AFFECTIVE LEARNING LAB

You don't remember what you're told. You remember what you feel.

PLAIN ENGLISH GUIDE

The full White Paper covers the science in detail. This is the short, no jargon, version: just the big ideas that explain learning biologically.

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FIRST, THE OLD IDEA

The brain is not a computer

For years we've talked about learning like it's data entry. Pay attention, take in the information, save it, retrieve it later, like saving a file. It's a tidy, but flawed, idea.

THE OLD IDEA	WHAT'S ACTUALLY TRUE
Brain = computer. Information goes in. Information gets saved. Repeat until it sticks.	Brain = survival machine serving the body. It keeps what it decides matters for survival. The rest is not remembered or deleted. On purpose.

So what actually makes it a ‘survival machine’ rather than a computer? Two key terms from biology matter here: homeostasis and allostasis.

Break the words apart and they basically explain themselves. Homeo: “the same.” Allo: “different,” or “other.” Stasis: “staying steady.” So homeostasis is staying steady by keeping things the same. Allostasis is staying steady by deliberately changing things, ahead of time.

Homeostasis is the reactive kind. Your body notices something's already gone wrong, too hot, too little sugar in your blood, and fixes it after the fact.

Allostasis is the clever bit, and the one that matters most for learning. Your brain doesn't wait for problems. It predicts what your body's about to need and adjusts in advance: releasing energy before you're hungry, gearing up before a challenge. This is why your brain is better described as a prediction machine than a filing cabinet, and it's the same system deciding what's worth learning. Something only gets flagged as worth keeping if it helps predict what matters for staying safe, functioning and, ideally, flourishing.

> DID YOU KNOW
> *It takes about 20 minutes for water you drink to actually reach the cells in the body that need it. But you feel satisfied soon after swallowing because your brain and body have already anticipated the hydrating effect.*

Here's the catch. Both systems share the same underlying preference: save energy wherever possible. Left to its own devices, your brain's default setting is to do the least it can get away with, not because it's lazy, but because thinking hard is metabolically expensive and may involve significant behaviour (even identity) change.

Learning, unavoidably, costs effort. So every brain runs the same quiet calculation before spending that effort: is this actually worth it? That biological calculation is the gate. Nothing gets past it just by being clearly explained or repeated often enough. It gets past it by mattering enough to be worth the energy.

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THE SCIENCE

Three key discoveries

Treat these as three parts of an integrated system.

DISCOVERY ONE · MEMORY

Your memory is more like a bouncer than a filing cabinet

A filing cabinet keeps everything you put in it. Your memory doesn't. It has a bouncer on the door who asks one question: does this matter to how I feel, now or in the future?

Say yes, and your brain releases stress hormones (cortisol and noradrenaline) that physically stamp the memory in while you sleep and in reconstruction. Say no, and it gets turned away. Frequent repetition can combat this, but it’s a blunt tool, often forcing brittle memories to stay with little rationale as to why.

DID YOU KNOW

In 2025, researchers found that even the brain’s support cells (astrocytes) are part of a memory trace, not just neurons that line up together. More than that, they help lock in emotionally charged context when the memory is revisited, primed by the same arousal chemical (noradrenaline). It’s early work in animal studies, but makes the idea of feeling as a bolt-on, or something separate to thinking and learning, harder and harder to defend.

The twist is every time you recall something, your brain doesn't just play it back. It briefly reopens the memory and can rewrite it, shaped by how you feel in that exact moment. Revise something while you're calm and curious, and it gets re-saved that way. Revise it in a panic before a test, and the panic gets saved with it.

Notice what this means. The chemicals that tell your brain a memory is worth keeping are released by feeling. Strip the feeling out and you strip out the signal and weaken the memory. So feeling isn't something added on top of learning for the sake of wellbeing. It is part of the machinery that decides what gets kept and what gets rebuilt. That is a claim about how memory works, not just about how children feel. It also suggests why some memories just ‘go in’ first time while others don’t, and why memory is pretty unreliable…

DID YOU KNOW

In a famous experiment, researchers convinced people they'd been lost in a shopping mall as a child, a memory that never happened. About a quarter of participants “remembered” it anyway, some adding vivid details like what the shop looked like or what the stranger who helped them was wearing (Loftus and Pickrell, 1995). Memory doesn't play back like a video. It rebuilds itself, and it can rebuild things that were never there at all.

