Programs That Challenge Students to Grow

Designed by 4ces.club ↗

for 6-8th grades

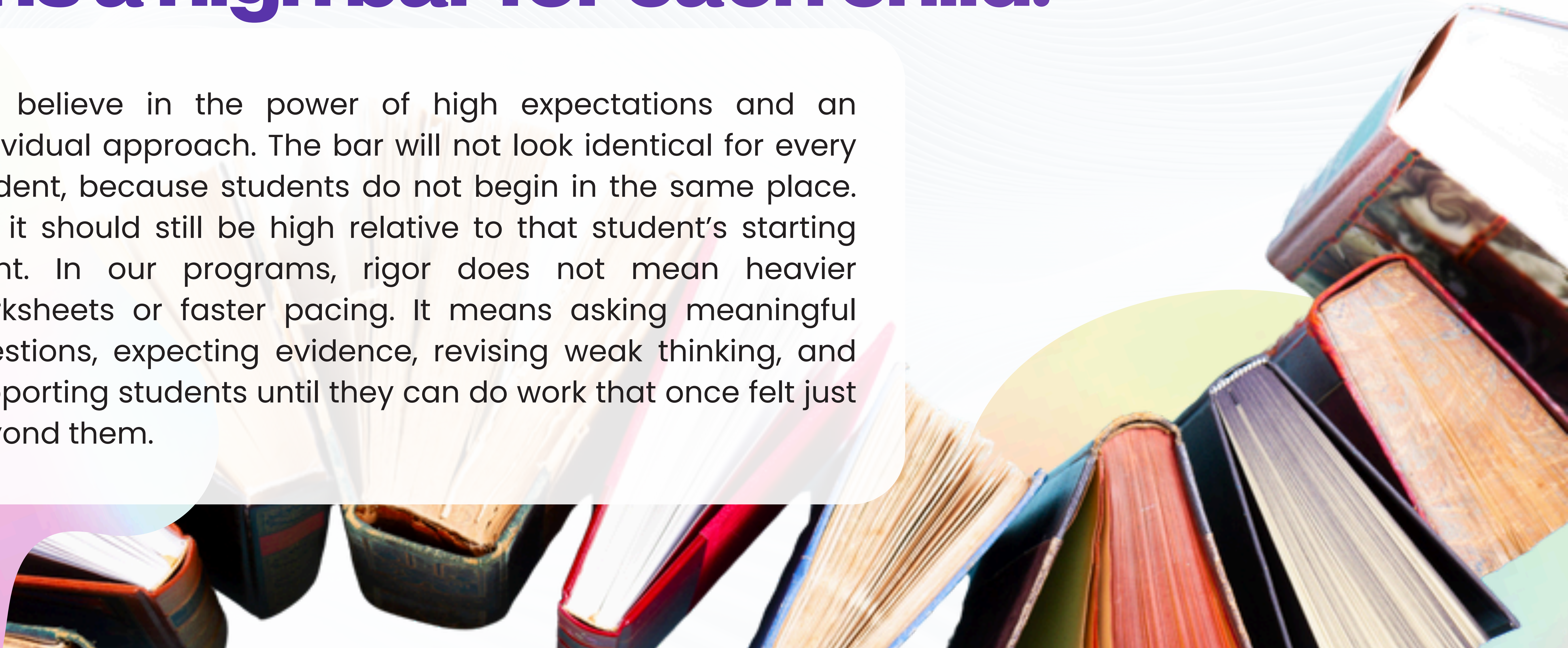
High-rigor, interdisciplinary courses designed for the freedom and responsibility of a microschool classroom

