AdaptaIQ

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Cognitive Modeled Learning

The third era of learning technology — where the learner's cognitive profile is established before the experience begins, and everything else is built on top of it.

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The thesis in brief

A category shift in learning technology

Learning technology has evolved through two eras: static digital content, which democratized access, and adaptive learning, which introduced personalization through performance data. Both treat the learner as something to be inferred from interaction with content. This paper describes a third era — **Cognitive Modeled Learning** — in which the learner's cognitive profile is established before the learning experience begins, and becomes the foundation on which content, pacing, format, and reinforcement are organized.

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The problem with one-size-fits-all learning

Every learner is different. Not just in what they know, but in how they think — how they process new information, how they build mental models, how they recover from confusion, and how they sustain attention through difficulty. These learning differences are not superficial. They are cognitive, behavioral, and deeply individual.

Yet throughout the history of education — and of education technology — this reality has been treated as an inconvenience rather than a design principle. Content has been standardized. Curricula have been fixed. The learner has been asked to adapt to the system, rather than the system adapting to the learner. The promise of student-centered learning — in which the system adapts to the learner rather than the reverse — has remained largely unfulfilled.

The consequences are familiar. Students who process information differently fall behind, not because they lack ability, but because the delivery mechanism does not match how they think. Professionals in corporate training sit through modules designed for a fictional average learner that matches almost nobody in the room. Children lose confidence in subjects they are fully capable of mastering, because no one has ever taken the time to understand how their particular mind works.

> **Key insight**
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> *The core failure of traditional education technology is not a lack of data. It is a failure to ask the right question — not **"What did this learner get wrong?"** but **"How does this learner actually think?"***

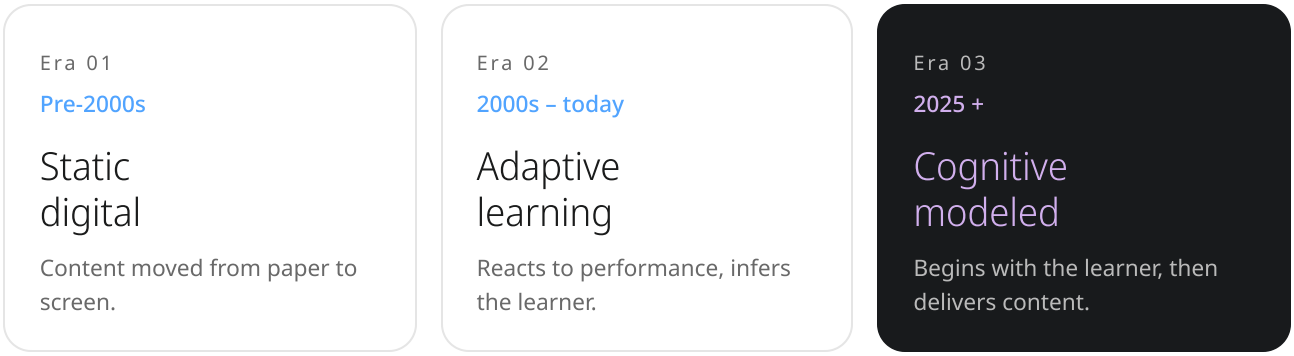


Figure 1 The three eras of learning technology — from delivering content, to reacting to performance, to beginning with the learner.

Section 02 · Era One

Traditional digital learning (pre-2000s)

The first wave of education technology did one thing well: it moved content from paper to screen. Digital textbooks, online courses, and video lectures made knowledge more accessible and more affordable. A student in Warsaw could access the same lecture as a student in Boston. That was a genuine and important achievement.

But the digital textbook has a fundamental limitation: it presents the same page to every reader. It does not know whether you understood the previous chapter. It does not notice when you skip ahead out of boredom, or re-read the same paragraph six times out of confusion. It has no model of you as a learner. It has only content.

This stage established the infrastructure — platforms, devices, internet connectivity, the cultural acceptance of digital learning — but it did not solve the underlying problem of personalization. Every learner was still receiving the same experience, now delivered on a laptop rather than in a classroom.