DISCOVERY TWO · ATTENTION

Your brain has three gears, not one

We talk about ‘paying attention’ as if it's one single thing you either have or don't. It's actually three brain systems taking turns. Picture a seesaw.

The Pivot: the point the whole thing turns on, responding to whatever matters to you. A threat, a surprise, something unexpected or exciting, even challenging.

Focus Mode: switches on when you're concentrating hard on a task.

Reflection Mode: switches on when you're reflecting, connecting ideas, making sense of concepts, chaining events together as a story *(even if it looks like just staring out the window)*.

Note: Focus Mode and Reflection Mode can't both run at full power at once. They seesaw, back and forth. The Pivot decides which way it tips, which is why the seesaw image has ‘what you care about’ written on it.

DID YOU KNOW

Staring out the window doesn't have to mean switching off. Teachers, and most people, read it as a sign someone's stopped listening, but there's no way to tell just from the outside. It's often Reflection Mode quietly stitching new information into everything you already know. Some of the ‘aha’ moments happen when you’re least expecting them. Wipe out every bit of that time to squeeze in ‘more content’, and you may get less learning, not more.

DISCOVERY THREE · STORY

Stories are significant to remembering

In a classic study, people who turned a random list of words into a silly story remembered **seven times more** of them than people who just tried to memorise the list (Bower and Clark, 1969). Same words. Same time. Seven times the result.

Facts on their own are thin thread, quick to fray. Facts wrapped in a story, with a character, a problem, and something at stake, are thick rope. Why? Because they make us feel something.

This matters even more for young people, who are constantly asking “who am I becoming?”. Learning that connects to that question sticks and is developmental. Learning that doesn't, however well it's delivered, mostly doesn't and is instrumental.

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ONE MORE TWIST

Your brain doesn't save the facts. It saves the facts-plus-feelings, together.

You don't remember an event, and separately remember how you felt about it. Your brain saves them as one single memory, stitched together, in the same instant.

> *“What you have emotion about is what you're thinking about, and what you're thinking about, you might be able to learn about.”*
>
> **Mary Helen Immordino-Yang, neuroscientist**

This is a bigger deal than it sounds. It means the target of the feeling matters just as much as the feeling itself. Picture a student sitting a maths test. She's anxious. Her brain is absolutely going to save that feeling. But save it about what? If she was never curious about the maths itself, only worried about the mark, then what gets stamped into memory is "(maths) tests are scary." Not the maths itself.

This is why two people can sit through the exact same lesson and walk away having learned completely different things. Not simply because one wasn't paying attention. Because they were having emotion about different things.

And none of this is happening only in your head. Feelings come from your whole body: heart rate, gut, energy levels, all of it, not just electrical activity behind your eyes. Some of your best decisions never pass through conscious thought at all. They arrive as a gut feeling, a hunch that something's right or wrong, before you could ever explain why.

> **DID YOU KNOW**
> *A patient known in the research as "Elliot" lost a small part of his brain, one of its key emotion-generating regions. His IQ and logical reasoning stayed perfectly intact. But he became unable to make even simple decisions, like which cereal to buy or which day to book an appointment. In a card game designed to study risky choices, healthy players start avoiding the bad decks before they can explain why, their body warns them first, as a gut feeling. Elliot never got that warning. He could explain the game perfectly and still kept losing (Damasio, 1994; Bechara et al., 1997). Logic alone wasn't enough. He needed the feeling too.*

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WHY THIS MATTERS MOST

Two very different kinds of learning

Once you know the target of the emotion matters, a bigger question follows: what should that target actually be? This is the difference between learning for the sake of it, and learning that builds who you are.

LEARNING FOR THE SAKE OF IT	LEARNING THAT BUILDS YOU
Learn it, test it, forget it. Fine for a fire drill or a bus timetable. It doesn't relate to who you are, so it is less likely to stay.	Learn it, connect it to who you're becoming, keep it for life. This is where identity, wellbeing and development come from.

There's a reason the first kind is so much more common than the second. Learning for the sake of it barely disturbs the status quo: you take in a fact, use it, move on, no real change required. Learning that builds you asks your brain to update its own model of who you are and how the world works, and that's expensive. Remember your brain's baseline preference from earlier: avoid unnecessary spend. Genuine development doesn't happen by accident. It has to be worth fighting your own biology's default settings for.