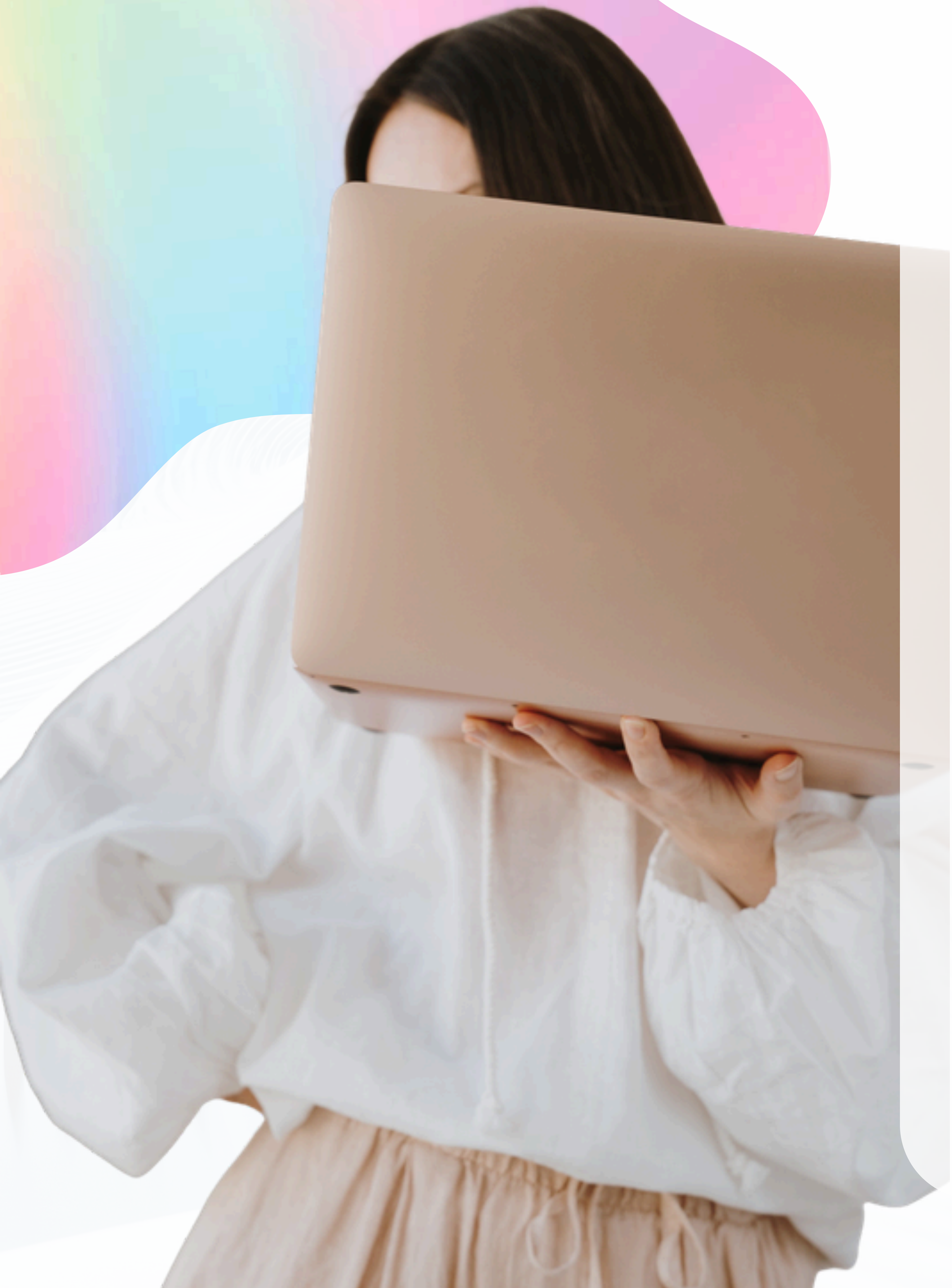
ABOUT 4CES.CLUB

4CES.Club creates academically ambitious, project-based learning for small groups of students. We design programs that develop creativity, critical thinking, communication, and collaboration through substantive disciplines and interest-driven projects. Our courses are built for educators who want students to investigate, build, test, explain, and leave with work that proves what they can do.

Rigor is not one bar for every child. It is a high bar for each child.

We believe in the power of high expectations and an individual approach. The bar will not look identical for every student, because students do not begin in the same place. But it should still be high relative to that student's starting point. In our programs, rigor does not mean heavier worksheets or faster pacing. It means asking meaningful questions, expecting evidence, revising weak thinking, and supporting students until they can do work that once felt just beyond them.





WHY THE COURSES COME IN COMBINATIONS

No subject or skill is learned simply to become another record on a report card. Sooner or later, students have to use what they know.

Every program pairs a rich content discipline with an analytical discipline that makes the content more understandable and usable.

Statistics helps students test a behavioral-economics claim. Graph theory reveals why a network fails. Spatial mathematics helps explain how cells form a body pattern. Coding turns a scientific model into something students can run, challenge, and improve. The second discipline is never decoration, it is the tool that makes the first one stick.

WHAT STUDENTS EXPERIENCE

- Short video micro-lessons and carefully chosen readings instead of hour-long lectures.
- Real cases, diagrams, data, models, experiments, and discussions that demand active thinking.
- Frequent knowledge checks, feedback, independent work, and revision-not one high-stakes test.
- Final project that requires students to apply knowledge, defend decisions, and communicate clearly.

WHAT EDUCATORS GET

A complete eight-week academic arc: five 60-minute lessons each week, with a deliberate progression from teacher-guided learning to increasingly independent inquiry.

These are courses educators can enjoy teaching, facilitating, or supervising. All materials are provided, including video micro-lessons, thoughtful discussion questions, meaningful student projects worth displaying, and the intellectual depth young people deserve.

THE COMMON FORMAT

LENGTH	SCHEDULE	LESSON	OUTCOME
8 weeks	5 days each week	60 minute daily	Evidence-based capstone

HUMAN DECISIONS & SYSTEMS

BEHAVIORAL ECONOMICS

Behavioral Economics: Why Does Easy Win?

How much of a "choice" is really a response to defaults, delay, effort, and friction?

CORE DISCIPLINE	THINKING TOOL	FORMAT	TECHNOLOGY
Behavioral economics	Experimental statistics	8 weeks • 40 × 60 min	Spreadsheet/ forms

HUMAN DECISIONS & SYSTEMS

WHY THIS COURSE EARNS A PLACE IN EVERY SCHOOL

Students make hundreds of choices inside systems designed by someone else: apps, forms, menus, sign-ups, schedules, and school routines. This course moves far beyond “companies trick your brain.” Students learn to see friction as an economic force, test whether small design changes actually affect behavior, and ask the question that makes the course matter: when does making a choice easier help people and when does it quietly manipulate them?

