our Experiences

Across our respective efforts to design and lead large-scale R&D initiatives, we have come to a shared realization: if you want to shape the future of educational R&D, the right starting point is not just better ideas, but better orchestration. Breakthroughs emerge not from individual brilliance alone, but from environments where infrastructure, talent, and purpose are deliberately aligned. This means investing in the conditions that allow diverse performers to do their best work—conditions that are curated, scaffolded, and continually adapted in response to discovery. Like conductors of an ensemble, we have found our most impactful roles to be those that shape how others collaborate, iterate, and learn. The metaphor of orchestration—setting the tempo, tuning the system, foregrounding emerging themes—captures how purpose-built R&D systems can transform latent potential into collective progress.

From one author's vantage point (Uncapher), one of the most consequential learnings is the power of SETAs—Scientific and Engineering Technical Assistance—as a structural lever for agility and rigor in educational R&D. In the ARPA tradition, SETAs are embedded technical experts who provide continuity, systems-level insight, and rapid response capacity across short-term, high-ambition research programs. In education, SETA-like roles can serve as translators between domains (e.g., learning science, data science, classroom practice), helping research teams navigate unfamiliar terrain such as real-time data pipelines, IRB compliance, or platform integration. These actors do not merely support execution; they shape and adapt the program's technical direction in response to evolving discoveries. Through initiatives like SEERNet and AERDF, we have also seen the value of time-limited, purpose-built organizations focused on emerging educational challenges—structures that are freed from legacy constraints and designed explicitly to identify, incubate, and accelerate breakthrough approaches. SEERNet focuses on stimulating researchers to work with the data available in digital learning platforms, while incentivizing developers to improve their research infrastructure to enable the work. Additionally, a network among the participants encourages deeper understanding of the challenges in this area, and how they can be overcome. AERDF focuses on tackling specific high-priority educational challenges (e.g. integrating executive function with learning mathematics) through a focused effort over five years. As with SEERNet, much is learned through the host organization's facilitation of the work of the participants.

From another author's experience (Roschelle), a second critical insight centers on how research is organized—not just who does it, but how the infrastructure shapes what is possible. Traditional models of education research rely heavily on bespoke data collection and isolated investigator teams. In contrast, the SEERNet initiative has demonstrated the promise of organizing around shared digital learning platforms as R&D infrastructure. This enables a *performer community model*: many researchers working in coordinated cycles, using real-world usage data, contributing to a cumulative evidence base, and driving improvement within and across sites. Such hub-based models make it possible to study and scale innovations with greater efficiency and relevance. They also democratize access to research participation by lowering technical and logistical barriers. As education increasingly operates in digital and data-rich environments, the ability to build and sustain R&D communities around shared infrastructures may be as important as any individual breakthrough.

These experiences underscore a broader insight: strategic surprise cannot be managed by reactive systems. It must be anticipated—and harnessed—by research ecosystems intentionally designed for responsiveness. If we want a novel model for educational R&D, we must start by orchestrating two core elements: **talent and infrastructure**. Breakthroughs do not emerge in isolation, but from the dynamic interplay between *capable people* and *enabling environments*. The most effective systems we've encountered are those that treat infrastructure not as a backdrop, but as a driver of innovation; that see technical assistance not as compliance, but as embedded capability; and that regard collaboration not as coordination, but as co-creation. As education confronts accelerating change, our most urgent task is not only to generate new knowledge, but to configure the conditions in which that knowledge can be rapidly tested, refined, and scaled. It is time to invest in architectures of learning that are dynamic by design—systems built not to resist disruption, but to thrive within it.

Four Shifts to Surprise-Ready and Transformation-Enabling R&D

If the education sector is to respond effectively to the next wave of disruptions—be it generative AI, new models of assessment, or shifting learner needs—it must be supported by a research system built not only for rigor, but also for agility and foresight. Strategic surprise is not an outlier; it is becoming the operating condition. To meet this reality, we propose a shift from legacy R&D structures toward a new architecture—one purpose-built for speed, responsiveness, and transformative potential. This architecture departs from long-standing conventions and instead reimagines how research is framed, executed, and brought to bear on practice.

