

LEGACY LEARNING CENTER

GRADE 9 BIOLOGY

COMPREHENSIVE CURRICULUM & LESSON PLAN HANDBOOK

Indiana Academic Standards (2023) — NGSS-Based — 3-Dimensional Instruction (SEP + CCC + DCI)

ILEARN Biology End-of-Course Assessment (ECA) — Mandatory upon Course Completion

Three ECA Testing Windows: Fall | Winter | Spring ([in.gov/doi/files/ILEARN-Biology-Test-Blueprint.pdf](https://www.in.gov/doi/files/ILEARN-Biology-Test-Blueprint.pdf))

Blueprint Source: IDOE ILEARN Biology Test Blueprint (2023–2024 School Year onward)

Primary Curriculum: OpenSciEd HS Biology (EdReports All-Green 2024) — FREE at opensci.ed.org/curriculum/high-school/

Legacy Learning Center | 2025–2026 | IDOE HQCM Science Compliant

ILEARN Biology ECA Reporting Category	Item Clusters	Stand-Alone Items	Total Items	Approx. % of ECA
From Molecules to Organisms (HS-LS1)	2	4	6	≈ 33%
Ecosystems (HS-LS2 + HS-LS4-6)	2	4	6	≈ 33%
Heredity and Evolution (HS-LS3 + HS-LS4)	2	4	6	≈ 33%
TOTAL	8 clusters	18 items	~26 tasks	100%

ILEARN Biology ECA — CRITICAL FACTS (Source: IDOE)

The ILEARN Biology ECA is MANDATORY upon completion of the high school Biology course (federal participation requirement).

Three testing windows: FALL | WINTER | SPRING. A student may only have ONE test attempt — no retests.

ECA is a computer-adaptive test (CAT). Students encounter scenario-based item CLUSTERS (each cluster: 4–6 tasks) measuring all THREE dimensions simultaneously (SEP + CCC + DCI).

Essential performance expectations are prioritized — all students receive at least one item cluster measuring EACH Essential PE.

ECA is NOT the same as prior ECA format. It fully aligns to 2023 Indiana Academic Standards (NGSS-based) beginning school year 2023–2024.

Contact: INassessments@doe.in.gov | (317) 232-9050 | Blueprint: [in.gov/doi/files/ILEARN-Biology-Test-Blueprint.pdf](https://www.in.gov/doi/files/ILEARN-Biology-Test-Blueprint.pdf)

Section 1: Biology Course Overview & Curriculum Framework

This handbook provides a complete, standards-aligned, ILEARN ECA-mapped Biology curriculum for Grade 9 at Legacy Learning Center. Every lesson follows the 5E instructional model and integrates all three NGSS dimensions.

Course At a Glance

Element	Details
Course	Grade 9 Biology Legacy Learning Center 2025–2026
Standards Framework	2023 Indiana Academic Standards for Science — NGSS-Based — 3-Dimensional (SEP + CCC + DCI)
Standards Adopted	June 7, 2023 — Indiana State Board of Education (SBOE)
ILEARN Biology ECA	Mandatory End-of-Course Assessment — Three windows (Fall, Winter, Spring) — Computer-Adaptive Test
ECA Blueprint	3 Reporting Categories × ≈33% each — 8 item clusters + 18 stand-alone items = ~26 tasks — Source: IDOE
Primary Curriculum	OpenSciEd High School Biology (2024) — FREE open-source — EdReports All-Green (top rating) — opencsied.org/curriculum/high-school/
Supplemental Sources	New Visions for Public Schools Biology (newvisions.org) HHMI BioInteractive (biointeractive.org) BSCS Science Learning (bscs.org) Khan Academy AP Biology IDOE IN Learning Lab Biology Frameworks
3 Units	Unit 1: From Molecules to Organisms (HS-LS1) Unit 2: Ecosystems (HS-LS2 + HS-LS4-6) Unit 3: Heredity & Evolution (HS-LS3 + HS-LS4)
Lesson Plans	12 detailed 5E lesson plans (4 per unit) — each with phenomenon, standards, schedule, investigation, ECA prep, differentiation, and resources
Instructional Model	5E (Engage-Explore-Explain-Elaborate-Evaluate) with ILEARN ECA item cluster practice from October onward
Science Notebooks	All students maintain science notebooks — updated every period — observations, models, claims, evidence, reasoning
Three Dimensions — Every Lesson	SEP (what students DO) + CCC (how students THINK) + DCI (what students KNOW) — ALL THREE REQUIRED EVERY LESSON

ILEARN Biology ECA — All 17 Performance Expectations with Priority

Source: IDOE ILEARN Biology Test Blueprint (in.gov/doe/files/ILEARN-Biology-Test-Blueprint.pdf) — Essential PEs receive at least one item cluster each. Standard PEs receive 0–1 stand-alone items.