HUMAN DECISIONS & SYSTEMS

BEHAVIORAL ECONOMICS

STUDENTS WILL LEARN TO

- Notice the hidden time, effort, search, and social costs built into everyday choices.
- Explain defaults, present bias, hassle factors, choice overload, nudges, and sludge without reducing them to catchy labels.
- Design a fair, low-risk comparison and use proportions, medians, and effect size to interpret the result.
- Judge a redesign for effectiveness, transparency, autonomy, and fairness—not convenience alone.

WHAT THE CLASSROOM FEELS LIKE

Students compare mock interfaces, map the “cost” of an ordinary process, predict where people will drop out, argue about ethical choice design, and test a small change. The room feels part economics lab, part design studio, and part lively ethics seminar.

THE 8-WEEK STORY

Weeks 1–2	Weeks 3-4	Weeks 5-6	Weeks 7-8
See friction and defaults hiding inside ordinary decisions.	Study hassle, delay, and why “later” so often loses to “now.”	Challenge simple claims about too much choice and debate nudge versus manipulation.	Design, run, analyze, and defend a low-stakes experiment and redesign.

FINAL CHALLENGE

Students choose a safe, everyday process, document where it creates friction, build two versions that differ in one feature, and test the effect with consenting participants or teacher-provided data. They finish with an evidence-based redesign and an oral defense of both its impact and its ethics.

WHY EDUCATORS CHOOSE IT

This course connects naturally to entrepreneurship, economics, research, design, and civics.

It generates immediate “I see this everywhere now” moments while still demanding careful data work and mature ethical reasoning.

HUMAN DECISIONS & SYSTEMS

SOCIOLOGY

Sociology: Who Decides What Counts?

When a school, company, or government sorts people and behavior into categories, what becomes visible and what disappears?

CORE DISCIPLINE	THINKING TOOL	FORMAT	TECHNOLOGY
Sociology of classification	Measurement theory & set logic	8 weeks • 40 × 60 min	Low-tech; spreadsheet optional

HUMAN DECISIONS & SYSTEMS

SOCIOLOGY

WHY THIS COURSE EARNS A PLACE IN EVERY SCHOOL

Categories seem harmless until they decide who qualifies, who is “advanced,” what counts as participation or which outcome becomes a success. This course gives students a sophisticated idea they can grasp immediately: classification systems do not merely describe reality, they shape it. Students learn to build definitions, test reliability, find boundary cases, and notice how metrics change the behavior they were meant to measure.

STUDENTS WILL LEARN TO

- Distinguish a concept from a category, indicator, threshold, and assignment rule.
- Write definitions precise enough for two people to use independently and discover why that is harder than it sounds.
- Use set logic, overlapping categories, and agreement measures to stress-test a system.
- Ask who benefits, who is burdened, and what information is lost when complexity is forced into boxes.

WHAT THE CLASSROOM FEELS LIKE

Students sort the same objects three “correct” ways, turn an idea like participation into competing measures, classify cases independently, compare disagreements, and redesign a broken codebook. Expect energetic arguments over edge cases—the productive kind.

THE 8-WEEK STORY

Weeks 1–2	Weeks 3-4	Weeks 5-6	Weeks 7-8
Discover that categories are designed for a purpose and built from proxies.	Explore thresholds, borderline cases, ambiguity, and inter-rater reliability.	Find what taxonomies erase and how rankings create gaming and feedback loops.	Build, test, revise, and publicly defend a classification system.

FINAL CHALLENGE

Students design or audit a non-sensitive classification system for a library collection, fictional competition, ecological objects, school resources, or another safe context. They create a codebook, test it with difficult cases, measure agreement, identify unfair or unusable boundaries, and propose a more defensible version.

HUMAN DECISIONS & SYSTEMS

SOCIOLOGY

WHY EDUCATORS CHOOSE IT

This is a rare bridge among humanities, social science, logic, and data literacy. It is especially powerful for advanced or discussion-driven groups because there is rarely one effortless answer only better definitions, stronger evidence, and more honest trade-offs.

HUMAN DECISIONS & SYSTEMS

HISTORY OF SCIENCE

History of Science: When Does a Number Become a Fact?

Before a measurement can settle an argument, who must trust the instrument, the unit, the procedure, and the people using them?