Section 03 · Era Two

The adaptive learning revolution (early 2000s – today)

The second wave addressed the personalization problem directly, and it represented a genuine leap forward. Adaptive learning platforms introduced the idea that educational software could watch how a learner performs and change the experience in response. For the first time, the path through a curriculum could diverge based on individual behavior.

The mechanism is now well established. An adaptive system operates through a continuous loop — a form of learning analytics — across three stages: i) data collection, in which the platform tracks behavioral signals such as quiz accuracy, response time, and error patterns; ii) analysis, in which adaptive learning AI identifies gaps and patterns in the learner’s performance; and iii) real-time adjustment, in which the content sequence, difficulty level, or explanatory format is modified to address what the system has observed.

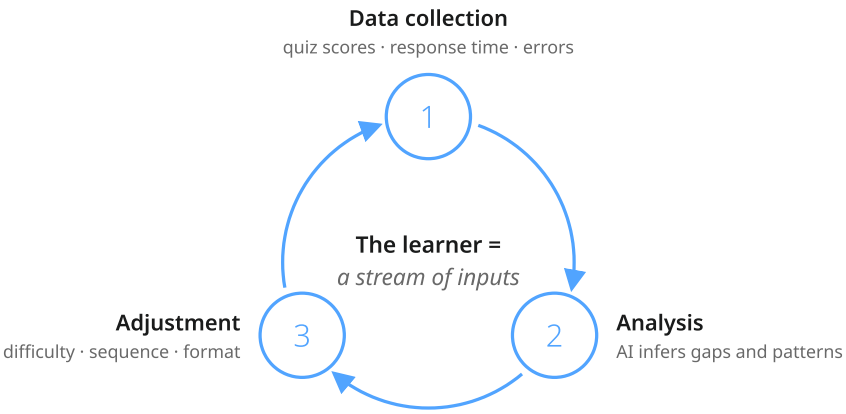


Figure 2 The reactive adaptive loop. The system observes outputs and infers the learner after the fact.

The results have been significant. Numerous studies suggest that adaptive learning platforms can improve learning outcomes — including efficiency, knowledge retention, and completion rates — compared to static alternatives. Adaptive learning platforms such as Khan Academy, ALEKS, Coursera, Duolingo, and Squirrel AI have brought personalized education to hundreds of millions of users.

$5B+	~20%	100M+
global adaptive learning market, 2026[1]	annual market growth rate	learners reached by adaptive platforms

The incomplete lens

Adaptive learning advanced the right goals — but through an incomplete lens. It asked: ***"How do we adjust content based on what a learner does?"*** *The more fundamental question is:* ***"How do we understand who the learner is, before they do anything at all?"***

This is not a criticism of adaptive learning. It was, and remains, a meaningful improvement over static digital content. But it contains a structural limitation that becomes visible only once you see it clearly. And once you see it, it cannot be unseen.

The unresolved problem at the heart of adaptive learning

Traditional adaptive learning is, by design, reactive. It waits for the learner to perform, observes the outputs of that performance, and then adjusts. The learner's identity — their cognitive architecture, their processing style, their attentional patterns, their learning modalities — is never directly known by the system. It is inferred, imperfectly and after the fact, from a stream of behavioral signals.

This creates several compounding problems.

01

It starts cold.

On day one, the system knows nothing about how this learner thinks. It must accumulate enough performance data to make meaningful inferences — a process that can take days or weeks, during which the experience remains generic and poorly matched.

02

It confuses outputs with causes.

Performance data tells you what a learner got right or wrong. It does not tell you why. Two learners can produce identical error patterns through entirely different cognitive mechanisms, and the reactive system cannot distinguish between them.

03

It does not transfer.

Because the model is inferred from performance on specific content, a learner's profile on a mathematics platform tells you nothing about how they will perform on a language platform. Every new domain starts from scratch.

04

The learner stays invisible.

Performance signals are outputs. The cognitive architecture that produces those outputs — the actual structure of how this person thinks — remains permanently invisible to the system.