Both kinds are legitimate. You need the fire drill kind. But only the second kind, what the research calls developmental learning, builds a person: someone who's grown in a healthy, social, emotional and self-directed way, not just someone who's passed a test. And the evidence for what that actually does to a young person is striking.

> THE LONG GAME
> *A study that followed teenagers for years found a clear pattern. The ones who did more of this deeper kind of thinking, connecting what they were learning to bigger questions about meaning, values and who they wanted to become, went on to report a stronger sense of identity, wellbeing and greater life satisfaction as young adults (Gotlieb et al., 2024).*

That's not a small claim. It suggests how we teach doesn't just affect what young people know. It affects who they become, and how satisfied they are with their lives, years later (see figure 1 below which found each step predicted the next).

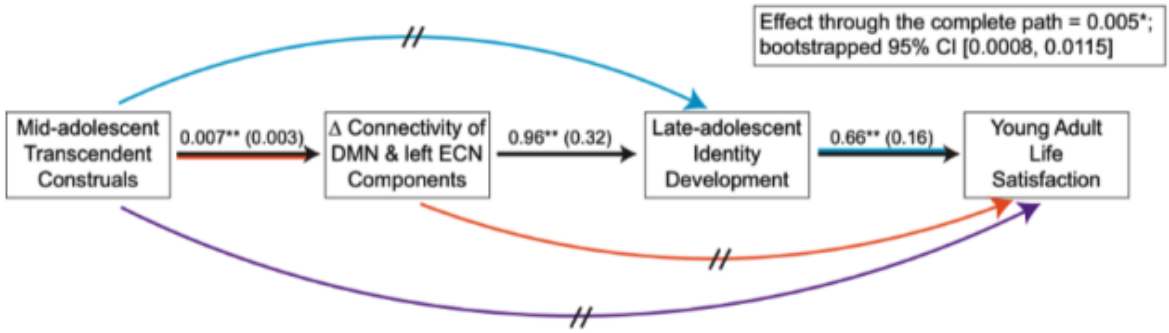

Figure 1: What Developmental Thinking Predicts taken from Gotlieb *et al.*, (2024)

When learning threatens who you are

The hardest thing to learn is the thing that challenges your sense of self.

Because developmental learning updates your model of who you are, the brain treats a serious challenge to a held belief as a kind of threat, and defends rather than updates. Counterintuitively this gets stronger with expertise, not weaker: the more someone knows, the better they are at arguing their way out of uncomfortable evidence. It is why piling on contradiction rarely changes a mind, and often hardens it. What lowers the cost of changing is safety: a relationship where being wrong carries no penalty, and where the new idea is offered as a deepening of what someone already understands rather than proof they were foolish. Safety is not the soft padding around learning. It is the condition that makes the hard part possible.

HOW NEW CARES GET BUILT

Caring is contagious

This is the ‘object-of-emotion’ point playing out over time. A new care doesn't appear from nothing, and you can't force yourself, or anyone else, into one. It forms by riding on the back of a care you already have, usually along one of three routes.

1. **Personal:** Something happens to you directly, and it strikes a chord. A near miss, a small thrill, a moment that mattered. Nobody had to convince you. You just cared.

2. **Social:** You catch it from someone you already care about. A teacher who's genuinely excited about their subject helps that interest and excitement spread through the room. When in action, the brain activity of teachers and students even tends to fall into sync (Dikker *et al.*, 2017).

3. **Cultural:** You catch it from the wider group you belong to: family, friends, community. Shared traditions and ‘the things people like us are into’ shape what feels worth caring about, often before you've consciously thought about it at all.

Immordino-Yang calls this a caring cascade: learning to care about new things through what you already care about. Someone who cares about social justice might end up caring about statistics. Someone who cares about basketball might end up caring about the physics of a free throw.

This is why “start with what they already care about” isn't just friendly advice. It's an actual mechanism, and it's rule one of planning for learning.

There is a fourth way in, and it works differently from the first three. Challenge, or surprise: a gap between what someone expected and what actually happens pulls the brain's attention straight to it. The catch is that you can only be surprised by something you already have a picture of, so challenge lands for a learner with some understanding, less so for a total beginner. Start beginners with relevance, and lean on challenge as expertise grows.