PE Code	Performance Expectation — Full Text	ECA Priority	Reporting Category
HS-LS1-1	Construct an explanation based on evidence for how the structure of DNA determines the structure of proteins which carry out the essential functions of life through systems of specialized cells.	ESSENTIAL	Molecules to Organisms
HS-LS1-2	Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.	Standard	Molecules to Organisms
HS-LS1-3	Plan and conduct an investigation to provide evidence that feedback mechanisms maintain homeostasis.	Standard	Molecules to Organisms
HS-LS1-4	Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.	ESSENTIAL	Molecules to Organisms

HS-LS1-5	Use a model to illustrate how photosynthesis transforms light energy into stored chemical energy.	Standard	Molecules to Organisms
HS-LS1-6	Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.	ESSENTIAL	Molecules to Organisms
HS-LS1-7	Use a model to illustrate that cellular respiration is a chemical process whereby the bonds of food molecules and oxygen molecules are broken and the bonds in new compounds are formed resulting in a net transfer of energy.	Standard	Molecules to Organisms
HS-LS2-1	Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.	Standard	Ecosystems
HS-LS2-2	Use mathematical representations to support and revise explanations based on evidence about factors affecting biodiversity and populations in ecosystems of different scales.	Standard	Ecosystems
HS-LS2-3	Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.	ESSENTIAL	Ecosystems
HS-LS2-4	Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.	Standard	Ecosystems
HS-LS2-5	Develop a model to illustrate the role of photosynthesis and cellular respiration in the cycling of carbon among the biosphere, atmosphere, hydrosphere, and geosphere.	Standard	Ecosystems
HS-LS2-6	Evaluate the claims, evidence, and reasoning that the complex interactions in ecosystems maintain relatively consistent numbers and types of organisms in stable conditions, but changing conditions may result in a new ecosystem.	Standard	Ecosystems
HS-LS2-7	Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.	ESSENTIAL	Ecosystems
HS-LS2-8	Evaluate the evidence for the role of group behavior on individual and species' chances to survive and reproduce.	Standard	Ecosystems
HS-LS4-6	Create or revise a simulation to test a solution to mitigate adverse impacts of human activity on biodiversity.	Standard	Ecosystems
HS-LS3-1	Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.	ESSENTIAL	Heredity & Evolution
HS-LS3-2	Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors occurring during replication, and/or (3) mutations caused by environmental factors.	ESSENTIAL	Heredity & Evolution
HS-LS3-3	Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.	Standard	Heredity & Evolution
HS-LS4-1	Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence.	Standard	Heredity & Evolution
HS-LS4-2	Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.	ESSENTIAL	Heredity & Evolution
HS-LS4-3	Apply concepts of statistics and probability to support	Standard	Heredity & Evolution

	explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait.		
HS-LS4-4	Construct an explanation based on evidence for how natural selection leads to adaptation of populations.	Standard	Heredity & Evolution
HS-LS4-5	Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species.	Standard	Heredity & Evolution

GREEN rows = Essential Performance Expectations — at least one item cluster guaranteed on ILEARN Biology ECA. All students MUST demonstrate mastery of every Essential PE before ECA testing window.

Year-Long Pacing Guide

Q	Months	Unit	Key Performance Expectations	ECA Window	Weeks
Q1	Aug–Oct	Unit 1: Molecules to Organisms	HS-LS1-1(E) HS-LS1-4(E) HS-LS1-6(E) + HS-LS1-2,3,5,7	FALL ECA Window open	9 wks
Q2	Nov–Jan	Unit 2: Ecosystems	HS-LS2-3(E) HS-LS2-7(E) + HS-LS2-1,2,4,5,6,8 + HS-LS4-6	WINTER ECA Window open	9 wks
Q3	Feb–Mar	Unit 3: Heredity & Evolution	HS-LS3-1(E) HS-LS3-2(E) HS-LS4-2(E) + HS-LS3-3 HS-LS4-1,3,4,5	SPRING ECA Prep begins	7 wks
Q4	Apr–May	ECA Review + Performance Task	ALL Essential PEs reviewed across all 3 reporting categories	SPRING ECA Window open	6 wks

Section 2: Curriculum Sources & Best-Practice References

The following sources were selected based on EdReports ratings, NGSS alignment, success in public and private high schools across Indiana and nationally, and alignment to the ILEARN Biology ECA blueprint. All primary sources are free unless noted.

Primary Curriculum — OpenSciEd High School Biology (FREE)

OpenSciEd HS Biology — EdReports ALL-GREEN — Free, Open-Source — Released March 2024

Access: opensci.ed.org/curriculum/high-school/ | Free download — all units, teacher guides, student materials, assessments

Developer: inquiryHub (Univ. of Colorado Boulder) + BSCS Science Learning + Northwestern University + The Charles A. Dana Center — field-tested in hundreds of classrooms across 10 states

EdReports Rating: ALL-GREEN (highest possible) for quality, coherence, and usability — confirmed 2024

NGSS Design Badge Certified — all units meet all three dimensions (SEP + CCC + DCI) every lesson

Unit structure for Indiana Biology: B.1 Ecosystem Interactions & Dynamics | B.2 Ecosystem Matter & Energy | B.3 Evolution by Natural Selection | B.4 Genetics & Heredity | B.5 Mitosis, Growth & Reproduction | B.6 Cells & Photosynthesis

Professional Learning: Free PD resources included with each unit — curriculum-based professional learning available at no cost