The deeper issue is philosophical as much as technical. Reactive adaptive learning treats the learner as a stream of inputs to be processed, not as a person to be understood. The system is organized around the content, and the learner is asked to reveal themselves through their interaction with it. The cognitive model, if it exists at all, is a by-product of content delivery rather than its foundation.

This is the gap that the next era of learning technology must close.

Section 05 · Era Three

Cognitive Modeled Learning — the new architecture (2025 +)

Cognitive Modeled Learning (CML) is an emerging architectural approach to learning technology: the cognitive model of the learner is established *before* the learning experience begins, and everything — content sequencing, delivery format, pacing, reinforcement — is organized around that model.

Where traditional adaptive learning builds a performance model reactively — observing outputs and inferring patterns — Cognitive Modeled Learning builds a cognitive model constitutively. The model is not a by-product of content delivery. It is the foundation on which delivery is built.

In traditional adaptive learning, the content is primary and the learner is a variable. In Cognitive Modeled Learning, the learner is primary and the content is a variable.

Category definition

Cognitive Modeled Learning builds upon adaptive learning, learner modeling, and cognitive science, while proposing a different architectural starting point: ***the learner model precedes content delivery rather than emerging primarily from it.*** *The difference is not one of degree — it is one of architecture.*

Two architectures

The shift is not when the profile is built — it is what the entire system is organized around. The distinction is architectural, not merely temporal.

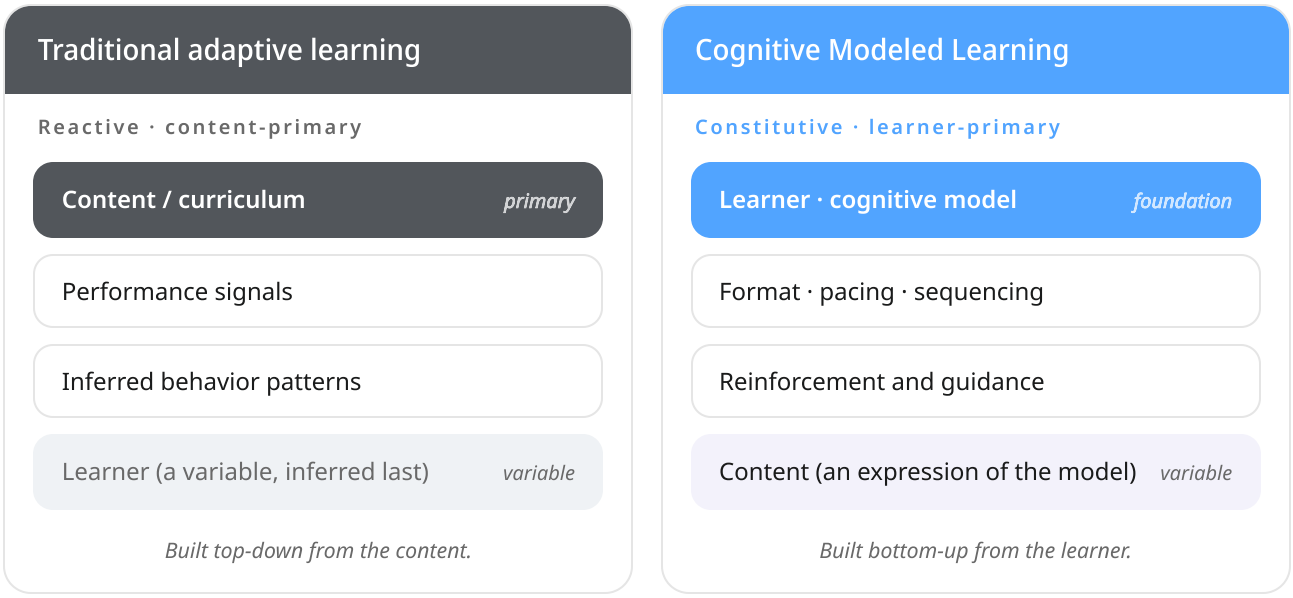


Figure 3 Two architectures. In adaptive learning the content is primary and the learner is a variable; in CML the learner is the foundation and the content is an expression of the model.

