

When Instruction is Free, Desire Becomes the Scarce Resource



The Old Bottleneck (Access)

- **The System:** Schools batched students to distribute scarce teachers.
- **The Cost:** External carrots and sticks (grades, certificates) forced compliance.

The New Bottleneck (Motivation)

- **The Reality:** AI drove instruction costs to zero (e.g., only 9% of students hit recommended usage on free platforms like Khan Academy).
- **The Paradox (Stanford '73):** Expected, tangible rewards systematically erode existing interest. When the certificate is the goal, the reason to draw vanishes.

The machine is stuck burning motivation to solve a problem that no longer exists.



Interest is a product, not an entry ticket.

High schoolers forced to write about how learning related to their lives saw motivation soar—especially those with the lowest initial interest (Science, 2009).

Motivation isn't
discovered in isolation. It
catches fire from others!

Engine 1: Demand Translation

This tool can solve
my immediate
problem.

Engine 2: Imitation (The Hidden Engine)

Desires are copied.
Watching a peer just like
you succeed on stage
is highly contagious.

Beating the Discount Curve with Reward Shaping



The Trap

"You'll Need It Someday"

Children under 13 discount future rewards hyperbolically. A distant career goal's present value to a young mind is roughly zero.

Hyperbolic Discounting

Code written today runs today. The goal didn't change—the geometry of the reward did!

The Fix

Reward Shaping

Lay a trail of small, immediately redeemable rewards along the exact same path.

Distal Goal: Learn AI programming.

Shaped Goal: Build a web game your friends can play today.

Reward Shaping

Smooth Learning Bypasses Long-Term Memory



The Law of Desirable Difficulties:
Operations that feel effortful (struggling, self-testing) carve knowledge into memory.
AI is the ultimate difficulty-remover.

Vanilla AI (Answers)

Practice scores: UP 48% | Exam scores: DOWN 17%
(The Crutch)

Guardrailed AI (Hints)

Practice scores: UP 127% | Exam scores: EQUALED
Control (The Sweet Spot)

No AI (Control)

Baseline effort | Baseline retention



An answer loop compresses thinking.
A hint loop protects motivation while preserving cognitive labor.

Education's Ultimate Success is the Designer's Exit

Push Creates the Foundation for Pull.

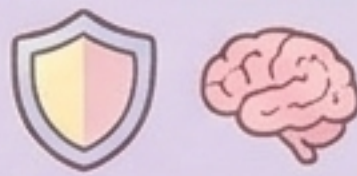
Purely need-driven learning is a greedy search—you cannot want a concept you cannot imagine.

Society lends its long-term horizon until the student builds their own.



1. Stage the Arena

Light the fire through imitation and immediate, shaped rewards.



2. Guard the Labor

Use hint-loops to protect the cognitive struggle that cannot be outsourced.



3. Dismantle the Scaffold

Step away and let the student rewrite their own desires.

What AI alignment calls a disaster (wireheading/changing your own goals), education calls graduation.