Accessibility: Built-in supports for ELL students, students with IEPs, multilingual learners — sentence starters, visuals, embedded scaffolds in every lesson

Supplemental Curriculum & Lab Resources

Resource	Provider	ILEARN ECA Units	Description & URL
HHMI BioInteractive	Howard Hughes Medical Institute	All 3 units	World-class free biology videos, labs, activities, data analysis tools — biointeractive.org — used in AP Biology, IB Biology, top public schools nationwide
New Visions Biology Curriculum	New Visions for Public Schools (NYC)	All 3 units	Free, NGSS-aligned HS Biology course — full year scope and sequence — lesson plans, labs, assessments — newvisions.org/curriculum/science/biology
BSCS Science Learning Resources	Biological Sciences Curriculum Study	All 3 units	Research-based 5E lessons from the inventors of the 5E model — bsos.org — used by IDOE and OpenSciEd consortium
Khan Academy — AP Biology	Khan Academy	All 3 units	Free videos, practice, article-based lessons aligned to HS Biology standards — khanacademy.org/science/ap-biology — excellent for student ECA practice
Amoeba Sisters Biology Videos	Amoeba Sisters	All 3 units	Free YouTube biology videos with downloadable worksheets — perfect for flipped instruction and ECA review — amoebasisters.com
Crash Course Biology	Crash Course / YouTube	All 3 units	Free 6–12 minute videos for each major biology topic — youtube.com/crashcourse — top-

			rated by high school biology teachers nationally
HHMI BioInteractive — Serengeti Case Study	HHMI BioInteractive	Unit 2: Ecosystems	Featured anchoring phenomenon in OpenSciEd B.1 — real Serengeti data analysis — biointeractive.org/serengeti
Concord Consortium Simulations	Concord Consortium	All 3 units	Free online science simulations for NGSS biology — concord.org — includes genetics, evolution, ecosystems simulations
IDOE IN Learning Lab — Biology Frameworks	Indiana DOE	All 3 units	Official Indiana 2023 Biology Frameworks grade-by-grade — inlearninglab.com — includes Performance Level Descriptors (PLDs) for ECA
IDOE ILEARN Released Biology Items	Indiana DOE	All 3 units	Official released ILEARN Biology ECA items — use for item cluster practice — available in RIR (Released Item Repository) on Indiana Assessment Portal
Pivot Interactives	Pivot Interactives	All 3 units	Premium (\$) — real video-based investigations — used by high-performing Indiana high schools (Carmel, Zionsville, Westfield)
Biology Corner (Worksheets & Labs)	Biology Corner	All 3 units	Free teacher-made labs, worksheets, and projects — biologycorner.com — widely used in Indiana public schools

What Successful Indiana & National Schools Use

School / District	Location	Biology Approach & Notable Practices
Carmel High School	Carmel, IN (Hamilton County)	NGSS 3-dimensional Biology — OpenSciEd units + Pivot Interactives labs — phenomenon-based anchoring each unit — ILEARN Biology ECA scores consistently above state average — science notebooks used daily
Westfield High School	Westfield, IN (Hamilton County)	5E model with HHMI BioInteractive — Serengeti ecosystem case study opens LS2 unit — weekly ECA-style item cluster practice from October — collaborative inquiry groups
Fishers High School	Fishers, IN (Hamilton Southeastern)	BSCS Active Biology approach — flipped instruction with Amoeba Sisters + Crash Course for DCI — classroom investigation for SEP — strong CCC anchoring through unit driving questions
IPS Thomas Carr Howe Community High School	Indianapolis, IN	NGSS Biology + OpenSciEd — equity-focused differentiation with embedded sentence frames — ELL supports in every lesson — ILEARN ECA preparation begins Q1 with item cluster analysis
New Visions for Public Schools (NYC model)	New York, NY (nationally replicated)	Full-year NGSS Biology — free curriculum at newvisions.org — phenomenon-based units — 3D assessments — widely replicated by Indiana small and charter schools
Louisiana OpenSciEd Pilot Schools	Statewide, Louisiana (2023–24 pilot)	OpenSciEd Biology with Louisiana LDOE guidance — modular units aligned to state standards — data from pilot shows strong engagement and standards mastery — guidance doc: doe.louisiana.gov
Boston Public Schools Biology	Boston, MA	NGSS Biology with HHMI BioInteractive + Concord Consortium simulations — each unit begins with real-world phenomena from local environment — ECA-style performance tasks every 6 weeks

Denver Public Schools (DPS)	Denver, CO	OpenSciEd HS Biology — all units — Activate Learning kits — phenomenon-based — ELL supports in every lesson — students see themselves as scientists from Day 1
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Section 3: 3-Dimensional Instruction Framework — SEP, CCC, DCI

Every Biology lesson must explicitly integrate all three dimensions. Post SEPs and CCCs in the classroom. Students must be able to name the SEP and CCC they are using in every investigation.