Cognitive Modeled Learning draws upon several established research traditions, including learner modeling, cognitive psychology, educational psychology, metacognition, executive function research, and adaptive learning systems. Self-Determination Theory, developed by Edward L. Deci and Richard M. Ryan, serves as the foundational framework, though it does not extend across all dimensions. The framework does not seek to replace these foundations, but rather to integrate them into a unified architecture supported by modern AI systems. CML does not simply improve the personalized learning platform — it redefines what personalization means by starting with the learner rather than the content.

The term is not without academic precedent. Learner modeling is an established subfield in education technology research, with over thirty years of literature examining how computational systems can represent the knowledge, skills, and cognitive states of individual learners. What Cognitive Modeled Learning adds to this tradition is three things: a psychologist-designed, multi-dimensional cognitive profile as the foundation of the model; a content-agnostic architecture that allows the model to transfer across domains; and a compounding value dynamic, in which the model deepens and becomes more precise over time as behavioral data accumulates on top of the cognitive foundation.

The core properties of Cognitive Modeled Learning

- The cognitive model is **built before content begins**, not inferred from content performance.
- It is **grounded in psychological science** — not inferred from behavioral signals alone.
- It is **content-agnostic**, transferring across subjects, domains, and platforms.
- It is **dynamic**, deepening over time as the system observes how the cognitive profile interacts with real learning behavior.
- Every element of the experience — format, pacing, sequencing, reinforcement — is **an expression of the cognitive model**, not a correction applied to it.

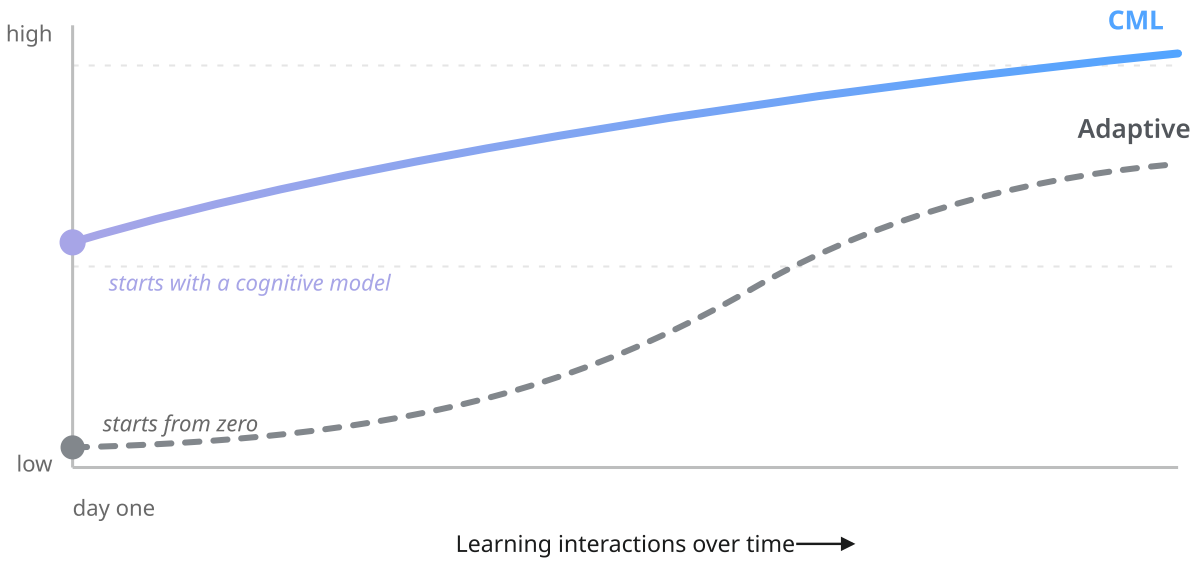


Figure 4 The compounding advantage. A model that begins with a cognitive foundation starts richer and deepens faster than one that must be inferred from performance.