Framing Commitments

To prepare education research for strategic surprise, we must rethink its foundational commitments—shifting from a model optimized for rigor and stability toward one designed for responsiveness, experimentation, and practical transformation. A future-facing R&D architecture begins by adopting a fundamentally different orientation to change. Whereas legacy systems often assume educational contexts are stable and can be incrementally improved, a strategic-surprise-ready system accepts volatility as the norm. It assumes that technology, data, and automation will continue to evolve rapidly—and that research must be positioned to both shape and respond to these shifts in real time.

Problem Definition

This future model also demands a redefinition of what constitutes a research-worthy problem. Rather than relying on generic or perennial goals (e.g., "improve literacy"), we must invest in the craft of problem definition—identifying solvable, high-leverage challenges that are specific enough to measure progress and broad enough to drive systemic value, but also problems that are timely and "ripe" for solution because of new data, tools, or enabling conditions. A ripe problem is one where concerted effort could produce measurable change in the near term, with lessons that generalize. Strategic R&D systems prioritize such problems, tolerating risk and failure in pursuit of breakthroughs with outsized impact, enabling bold bets that may fail but offer disproportionate upside if they succeed.

Strategic surprise in education happens when rapid shifts—technological, policy, demographic, or social—outpace our sensing and response cycles. The "ripe problems" below double as early-warning probes and shock absorbers: they turn weak signals into leading indicators, compress the observe–orient–decide–act loop, and give schools switchable, low-risk responses when conditions change. Concretely, here are some examples of pressing problems and how a "strategic surprise"-ready mindset could help teams spot issues early, act quickly, and build longer-term defenses. In each example we use a three-part lens: **the tripwire** (the signal that triggers action), **the mitigation path** (the near-term steps to address it), and **the general defense** (the durable safeguards that reduce future risk):

- **Make writing processes visible**
  Tripwire. Sudden drops in planning/revision events or spikes in single-draft submissions.
  Mitigation path. Process instrumentation distinguishes practiced skill from AI substitution and prompts assignment redesign before grading integrity erodes.
  General defense. Keeps evidentiary standards robust as model capabilities evolve.

- **Cut quiet disengagement**
  Tripwire. Rising "zero-activity" weeks among present-but-inactive students.
  Mitigation path. Just-in-time pings, micro-goals, and streak resets stabilize participation before it spirals into chronic absenteeism.
  General defense. Maintains learning continuity during schedule disruptions or novel platform features that change attention dynamics.

- **Help students plan their learning**
  Tripwire. Gaps in practice after closures, testing windows, or scope/sequence shifts.
  Mitigation path. Auto-schedulers restore retrieval practice without adding teacher load.
  General defense. Reduces volatility in cumulative learning when calendars or materials change abruptly.

- **Manage changing assessment paradigms:** Keep learning on track when tests change: Use everyday learning signals to spot trouble early, make smart adjustments, and avoid relying on any single test.
  Tripwire. Watch for a growing gap between day-to-day learning signals (e.g., assignment performance, platform logs, reading checks) and results on benchmark tests. If they stop lining up, that's our early warning.
  Mitigation path. If those day-to-day signals still reliably forecast end-of-year outcomes, we can temporarily **pause or replace one interim test** and lean on the stronger signals during disruptions. If they don't, add a **lightweight check** (e.g., a short probe) until alignment returns.
  General defense. This approach avoids single points of failure. When assessments are delayed, revised, or contested, we still have multiple, consistent measures to guide instruction and support students.

- **Scaffold multilingual newcomers**
  Tripwire. Rising time-to-first-correct or task abandonment among newcomer cohorts.
  Mitigation path. Bilingual hints, previews, and sentence starters narrow gaps immediately while longer-term supports come online.
  General defense. Maintains access to core content during sudden enrollment shifts.

- **Reduce dashboard overload**
  Tripwire. Declining "action-within-48-hours" rates on existing dashboards.
  Mitigation path. A "three-things view" (one risk, one growth trend, one suggested action) preserves educator bandwidth during turbulent periods.
  General defense. Ensures the right people act on the right signals when conditions change fast.