Science & Engineering Practices (SEP) — Biology Applications

#	Practice	Biology Example	ECA Connection
1	Asking Questions & Defining Problems	Ask: Why do some cells differentiate into neurons while others become muscle cells?	ECA item clusters begin with a phenomenon — students must ask questions to begin sense-making
2	Developing and Using Models	Model: DNA → mRNA → protein (central dogma); food web with energy flow arrows; population growth curves	Model use is the most common SEP in ILEARN Biology ECA item clusters — practice building AND critiquing models
3	Planning & Carrying Out Investigations	Design: Investigation comparing rates of photosynthesis under different light conditions	ECA stand-alone items include 'which investigation best answers the question?' — practice experimental design
4	Analyzing & Interpreting Data	Analyze: Hardy-Weinberg allele frequency data; population size graphs over time; protein gel electrophoresis bands	Data tables and graphs appear in every ECA item cluster — practice finding patterns and anomalies in data
5	Using Mathematics & Computational Thinking	Apply: Punnett square probability; Hardy-Weinberg equations; 10% rule for energy transfer; carrying capacity calculations	Mathematical reasoning is embedded in HS-LS2 and HS-LS4 ECA clusters — practice writing equations and interpreting results
6	Constructing Explanations	Construct: Claim-Evidence-Reasoning (CER) for how natural selection explains antibiotic resistance	CER format appears in ECA performance tasks — practice with every major concept
7	Engaging in Argument from Evidence	Argue: Whether habitat fragmentation is the primary driver of a specific species' population decline	ECA clusters ask students to evaluate claims and evidence — practice distinguishing supported from unsupported claims
8	Obtaining, Evaluating & Communicating Info	Read: HHMI BioInteractive article on CRISPR; evaluate: Is this source peer-reviewed?	Scientific literacy is tested across all three ECA reporting categories

Crosscutting Concepts (CCC) — Biology Applications

Crosscutting Concept	Biology Application	ILEARN ECA ECA Connection
CC.1 Patterns	DNA sequences show patterns that provide evidence of common ancestry; population genetics shows predictable allele frequency patterns	ECA HS-LS4-1: multiple lines of evidence for evolution — all show patterns
CC.2 Cause and Effect	Natural selection causes certain traits to increase in a population; mutations cause changes in protein structure	ECA clusters begin with scenarios — students must identify cause-effect relationships (HS-LS1-1, HS-LS3-2)
CC.3 Scale, Proportion & Quantity	From DNA base pairs (nm scale) to ecosystems (km scale); 10% energy rule in food webs	HS-LS2-4: mathematical representations for energy transfer — requires understanding of scale
CC.4 Systems and System Models	Cell as a system; organism as a system; ecosystem as a system — inputs, outputs,	HS-LS1-2: hierarchical organization of systems — model building is the primary

	feedback	SEP
CC.5 Energy and Matter	Matter and energy flow through food webs; carbon cycles through biosphere; cellular respiration transfers energy	HS-LS2-3(E): cycling of matter and flow of energy — major Essential PE for ECA
CC.6 Structure and Function	DNA double helix structure → protein synthesis function; cell membrane structure → selective permeability function	HS-LS1-1(E) HS-LS1-6(E): structure-function relationship between DNA and proteins
CC.7 Stability and Change	Homeostasis maintains stability; evolution changes populations over time; ecosystems shift with disturbance	HS-LS1-3: homeostasis as stability mechanism; HS-LS2-6: ecosystem stability and change

Legacy Learning Center · Grade 9 Biology · 2025–2026

UNIT 1

FROM MOLECULES TO ORGANISMS

ILEARN Biology ECA Coverage: ≈ 33% of ILEARN Biology ECA (6 items)

4 Lesson Plans Lesson Plans | 2023 Indiana Academic Standards (NGSS-Based) | 3-Dimensional Instruction

UNIT 1 OVERVIEW: Students investigate how DNA encodes proteins that carry out essential life functions in systems of specialized cells. This unit addresses all seven HS-LS1 performance expectations with highest weight on three Essential PEs. Primary phenomenon: 'Why do some people respond differently to the same medication?' OpenSciEd Unit B.5 and B.6 (Mitosis, Growth, Reproduction / Cells & Photosynthesis).

Unit 1 Essential PEs — ILEARN ECA Guaranteed Clusters

HS-LS1-1 (ESSENTIAL): Construct an explanation for how the structure of DNA determines protein structure, which carries out essential functions through specialized cells.

HS-LS1-4 (ESSENTIAL): Use a model to illustrate the role of cellular division (mitosis) and differentiation in producing and maintaining complex organisms.

HS-LS1-6 (ESSENTIAL): Construct and revise an explanation based on evidence for how carbon, hydrogen, and oxygen from sugar molecules may combine with other elements to form amino acids and/or other large carbon-based molecules.

All three Essential PEs guaranteed at least one item cluster each on ILEARN Biology ECA. Begin ECA item cluster practice for Unit 1 Essential PEs in September.

LESSON PLAN 1.1 (Unit 1, Lesson 1) | Legacy Learning Center | Grade 9 Biology | 2025–2026

Why Do Cells Look So Different If They All Have the Same DNA? — Cell Specialization & Differentiation

Anchoring Phenomenon: A nerve cell and a muscle cell in the same person look completely different and do completely different things — even though they contain identical DNA. Why?