In this sense, CML should be understood not as a rejection of adaptive learning, but as an attempt to extend it: from systems that primarily adapt to observed performance toward systems that begin with a richer hypothesis about how the learner thinks, learns, responds to difficulty, and sustains motivation.

How AdaptaIQ operationalizes Cognitive Modeled Learning

AdaptaIQ is the first platform to operationalize Cognitive Modeled Learning at scale. The company's architecture is built around a psychologist-designed **Learning Profile** that maps a learner across twelve learning dimensions — expanding to thirty by year end — developed in partnership with SWPS University in Warsaw, one of Europe's leading research institutions in applied psychology.

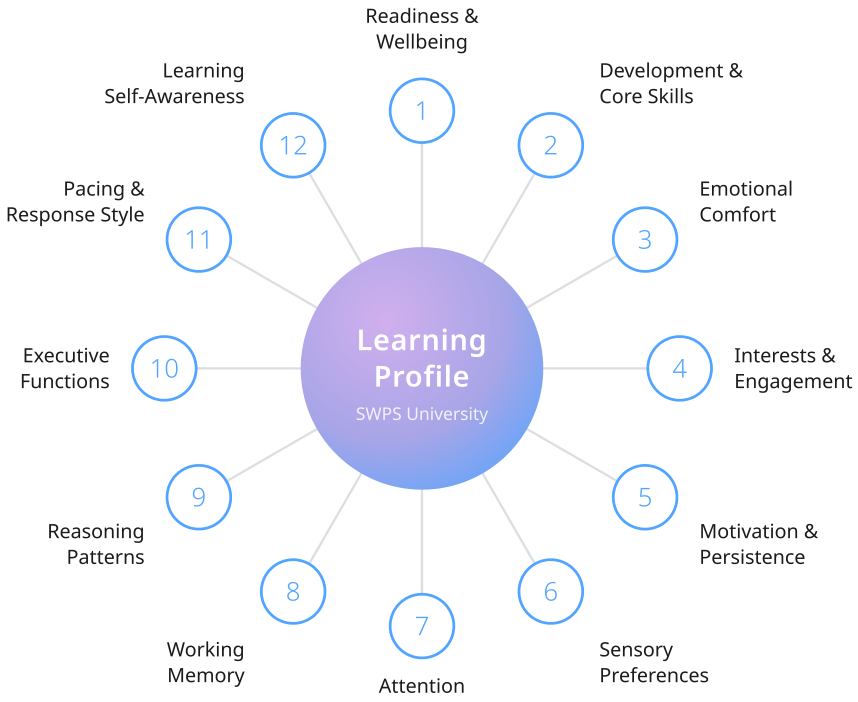


Figure 5 The Learning Profile. A psychologist-designed cognitive model established before any content is delivered — expanding to thirty dimensions by year end. *Note: the twelve dimension names indicate the broad construct each addresses. They are not exhaustive definitions, and the specific aspects measured within each dimension might be refined through ongoing validation.*

The Learning Profile is established through a structured cognitive assessment before any content is delivered. Grounded in learning science, it captures not just what the learner knows, but how they think — their processing style, attentional patterns, preferred modalities, working memory characteristics, and metacognitive tendencies. This profile is not a questionnaire. It is a cognitive model, grounded in decades of educational psychology research.

The twelve dimensions are drawn from an integrative view of cognition — one that encompasses affective, motivational, and sensory dimensions as constitutive elements of how the mind learns, consistent with the work of Immordino-Yang, Damasio, and the embodied cognition tradition. Under this framework, emotional comfort, motivation, and sensory preferences are not peripheral to cognition; they are part of the mechanism through which learning activates, sustains, and consolidates itself.

From the moment the first lesson begins, every decision the AdaptaIQ platform makes — what to show, in what format, at what pace, with what kind of reinforcement — is an expression of the cognitive model. As the learner progresses, behavioral data accumulates on top of the cognitive foundation, making the model increasingly precise. The profile does not start from zero and build up; it starts from a rich cognitive understanding and refines from there.

AdaptaIQ collects behavioral signals too — response times, accuracy, in-game choices — but interprets them against the cognitive model, correlating them across dimensions to build a psychological picture, rather than treating them as the model itself.