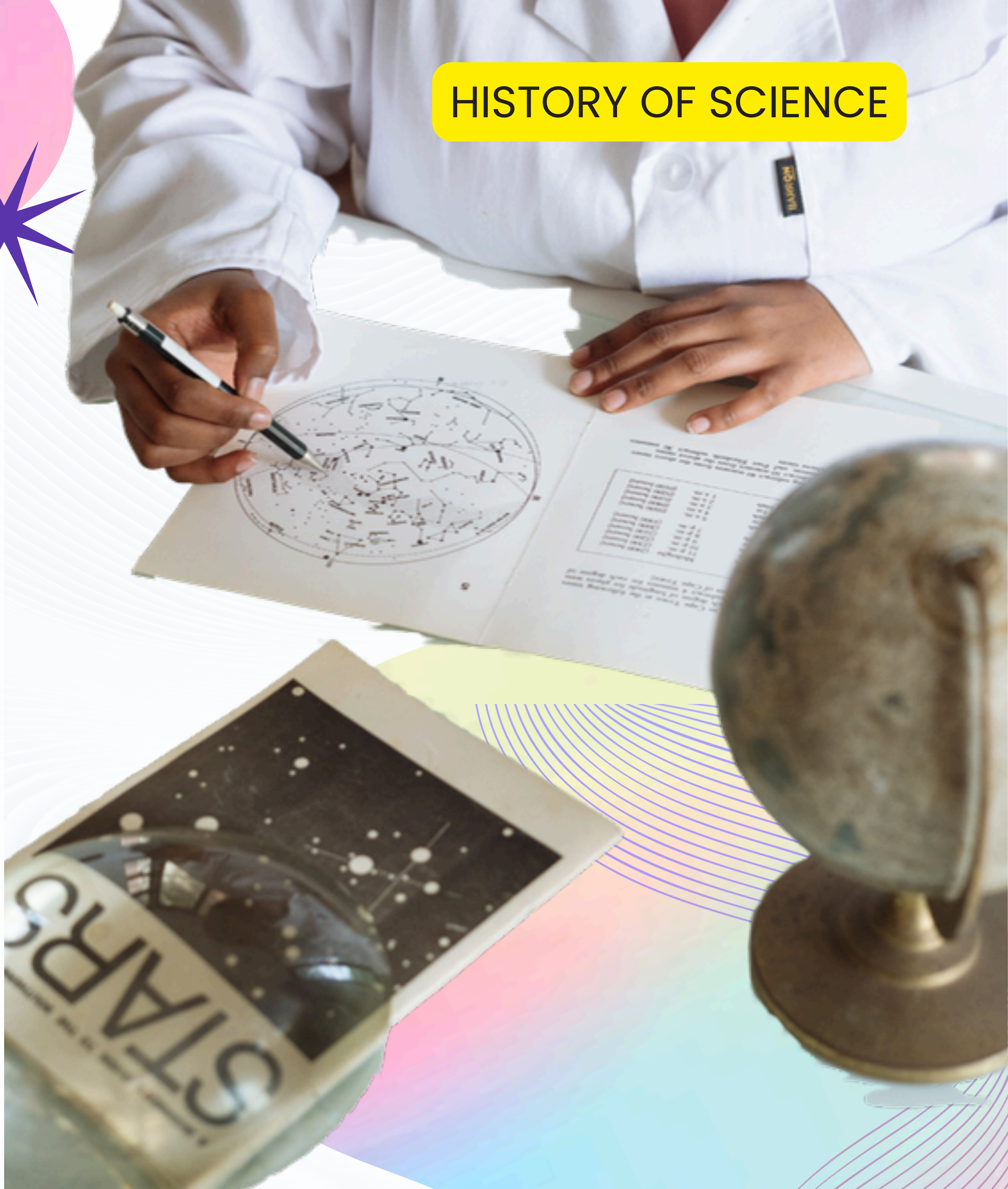
CORE DISCIPLINE	THINKING TOOL	FORMAT	TECHNOLOGY
History of science & technology	Source criticism & argument maps	8 weeks • 40 × 60 min	Simple measuring tools

HUMAN DECISIONS & SYSTEMS

HISTORY OF SCIENCE

WHY THIS COURSE EARNS A PLACE IN EVERY SCHOOL

Students are surrounded by numbers that look neutral and final. This course pulls back the curtain. Temperature, time, age, pollution, and magnitude became useful only after people built instruments, agreed on standards, corrected errors, and learned to reproduce results. It is genuine STEM-humanities integration: history is not decoration around the science, and science is not a list of inventions.