Indiana Standards	Performance Expectations (Source: IDOE 2023 IAS Biology)
Standards	HS-LS1-1 (ESSENTIAL): DNA structure → protein structure → specialized cell function HS-LS1-4 (ESSENTIAL): Mitosis and differentiation producing complex organisms
Learning Objectives	(1) Construct a model showing how DNA base sequence → mRNA → amino acid sequence → protein structure; (2) Explain how differential gene expression causes specialization without changing DNA; (3) Identify which cells in an organism undergo mitosis and why; (4) Argue from evidence that differentiated cells have specialized structures that match their functions.
Materials	Pipe cleaners (DNA/protein models) Colored beads representing nucleotides OpenSciEd B.5 Student Notebook Images of specialized cells (neuron, muscle, RBC) Computer access for HHMI 'Cell Specialization' short film (biointeractive.org) Whiteboard / sticky notes for consensus model

5E Lesson Schedule

Phase	Time	Teacher & Student Actions
Engage	12 min	Teacher presents phenomenon: side-by-side images of a neuron and a muscle cell. Students: 'What do you notice? What do you wonder?' Record in notebooks. Anchor driving question on board: 'Why do different cells do such different jobs if they all have the same DNA?' Students share initial ideas; teacher charts without correcting.
Explore	20 min	Students use colored beads to build a 3-codon DNA sequence, transcribe it to mRNA, and translate to an amino acid chain. Small groups: build 3 different

		protein models from the same 'gene library.' Compare structures. Students: 'What changed? What stayed the same?' Record observations.
Explain	15 min	Teacher facilitates class discussion with HHMI 'DNA and RNA' animation (5 min, biointeractive.org). Students construct class consensus model showing central dogma: DNA → mRNA → protein. Teacher introduces term 'gene expression' — which genes are turned on or off controls what proteins a cell makes.
Elaborate	10 min	Students examine OpenSciEd B.5 image set of 4 specialized cell types. For each: 'What protein structures would this cell need? What genes must be expressed?' Students write claims with evidence and reasoning (CER) for 1 cell type.
Evaluate	8 min	ILEARN ECA Practice: Show one past ILEARN Biology cluster item showing a scenario about a cell differentiation mutation. Students complete 2 tasks: (1) identify what went wrong at the DNA/protein level; (2) predict the effect on the organism. Debrief as class.

<p>Assessment / ECA Prep CER written response on cell specialization (scored with 3D rubric: SEP6 + CCC6 Structure/Function + DCI HS-LS1-1). ILEARN item cluster practice item scored. Exit ticket: 'Explain in 2 sentences how the same DNA produces 200+ different cell types.'</p>	<p>Differentiation ELL: Sentence frames for CER — 'This cell is specialized to ___ because it has ___ (structure) which allows it to ___ (function).'</p> <p>Below level: pre-built partial protein model to complete Above level: research epigenetic modifications that control gene expression in different tissues</p>	<p>Open Resources OpenSciEd B.5 Unit (free): opensci.ed.org HHMI BioInteractive 'Central Dogma' animation: biointeractive.org Amoeba Sisters 'DNA, Chromosomes, Genes, and Traits' video Khan Academy 'Gene expression': khanacademy.org/science/ap-biology</p>
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LESSON PLAN 1.2 (Unit 1, Lesson 2) | Legacy Learning Center | Grade 9 Biology | 2025–2026

How Does Your Body Know When to Grow and When to Stop? — Mitosis, Cell Cycle, and Differentiation

Anchoring Phenomenon: A healthy liver can regenerate itself after up to 70% is removed. But in cancer, cells divide uncontrollably. What controls when cells divide?

Indiana Standards	Performance Expectations (Source: IDOE 2023 IAS Biology)
Standards	HS-LS1-4 (ESSENTIAL): Mitosis and differentiation in producing and maintaining complex organisms HS-LS1-2 (Standard): Hierarchical organization of multicellular organisms
Learning Objectives	(1) Model the stages of mitosis and connect each stage to its function in growth and repair; (2) Explain how mitosis maintains genetic information across cell divisions; (3) Compare normal cell division to cancerous cell division; (4) Construct a hierarchical model from cell → tissue → organ → organ system → organism.
Materials	Yarn or pipe cleaner 'chromosomes' (2 per student) Cell division flip-book template (print from OpenSciEd B.5) Computer: PBS/Crash Course 'Mitosis' video HHMI 'Cell Division' animation Whiteboard for class consensus model Prepared slide images (onion root tip) via microscope or projected images

5E Lesson Schedule

Phase	Time	Teacher & Student Actions
Engage	10 min	Teacher shows time-lapse video of liver regeneration in a mouse (HHMI BioInteractive) and a cancer cell dividing uncontrollably. Students: 'What's different about these two situations?' Anchor question: 'How does a cell know when to divide — and when to stop?'
Explore	20 min	Students model mitosis using yarn chromosomes: (1) replicate (interphase) — make 2 copies; (2) line up (metaphase); (3) pull apart (anaphase); (4) divide into 2 cells (cytokinesis). Partner: check each other's models. Examine projected onion root tip images — identify cells in different stages.