> A working hypothesis
>
> *Importantly, the initial Learning Profile should be understood as a working hypothesis rather than a fixed representation of the learner. As behavioral data accumulates through real learning interactions, the model is continuously updated and refined. The diagnostic layer provides the starting architecture, while ongoing learner behavior improves the precision of the model over time.*

The architecture is content-agnostic by design. Because the cognitive model is independent of any specific curriculum, it transfers across subjects, domains, and deployment contexts — compounding in value with every interaction.

Cognitive Modeled Learning vs. traditional adaptive learning

The two approaches are easily confused, because both personalize the learning experience. The difference lies in where each begins and what each is organized around.

	Traditional adaptive learning	Cognitive Modeled Learning
Starting point	Content curriculum	12-dimension Learning Profile + behavioral data
How it works	Monitors performance, then adjusts the path	Builds an initial cognitive model, then refines it
Model type	Performance model (reactive)	Cognitive model (constitutive)
Value over time	Improves content sequencing	Deepens the learner model, compounds value
Content dependency	Tied to proprietary curriculum	Content-agnostic, works across any domain

Table 1 How the two architectures differ across the dimensions that matter most.

Why this matters beyond K–12

Cognitive Modeled Learning is not a feature of a children's app. It is a **category claim** with implications across every context in which people learn.

For **educational content providers**

The CML architecture means that content can finally be delivered in a way that matches how each learner thinks, not just how each learner has performed so far. The Learning Profile travels with the learner, enriching every piece of content it touches. Content providers who integrate with a CML platform are not just distributing material — they are delivering it with cognitive intelligence.

For **corporate learning and enterprise development**

The implications are equally significant. Corporate training has long suffered from the same problem as classroom education: it is designed for an average learner who does not exist. CML brings the cognitive model into the enterprise context, enabling organizations to develop their people more effectively, reduce time-to-competency, and build learning cultures that account for cognitive diversity rather than flattening it.

For **financial services**

For instance — an industry where the ability to process complex information under pressure, adapt to new regulatory environments, and develop deep client understanding is a direct commercial differentiator — the application of Cognitive Modeled Learning to professional development and client engagement represents a genuinely new capability.

> **A durable asset**
>
> *The Learning Profile, once established, is a durable asset. It does not expire. It does not need to be rebuilt every time a learner enters a new domain. It travels with the person across their entire learning lifetime, becoming more accurate and more valuable with every interaction.*

Conclusion

The future is cognitive

The evolution of learning technology follows a clear arc. Static digital content democratized access but ignored the learner as an individual. Adaptive learning introduced personalization through performance data but remained reactive, treating the learner as a stream of behavioral outputs rather than a person with a distinctive cognitive identity. Cognitive Modeled Learning closes that gap — not by improving the adaptive loop, but by changing the architecture entirely. The future of education technology is not better algorithms — it is better understanding of the learner.

The learner is no longer the variable. The learner is the foundation.

This is not a marginal improvement. It is a categorical shift in what learning technology is for and how it works. And it produces a compounding advantage that reactive systems cannot replicate: a model that starts richer, deepens faster, and transfers across every domain a learner encounters.

> Founding vision
>
> *AdaptaIQ did not set out to build a better adaptive learning platform. It set out to build the first platform that **truly understands how a person learns** — and to let that understanding drive everything else.*

AdaptaIQ

The framework is Cognitive Modeled Learning. AdaptaIQ uses this term to describe an architecture in which the learner's cognitive profile becomes the foundation for how learning experiences are designed, delivered, and refined. We believe this represents a meaningful evolution in learning technology: from systems that react to performance, toward systems that begin by trying to understand how a person learns.

About AdaptaIQ

AdaptaIQ Inc. is a Delaware C-Corp with operations in North America and Europe. Kidaro (kidaro.app) is AdaptaIQ's first product, launching in 2026. This white paper may be shared freely with attribution.

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[1] Source: Business Research Insights and Research and Markets, 2026 Global Adaptive Learning Market Report.