Across all six examples, the strategic-surprise payoff is the same: **convert unknown-unknowns into monitorable metrics, pre-define thresholds, and attach ready-to-ship responses** (feature-flagged nudges, alternate schedules, simplified views, or assessment backstops). Doing this work now creates a reusable playbook: shared telemetry across platforms, rapid A/B learning cycles, and performer teams with SETA-style expertise who can deploy evidence-based mitigations within weeks—not school years—when the next surprise hits.

Project Model

Talent structures must evolve in parallel. The traditional focus on individual principal investigators (PIs) leading multiyear studies is ill-suited to dynamic environments. Instead, we need talent models that support collaborative teams, shorter-cycle projects, and agile reconfiguration. SETA roles are critical here, providing technical continuity, systems insight, and support for high-functioning cross-sector teams. Management practices must also shift from grant oversight to program stewardship, emphasizing rapid iteration, real-time learning, and directional course correction.

Focal Outcomes

Finally, the focal outcomes of education R&D must expand. In legacy systems, innovation is often defined by publication or policy influence. In a strategic-surprise-ready model, innovation includes new modalities—like platform-embedded experimentation, adaptive tools, or co-designed interventions—and is evaluated not just by statistical significance but by system relevance, practitioner uptake, and the potential for scaling through both public and commercial channels. Impact is defined not only by what is discovered, but by what is used.

Recommendations: Building a Strategic-Surprise-Ready R&D Ecosystem

To navigate—and shape—an era of accelerating change, the education sector must adopt new roles, structures, and habits of mind aligned with the realities of strategic surprise. In this section, we offer two complementary frames for action. First, we outline **four strategic shifts** that define the architecture of a surprise-ready R&D system—transitions in how we frame problems, organize projects, support implementation, and engage schools. Second, we offer tailored **recommendations for four stakeholder groups**—researchers, developers, funders, and systems leaders—whose participation is essential to reimagining what educational R&D can become. Together, these recommendations aim to move the field from a model that is reactive and fragmented to one that is anticipatory, collaborative, and built for transformative impact.

1. Strategic Shifts. These shifts represent the structural moves necessary to design R&D ecosystems that are faster, more adaptive, and more likely to yield breakthrough results:

From Field-Initiated to Problem-Focused Research

Summary: Make solvable, high-leverage problems the organizing unit of R&D.

- Invest in the discipline of problem definition.
- Replace generic goals ("improve literacy") with measurable, time-bound challenges.
- Involve practitioners in all research stages through co-design and other methods.
- Build infrastructure for cumulative progress.

From Disciplinary Projects to Collaborative R&D Communities

Summary: Replace isolated projects with iterative, team-based R&D cycles.

- Ditch the 3-year solo PI model.
- Promote performer teams that cycle fast, learn faster.
- Embrace dynamic teams over fixed hierarchies.

From Oversight to Embedded Support

Summary: Shift from back-end evaluation to ongoing stewardship.

- Deploy SETAs as design and engineering partners, not just compliance tools.
- Fund technical, contextual, and managerial fluency.
- Focus on iteration, not just justification.

From School Participation as Burden to Value Proposition

Summary: Design R&D as a service to schools, not a demand on them.

- Offer value that schools see, use, and celebrate.
- Build supports for leadership, recognition, and joy in participation.
- Make research a lever for school improvement—not a side task.

Implementation constraints and mitigations:

The items below pair *predictable frictions* that slow valid school-based R&D with a *tested mitigation* that turns each friction into standard work. The purpose is not to catalogue barriers, but to make participation easier for schools and vendors and to shorten time-to-evidence when the next surprise arrives.

Data governance. Use pre-approved data-sharing playbooks (FERPA school-official or research exceptions), publish a data dictionary, and adopt **minimum-viable telemetry** aligned to use-cases.

School capacity/turnover. Offer plug-and-play supports: standard onboarding, short "test-card" cycles, and artifacts teachers can adopt immediately (e.g., "three-things" view templates).