Explain	15 min	Crash Course Biology 'Mitosis vs. Meiosis' (12 min, first 8 min). Teacher leads discussion: 'What would happen if a checkpoint failed? What do we call that?' Students update models. Build hierarchical organization diagram: cell → tissue → organ → organ system (HS-LS1-2).
Elaborate	10 min	Case study: Henrietta Lacks (HeLa cells). Read 1 paragraph excerpt (OpenSciEd style text). 'Why were HeLa cells so useful to scientists? What does this tell us about the cell cycle?' Students discuss ethical implications — connect to real-world science.
Evaluate	10 min	ILEARN ECA Practice: Scenario — 'A mutation in the p53 gene prevents cells from recognizing DNA damage.' Students: (1) draw a model showing what happens during division; (2) predict the effect on the organism. Exit ticket: sketch 4 stages of mitosis with labels; write 1-sentence function for each.

Assessment / ECA Prep Mitosis model accuracy (SEP2 + CCC4 Systems + DCI HS-LS1-4). CER on cancer cell division. ILEARN practice cluster item. Exit ticket sketch with labels.	Differentiation ELL: Vocabulary cards with images for each stage of mitosis — prophase, metaphase, anaphase, telophase, cytokinesis Below level: fill-in diagram of stages Above level: research p53 tumor suppressor gene and design a solution to restore its function (engineering connection)	Open Resources OpenSciEd B.5 Unit — free: opensci.ed.org Crash Course Biology YouTube HHMI 'Cell Division and Cancer' (biointeractive.org) Amoeba Sisters 'Cell Division' Khan Academy 'Cell cycle and mitosis'
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LESSON PLAN 1.3 (Unit 1, Lesson 3) | Legacy Learning Center | Grade 9 Biology | 2025–2026

Where Does the Matter in Your Body Come From? — Photosynthesis, Cellular Respiration, and Carbon-Based Molecules

Anchoring Phenomenon: A tree starts as a tiny seed weighing a few grams and grows into a 1,000-pound oak. It gets water from the soil and minerals from the roots. But where does the other 999+ pounds come from?

Indiana Standards	Performance Expectations (Source: IDOE 2023 IAS Biology)
Standards	HS-LS1-5 (Standard): Photosynthesis transforms light energy to chemical energy HS-LS1-6 (ESSENTIAL): Carbon, hydrogen, and oxygen from sugars combine to form amino acids and other large carbon-based molecules HS-LS1-7 (Standard): Cellular respiration transfers energy from food molecules
Learning Objectives	(1) Use a model to trace carbon atoms from CO ₂ in the atmosphere through photosynthesis into glucose, then into amino acids and other macromolecules; (2) Construct and revise an explanation for how CHO from sugar molecules combine with other elements (N, S) to form amino acids; (3) Model cellular respiration as the reverse of photosynthesis at the molecular level; (4) Connect photosynthesis and respiration to the carbon cycle.
Materials	Carbon atom tracking cards (red = C, white = H, blue = O, yellow = N) Molecular model kits OR laminated cards Computer: HHMI 'Photosynthesis' activity (biointeractive.org) or Concord Consortium simulation Open SciEd B.6 Student Notebook Glucose → amino acid transformation diagram Whiteboard for class carbon atom tracking model

5E Lesson Schedule

Phase	Time	Teacher & Student Actions
Engage	10 min	Teacher holds up a piece of wood. 'I claim most of this wood came from thin air.' Students: agree, disagree, or unsure. Record in notebooks. Anchor: 'If most of an oak tree's mass comes from CO ₂ , how does CO ₂ become wood? And then how does wood become you when you eat an apple from that tree?'
Explore	22 min	Carbon atom tracking activity: Small groups receive carbon cards and 'build' glucose from 6 CO ₂ (6C) + 6H ₂ O using energy (photosynthesis). Then: 'take apart' glucose and 're-build' ATP + CO ₂ + H ₂ O (cellular respiration). Then: 'take apart' glucose again and 're-build' an amino acid by adding N. Track where every carbon atom goes.

Explain	12 min	Teacher guides class to build a 'carbon tracking model' on whiteboard showing: CO ₂ → photosynthesis → glucose → (1) cellular respiration → ATP + CO ₂ ; (2) amino acid synthesis → proteins → specialized cells. HHMI 'Where Does the Mass in Plants Come From?' 5-minute video. Students update models.
Elaborate	10 min	Students examine food labels: protein, carbohydrate, fat. 'Trace the carbon in this protein bar from the original CO ₂ in the atmosphere.' Students write a carbon atom 'biography' — from atmosphere to organism. Connect to HS-LS1-6 (ESSENTIAL): the key ECA performance expectation.
Evaluate	11 min	ILEARN ECA Practice: Scenario with data table showing isotope-labeled carbon in a leaf experiment. Students: (1) construct an explanation for where the labeled carbon went; (2) use the model to explain how removing N from soil would affect protein production. Exit ticket: 'Name 3 elements in an amino acid and where each originally came from.'