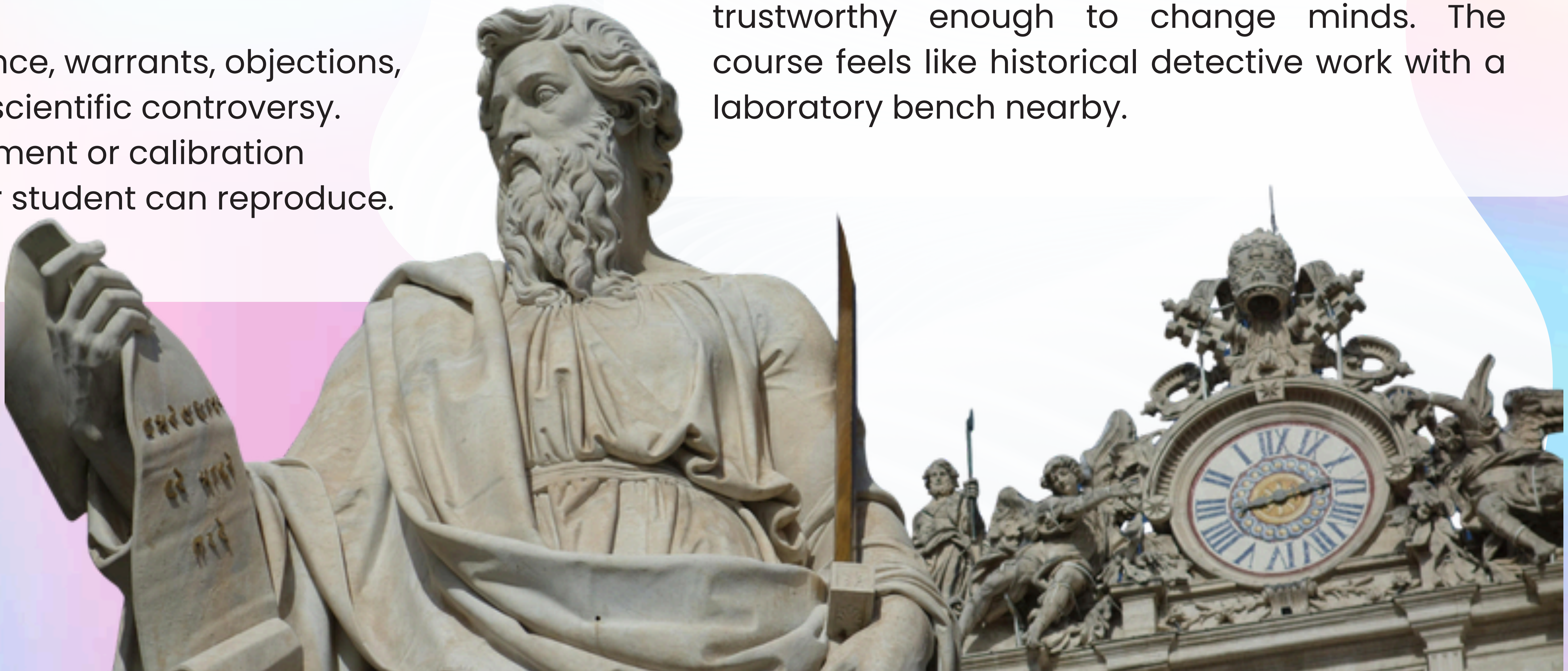


STUDENTS WILL LEARN TO

- Separate precision, accuracy, resolution, calibration, traceability, and uncertainty.
- Read short primary sources and compare what historical actors believed with later interpretations.
- Map claims, evidence, warrants, objections, and revisions in a scientific controversy.
- Design a measurement or calibration procedure another student can reproduce.

WHAT THE CLASSROOM FEELS LIKE

Students handle strange historical units, inspect instrument diagrams, compare conflicting measurements, recreate calibration problems, and argue about when evidence became trustworthy enough to change minds. The course feels like historical detective work with a laboratory bench nearby.



HUMAN DECISIONS & SYSTEMS

HISTORY OF SCIENCE

THE 8-WEEK STORY

Weeks 1–2	Weeks 3-4	Weeks 5-6	Weeks 7-8
Enter a world before shared units and learn how observers and instruments create error.	Follow the battles to standardize temperature, time, longitude, and coordination.	Compare competing “clocks” for Earth and trace how standards became international.	Investigate a measurement controversy and stage an evidence conference.

FINAL CHALLENGE

Students reconstruct a historical problem such as longitude, Earth’s age, temperature standardization, earthquake magnitude, or air-quality measurement. They build a dated evidence chain, compare primary and later sources, explain the instrument and its error, and demonstrate a reproducible measurement or calibration protocol.

WHY EDUCATORS CHOOSE IT

It rewards curiosity, careful reading, hands-on demonstration, and argument without requiring advanced mathematics or a specialized laboratory.

HUMAN DECISIONS & SYSTEMS

EXERCISE PHYSIOLOGY

Exercise Physiology: When Does Training Backfire?

Why can the same workout produce adaptation in one context, no improvement in another, and excessive fatigue in a third?

CORE DISCIPLINE	THINKING TOOL	FORMAT	TECHNOLOGY
Exercise physiology	Time-series & dose-response reasoning	8 weeks • 40 × 60 min	Spreadsheet/ graphing

WHY THIS COURSE EARNS A PLACE IN EVERY SCHOOL

Young athletes hear endless advice about effort, rest, heart rate, sleep, and “pushing through.” What they rarely get is a coherent model of what the body is doing. This course teaches exercise as controlled physiological disruption and adaptation as a delayed response not a motivational slogan. Students learn to read multiple signals without treating any single number as a verdict.

HUMAN DECISIONS & SYSTEMS

EXERCISE PHYSIOLOGY

STUDENTS WILL LEARN TO

- Explain acute response versus long-term adaptation, energy demand, recovery, and accumulated fatigue.
- Understand training dose as intensity, duration, frequency, and density—not minutes alone.
- Read multi-variable time-series data and recognize trend, lag, outlier, and noise.
- Generate competing explanations and make cautious recommendations without diagnosing.

WHAT THE CLASSROOM FEELS LIKE

Students annotate physiology diagrams, calculate simplified training load, compare fictional athletes, hunt for delayed effects, challenge overconfident conclusions, and conduct case conferences. Athletes bring experience; non-athletes bring fresh questions. Both have real evidence to work with.

THE 8-WEEK STORY

Weeks 1–2	Weeks 3-4	Weeks 5-6	Weeks 7-8
Understand stress, recovery, adaptation, and where exercise energy comes from.	Model dose and see how fitness and fatigue can rise on different timelines.	Interpret heart rate, sleep, soreness, RPE, performance, variation, and monotony.	Analyze competing athlete cases, forecast cautiously, and defend a recommendation.

FINAL CHALLENGE

Students receive six weeks of fictional or de-identified data for athletes who completed similar training but changed differently. They identify patterns and lags, develop competing physiological explanations, and recommend the safest next step or missing information. The final product is a case board, report or an oral conference.