Platform readiness. Fund **instrumentation sprints** with vendors to expose event logs and feature flags needed for rapid experiments; share SDKs and open schemas where feasible.

Privacy and trust. Pre-commit to de-identification and independent IRB review; ensure opt-outs; foreground benefits to students and teachers.

Taken together, these steps convert known frictions into routine practice—so the field can run rapid, ethical learning cycles and produce decision-ready evidence when the next surprise hits.

Limitations and open questions. Surprise-ready R&D requires capabilities (e.g., telemetry standards, SETA-style staffing, milestone budgeting) that are not yet universal. We note open issues around cross-platform interoperability, sustaining school participation without added burden, and balancing openness with privacy. We offer these as invitations for field-level coordination, not reasons to defer action.

2. For Stakeholder Groups. These role-specific recommendations recognize that transformation requires action at every layer of the ecosystem, from those who generate knowledge to those who implement and sustain it:

For Education Researchers

Seize upon surprises to define challenge problems where team science and emerging infrastructure could thrive. Sharpen the unit of analysis: study solvable problems, not just familiar ones.

- Move beyond "what interests me" to "what moves the needle"—define problems that are actionable within cycles.
- Work with practitioner partners to articulate constraints and success signals up front.
- Contribute to shared infrastructures that enable comparison and iteration across contexts.

For Education Developers and Builders

Conceptualize research as a critical element in making sense of and harnessing strategic surprise. Build tools for learning, not just for demonstration.

- Shift from tools that generate outputs to tools that improve the quality of thinking and engagement.
- Prioritize instrumentation: build in metrics that track learning processes, not just final answers.
- Design products that can be rapidly prototyped, iterated, and studied in authentic environments.

For Education Funders (federal, state, philanthropic)
Fund opportunity spaces around surprises, capacity, risk, and agility. Curate talent and infrastructure to accelerate learning—not just fund ideas.

- Incentivize performer communities, not isolated projects.
- Make "expertise and infrastructure on demand" models (such as SETAs) a default feature for ambitious programs: bring technical depth and program stewardship.
- Use milestones as outcomes, not end-points; adjust funding based on iteration and responsiveness.

For Systems-Level Leaders (Policy, District, Platform, and Agency Roles)
Participate where you can shape a "surprise" to your desired strategic improvements. Make participation in R&D a source of strategic advantage, not distraction.

- **Choose research partners who value you as active participants in R&D, not passive end-users:** Shape research agendas by identifying pressing problems and offering authentic testbeds.
- Provide supports that make participation easier and more rewarding.
- Tie R&D participation to leadership pipelines, recognition, and real decision-making influence.
- Involve educators as co-designers, not just implementers—value their perspective in shaping the work.

A system that is ready for strategic surprise is not one that predicts the future—it is one that is prepared to shape it. These recommendations aim to help education stakeholders shift from a model of research that is reactive and siloed to one that is anticipatory, collaborative, and built for impact.

Conclusion: Shaping the Next Chapter of Educational R&D

We stand at a threshold moment. The disruptions of our time—technological, infrastructural, cultural—are not problems to be solved after the fact, but invitations to lead. Strategic surprise need not be chaos; it can be a catalyst. If we are bold enough to shift our models, if we are disciplined enough to reimagine our tools and our teams, then education R&D can do more than adapt—it can define what comes next.

This is our chance to build an R&D system that is not only more rigorous, but more responsive; not only more inclusive, but more imaginative. A system where researchers, educators, developers, and funders do not merely coexist, but collaborate with intention, creativity, and urgency. We can build a future where breakthroughs are not accidental or isolated, but orchestrated: deliberate, cumulative, and transformative.

Strategic surprise is not a disruption to withstand, but a momentum to embrace—if we are ready to lead with foresight, creativity, and conviction, and to orchestrate the two levers that matter most: capable people and enabling environments.

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Washington, DC:
1001 Connecticut Avenue NW, Suite 935
Washington, DC 20036

Redwood City, CA:
702 Marshall St., Suite 340
Redwood City, CA 94063

Website: https://digitalpromise.org/