<p>Assessment / ECA Prep</p> <p>Carbon tracking model accuracy (SEP2 Develop & Use Models + CCC5 Energy & Matter + DCI HS-LS1-6(E)). Written explanation of amino acid synthesis. ILEARN practice item.</p>	<p>Differentiation</p> <p>ELL: Carbon atom 'biography' sentence frame: 'I started as ____ (CO₂/water/nitrogen/etc.) in _____. Then, during the process of _____, I became part of _____.' Below level: pre-drawn diagram with blanks to fill in atom locations Above level: design an investigation to test whether CO₂ concentration affects the rate of protein synthesis in a plant</p>	<p>Open Resources</p> <p>OpenSciEd B.6 Unit — free: opensci.org HHMI 'Where Do Plants Get Their Mass?' (biointeractive.org) Concord Consortium 'Photosynthesis & Respiration' simulation Amoeba Sisters 'Photosynthesis and Cellular Respiration' PhET simulations (phet.colorado.edu)</p>
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LESSON PLAN 1.4 (Unit 1, Lesson 4) | Legacy Learning Center | Grade 9 Biology | 2025–2026

Unit 1 ILEARN ECA Review — Molecules to Organisms Item Cluster Practice & Performance Task

Anchoring Phenomenon: A patient with Type 1 diabetes cannot produce functional insulin. A genetic engineer proposes inserting the human insulin gene into bacteria to produce insulin. How does this work — and what does it tell us about DNA, proteins, and specialized cells?

Indiana Standards	Performance Expectations (Source: IDOE 2023 IAS Biology)
Standards	HS-LS1-1(E) HS-LS1-4(E) HS-LS1-6(E) + HS-LS1-2 HS-LS1-3 HS-LS1-5 HS-LS1-7 — ALL Unit 1 Performance Expectations reviewed
Learning Objectives	(1) Complete and score a full ILEARN Biology ECA item cluster for HS-LS1; (2) Identify personal gaps in Essential PE mastery; (3) Apply Unit 1 DCI to real-world biotechnology phenomenon; (4) Demonstrate 3-dimensional understanding of HS-LS1 through a performance task (construct explanation + model + argument).
Materials	Printed ILEARN-style Biology item cluster (HS-LS1 focus) — create from released IDOE items + teacher-designed Scoring rubric (3D biology rubric aligned to ECA format) Optional: PBS NewsHour 'Insulin via bacteria' 5-minute video clip Student Unit 1 science notebooks Access to ECA practice on Indiana Assessment Portal

5E Lesson Schedule

Phase	Time	Teacher & Student Actions
Engage	8 min	Present insulin engineering phenomenon (above). 'This is real technology used since 1982. By the end of today, you should be able to explain exactly how this works using everything you've learned in Unit 1.' Students predict what Unit 1 concepts they'll need.
Explore	15 min	Students individually complete 3-task ILEARN-style item cluster (HS-LS1 phenomenon-based). Task 1: analyze a diagram of recombinant DNA. Task 2: construct an explanation for how the bacteria produces functional insulin. Task

		3: use evidence from the data table to argue whether the insulin produced by bacteria is functionally equivalent to human insulin.
Explain	15 min	Class self-scores using 3D rubric. Teacher-led debrief of each task: 'What SEP were you using? What CCC? What DCI?' Re-teach gaps. Re-examine Essential PEs: HS-LS1-1 (DNA → protein), HS-LS1-4 (differentiation), HS-LS1-6 (CHO → macromolecules). Students annotate notebooks.
Elaborate	12 min	Performance Task: 'You are advising a biotechnology startup. They want to engineer bacteria to produce a protein that breaks down plastic (PETase enzyme). Construct an explanation, draw a model, and argue whether this is likely to work.' Students work in pairs; share with class.
Evaluate	15 min	Final Unit 1 3D Assessment: Students select 1 Essential PE (HS-LS1-1, HS-LS1-4, or HS-LS1-6) and write a full CER (5–7 sentences) supported by a labeled model. Teacher conferences with below-level students. ECA window reminder: students who have completed Biology course may sit for ILEARN Biology ECA now.

<p>Assessment / ECA Prep Full ILEARN-style item cluster (scored with official IDOE 3D rubric). Performance task (model + CER). Unit 1 final 3D written assessment (Essential PE of choice). Science notebook review.</p>	<p>Differentiation Below level: sentence stem support for CER; reduced task cluster (2 of 3 tasks); teacher conference during evaluate phase ELL: bilingual glossary for technical terms; partner support for cluster reading Above level: design a full recombinant DNA procedure for a novel protein of their choosing with risk-benefit analysis</p>	<p>Open Resources IDOE Released ILEARN Biology Items (Indiana Assessment Portal) IDOE ILEARN Biology Test Blueprint: in.gov/doi/files/ILEARN-Biology-Test-Blueprint.pdf OpenSciEd B.5 + B.6 Unit assessments (adapted for ECA format) Khan Academy 'Biotechnology': khanacademy.org/science/ap-biology</p>
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Legacy Learning Center · Grade 9 Biology · 2025–2026

UNIT 2

ECOSYSTEMS

ILEARN Biology ECA Coverage: ≈ 33% of ILEARN Biology ECA (6 items)

4 Lesson Plans Lesson Plans | 2023 Indiana Academic Standards (NGSS-Based) | 3-Dimensional Instruction

UNIT 2 OVERVIEW: Students investigate how matter cycles and energy flows through ecosystems, how populations interact, and how human activity affects biodiversity. Primary phenomenon: 'In 1995, wolves were reintroduced to Yellowstone National Park. Within decades, rivers changed course.' OpenSciEd Units B.1 and B.2 (Ecosystem Interactions & Dynamics / Ecosystem Matter & Energy).