HUMAN DECISIONS & SYSTEMS

EXERCISE PHYSIOLOGY

WHY EDUCATORS CHOOSE IT

This course gives sports-focused students genuine biology and gives every student a reason to care about graphs, uncertainty, and systems. It fits beautifully in schools with athletics, health science, or a strong “learn through real life” philosophy.

SCIENTIFIC INQUIRY & MODELING

EVOLUTIONARY BIOLOGY

Evolutionary Biology: Why Can’t Nature Start Over?

Why does evolution produce workable compromises instead of designing the best organism from scratch?

CORE DISCIPLINE	THINKING TOOL	FORMAT	TECHNOLOGY
Evolutionary biology	Constrained optimization & trade-off graphs	8 weeks • 40 × 60 min	AI-assisted coding (vibe coding) in Weeks 7–8

SCIENTIFIC INQUIRY & MODELING

EVOLUTIONARY BIOLOGY

WHY THIS COURSE EARNS A PLACE IN EVERY SCHOOL

Students often leave evolution units with a hidden misconception: natural selection improves organisms toward perfection. This course replaces that story with a more accurate and more interesting one. Evolution works with inherited structures, finite resources, conflicting functions, local opportunities, and changing environments. Math helps students see why “best” depends on what must be sacrificed and where the organism lives.

SCIENTIFIC INQUIRY & MODELING

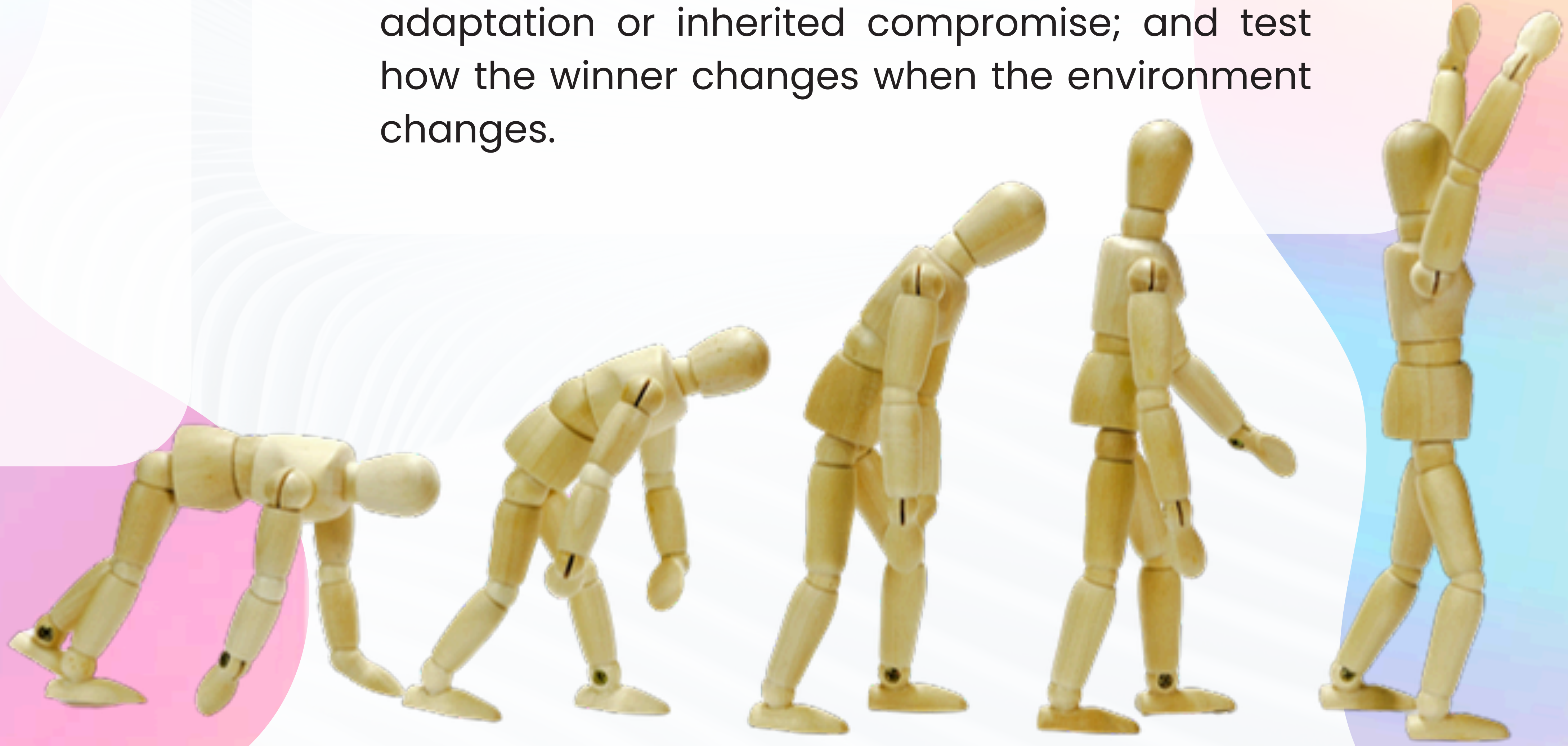
EVOLUTIONARY BIOLOGY

STUDENTS WILL LEARN TO

- Explain natural selection without foresight, purpose, or an imaginary engineering plan.
- Analyze limited budgets, conflicting functions, historical constraints, exaptation, and contingency.
- Create trade-off graphs and distinguish dominated solutions from reasonable compromises.
- Predict how a new environment changes which trait combination has the highest fitness.