One catch, though. To succeed as developmental learning, the new thing should genuinely start to matter on its own, not just as a way of staying in someone's good books. A student who's really just trying not to let a favourite teacher down is borrowing care, not building it. This is to be expected at first. Ideally, the initial cascade transfers to the content itself.

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ONE MORE LAYER

The story a teacher holds is contagious too

A study of forty teachers found something worth knowing. Great teaching went hand in hand not with years of experience, but with the story a teacher held about what teaching is even for.

TRANSACTIONAL	DEVELOPMENTAL
I deliver the content. You give it back correctly. Success equates to assessment outcomes and compliance with the system.	Academic learning is inseparable from who a student is becoming. Concepts and ideas are the vehicle, not the destination.

Teachers living the second story tended to be rated as stronger practitioners, while years of experience barely featured by comparison (Kundrak *et al.*, 2026).

This is the same instrumental-versus-developmental split mentioned earlier. Just this time, it's not about what a student is having emotion about. It's about what the teacher believes they're actually there to do, and that belief is exactly the kind of thing a caring cascade carries into the classroom.

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WHAT TO DO ABOUT IT

Six guiding principles

None of this is reducing learning to mere 'engagement'. It's about working with biology, not against it.

1. **Start with what they already care about.** This is a mechanism, not a nicety. You can't force someone to care about quadratic equations, but you can show them how quadratics matter and connect to something they care about.
2. **Safety first.** The body gates the brain. Excessive stress or threat results in survival mode, not learning mode. A little challenge and uncertainty tips the seesaw; too much, and especially anything that feels like a threat to who they are, and the system shuts down.
3. **Offer problems worth entering.** Not coverage to 'get through'. Rather than teach the concept / skill and hope they want it, aim to offer a problem interesting enough to need to resolve it.
4. **Give reflection mode its turn.** Build in real time to reflect, consider, discuss; not just time to receive.
5. **Watch where the feeling lands.** On the idea / concept or something else? Memories are built and reconstructed with emotion as well as content. The same lesson can save as "I'm curious about this" and "tests are scary" depending on what resonates.
6. **Wrap details in stories.** We organise what matters into stories. Give them a character, a problem, something at stake.

> WHAT THIS LOOKS LIKE
> *A student had never passed a maths class. He was given a puzzle: if you keep travelling half way towards a door, do you ever reach it? He spent months on it, guided and supported, and taught himself fractions along the way, because he needed them to answer a question that had become his own. As he put it, he has a problem, and "had to learn fractions" to think about it (Immordino-Yang and Knecht, 2020).*

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WHERE THIS SHOWS UP

It's the same biology everywhere

SCHOOL

Swap “sit still, focus and absorb” for lessons built around a question someone in the room actually cares about.

WORK

Training sticks when it solves a real problem someone's genuinely stuck on, not when it's a box-ticking module.

LEADERSHIP

People follow a story about where things are going, and with whom, more than a slide full of bullet points.

AI

AI can hand you information instantly. It can't care about you, or make meaning out of anything for you. That part is still entirely yours.

BUT WAIT

Doesn't this just mean making everything fun?

No, and this is the bit people misunderstand most. This isn't about jazz hands, jokes, games or gimmicks. A musician will happily practise scales for hours, which is repetitive and, quite possibly, boring, because the scales serve something they genuinely care about. Scales may not be fun. But the reason behind them is.

This doesn't throw out clear explanations or expert teaching either. Explicit instruction still matters. The point isn't either/or. But clear explanations stick if the concepts and ideas matter and are worth keeping.

One landmark study followed over 10,000 university math students across several years (Carrell and West, 2010). The professors whose students aced immediate final exams were often the ones whose students struggled most in advanced follow-on courses. The likely reason? Less experienced teachers taught for short-term attainment, while experienced professors taught for deep conceptual mastery. Transactional teaching for quick wins and developmental teaching for long-term growth are not the same goal.

THE HONEST BIT

How sure are we?

Some of this is about as settled as brain science gets. Moderate levels of stress hormones strengthening memory, sleep helping you consolidate what mattered during the day; that's been tested for decades.

Other parts are newer and still being tested, like exactly how memories get rewritten each time you recall them. We explore details in the full paper, because being right matters more to us than sounding dramatic.

“Learning isn't information transfer. It's biology deciding what's worth keeping.”

For the full version of the science, the citations, and the detail behind the claims, read the White Paper at affectivelearninglab.com.