WHAT THE CLASSROOM FEELS LIKE

Students allocate limited energy to speed, armor, repair, sensing, and reproduction; compare organisms that cannot maximize everything; debate whether a feature is an adaptation or inherited compromise; and test how the winner changes when the environment changes.



SCIENTIFIC INQUIRY & MODELING

EVOLUTIONARY BIOLOGY

THE 8-WEEK STORY

Weeks 1–2	Weeks 3–4	Weeks 5–6	Weeks 7–8
Build a no-foresight model of selection and confront the organism's resource budget.	Explore conflicting functions, inherited structures, homology, and exaptation.	Study environment-dependent fitness, local optima, and inaccessible solutions.	Specify and code a trade-off landscape, then run a tournament across environments.

FINAL CHALLENGE

Students design a hypothetical organism with a fixed resource budget and competing traits. They define how each trait affects survival or reproduction across several environments, then build a model that evaluates many combinations. The scientific goal is to show why no design wins everywhere and to separate biological insight from modeling assumptions.

SCIENTIFIC INQUIRY & MODELING

EVOLUTIONARY BIOLOGY

WHY EDUCATORS CHOOSE IT

The class creates the kind of scientific discussion many adults never had: not “What is the perfect animal?” but “Perfect for what, under which constraints, and at what cost?” It is a strong choice for schools that value conceptual depth and mathematical thinking.

SCIENTIFIC INQUIRY & MODELING

EPIDEMIOLOGY

Epidemiology: Why Do Healthy Places Look Sick?

When one place reports more cases, does it have more disease—or more people, more testing, better reporting, or a different population?

CORE DISCIPLINE	THINKING TOOL	FORMAT	TECHNOLOGY
Epidemiology & surveillance	Statistics & causal diagrams	8 weeks • 40 × 60 min	Spreadsheet + AI coding in Weeks 7–8

SCIENTIFIC INQUIRY & MODELING

EPIDEMIOLOGY

WHY THIS COURSE EARNS A PLACE IN EVERY SCHOOL

Students see health numbers everywhere, but a count without a denominator can tell the wrong story. This course gives them the tools to ask better questions before reacting to a graph or headline. They learn how testing, definitions, reporting, population size, and population structure produce the numbers we observe. The result is foundations of statistics taught through a problem with obvious civic importance.

SCIENTIFIC INQUIRY & MODELING

EPIDEMIOLOGY

STUDENTS WILL LEARN TO

- Distinguish counts, proportions, rates, incidence, prevalence, and risk.
- Explain how testing and reporting can make a healthier place appear sicker or the reverse.
- Build a public display that communicates uncertainty and avoids unfair comparisons.

WHAT THE CLASSROOM FEELS LIKE

Students investigate fictional communities, convert counts into rates, change case definitions, simulate unequal testing, watch an aggregate pattern reverse after stratification, and critique dashboards that look authoritative while hiding the most important context.

SCIENTIFIC INQUIRY & MODELING

EPIDEMIOLOGY

THE 8-WEEK STORY

Weeks 1–2	Weeks 3–4	Weeks 5–6	Weeks 7–8
Move from counts to denominators, rates, incidence, prevalence, and burden.	Study case definitions, thresholds, testing intensity, access, and reporting.	Uncover confounding, population composition, reversals, and fair comparison.	Specify and build a surveillance display, then deliver a clear public briefing.

FINAL CHALLENGE

Students use synthetic data for fictional communities that differ in size, testing, reporting, and age or risk structure. They build an interactive display that switches among raw counts, rates, detection effort, and stratified comparisons. It must include one deliberately misleading default view and explain exactly why that view misleads.

SCIENTIFIC INQUIRY & MODELING

EPIDEMIOLOGY

WHY EDUCATORS CHOOSE IT

This is data literacy with consequences. It gives students a reason to care about denominators, variables, and causal structure while avoiding partisan debate or alarming personal-health content. It fits science, math, civics, and health programs equally well.

SCIENTIFIC INQUIRY & MODELING

NEUROSCIENCE

Neuroscience: What Does the Brain Ignore?

How does the nervous system decide which signals reach awareness and action when it cannot process everything at once?

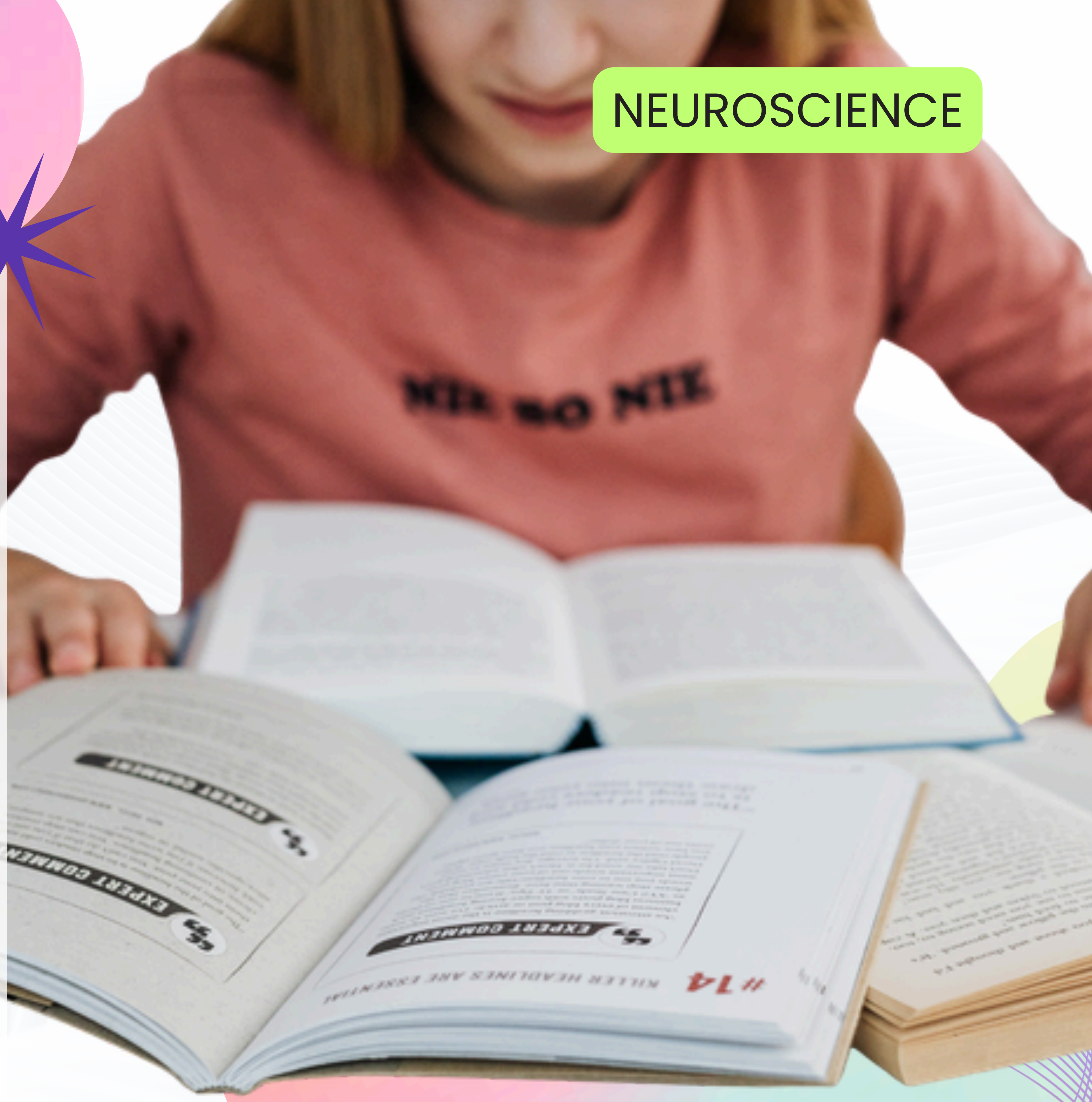
CORE DISCIPLINE	THINKING TOOL	FORMAT	TECHNOLOGY
Neuroscience of attention	Signal detection & experimental design	8 weeks • 40 × 60 min	Devices + AI coding in Weeks 7–8

SCIENTIFIC INQUIRY & MODELING

NEUROSCIENCE

WHY THIS COURSE EARNS A PLACE IN EVERY SCHOOL

Attention is often treated as a character trait: focus harder, try harder, care more. Neuroscience offers a more useful explanation. The brain has limited processing capacity and must select among competing signals. Students investigate salience, goals, timing, distractors, hits, misses, and false alarms then build and validate an actual attention experiment rather than simply looking at optical illusions.



SCIENTIFIC INQUIRY & MODELING

NEUROSCIENCE

STUDENTS WILL LEARN TO

- Explain attention as selective information processing, not an on/off spotlight or moral virtue.
- Distinguish bottom-up capture from top-down goals and expectations.
- Interpret hits, misses, false alarms, correct rejections, and response strategy.
- Design, test, and audit an experiment for timing, randomization, trial balance, and data quality.

WHAT THE CLASSROOM FEELS LIKE

Students run fast detection trials, manipulate distractors and cues, experience missed changes, compare accuracy with false alarms, pre-register predictions, and debug an experiment whose timing or data logging must actually work. It feels like a real cognitive lab scaled responsibly for middle school.

SCIENTIFIC INQUIRY & MODELING

NEUROSCIENCE

THE 8-WEEK STORY

Weeks 1–2	Weeks 3-4	Weeks 5-6	Weeks 7-8
Explore limited capacity, selection, salience, novelty, and orienting.	Add goals, cues, expectation, inattentional blindness, and change blindness.	Study timing, attentional blink, signal and noise, hits, misses, and criterion.	Specify, build, pilot, debug, collect data, and interpret an attention task.

FINAL CHALLENGE

Students create a brief visual or auditory detection task with adjustable target strength or distractor load. The program randomizes signal-present and signal-absent trials and records response, correctness, and reaction time. Students pilot, fix timing or logging problems, analyze de-identified data, and explain what the results do and do not show about attention.

SCIENTIFIC INQUIRY & MODELING

NEUROSCIENCE

WHY EDUCATORS CHOOSE IT

Students are fascinated by the brain, but this course protects that curiosity from becoming pop-neuroscience. Teachers get rich discussion, hands-on experimentation, careful statistics, and an authentic reason for students to inspect and debug AI-generated code.