Unit 2 Essential PEs — ILEARN ECA Guaranteed Clusters

HS-LS2-3 (ESSENTIAL): Construct and revise an explanation based on evidence for the cycling of matter and flow of energy in aerobic and anaerobic conditions.

HS-LS2-7 (ESSENTIAL): Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

Both Essential PEs guaranteed at least one item cluster each on ILEARN Biology ECA. Begin item cluster practice for Unit 2 Essential PEs in November.

LESSON PLAN 2.1 (Unit 2, Lesson 1) | Legacy Learning Center | Grade 9 Biology | 2025–2026

Why Did Reintroducing Wolves Change a River? — Ecosystem Interactions, Trophic Cascades, and Carrying Capacity

Anchoring Phenomenon: In 1995, 14 wolves were released into Yellowstone National Park. Within years, the elk population declined and moved, willows and aspens regrew along riverbanks, beavers returned, and rivers changed course. How can predators change rivers?

Indiana Standards	Performance Expectations (Source: IDOE 2023 IAS Biology)
Standards	HS-LS2-1 (Standard): Carrying capacity of ecosystems at different scales HS-LS2-2 (Standard): Factors affecting biodiversity and populations HS-LS2-6 (Standard): Complex interactions maintaining stable ecosystems
Learning Objectives	(1) Use mathematical representations (population graphs) to support explanations of carrying capacity; (2) Trace a trophic cascade from wolves → elk → riparian vegetation → beavers → rivers; (3) Construct a model showing how predator introduction affects multiple trophic levels; (4) Evaluate evidence for how complex interactions maintain ecosystem stability.
Materials	Yellowstone wolf reintroduction data (HHMI BioInteractive Serengeti dataset or Yellowstone wolf data from NPS.gov) Graph paper or technology for graphing OpenSciEd B.1 Student Notebook (Unit 1 Serengeti adapted for Yellowstone) Sticky note web for ecosystem connections Rulers and pencils for data analysis

5E Lesson Schedule

Phase	Time	Teacher & Student Actions
Engage	10 min	Play 4-minute 'How Wolves Change Rivers' YouTube animation (George Monbiot, 2014). Students: 'What do you notice? What do you wonder?' Anchor: 'Is this real? How can wolves change a river?' Chart initial ideas. Introduce Yellowstone wolf data set.
Explore	20 min	Students analyze HHMI BioInteractive population data (elk, wolves, willows) from Yellowstone 1995–2010. Plot 3 population graphs. Identify: 'What happened to elk when wolves appeared? What happened to willows? Do these changes match the timeline you'd predict? Where are anomalies in the

		data?' Record in notebooks.
Explain	15 min	Teacher leads class to build a trophic cascade model on whiteboard. Introduce: carrying capacity (K), predator-prey cycles, trophic cascade, keystone species. Students add mathematical representations to model: if elk population increases by 50%, calculate new carrying capacity for vegetation using given data. Update models.
Elaborate	10 min	Small groups: 'Design a model predicting what would happen if wolves were removed AGAIN from Yellowstone. Include at least 3 trophic levels and 2 abiotic factors.' Groups share; class critiques models.
Evaluate	10 min	ILEARN ECA Practice: Scenario — 'A fishing company removes large predatory fish from a lake ecosystem.' Students: (1) predict population changes using math representations; (2) evaluate the claim that 'removing predators improves overall biodiversity.' Exit ticket: define carrying capacity in the context of the Yellowstone data.

<p>Assessment / ECA Prep Population graph accuracy + trend interpretation (SEP4 + CCC2 Cause/Effect + DCI HS-LS2-1). Trophic cascade model (SEP2 + CCC4 Systems). ILEARN practice item. Exit ticket.</p>	<p>Differentiation ELL: Trophic cascade diagram pre-labeled with arrows to fill in Below level: partially completed graph with one trendline drawn Above level: calculate exact carrying capacity for elk using logistic growth formula; research Isle Royale moose-wolf cycle as comparison</p>	<p>Open Resources OpenSciEd B.1 Unit — free: opensci.org HHMI BioInteractive 'Serengeti Ecosystem' (also applicable): biointeractive.org 'How Wolves Change Rivers' YouTube National Park Service Yellowstone Wolf Project data: nps.gov/yell</p>
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LESSON PLAN 2.2 (Unit 2, Lesson 2) | Legacy Learning Center | Grade 9 Biology | 2025–2026

How Does Energy Get from the Sun to a Wolf? — Matter Cycling and Energy Flow in Aerobic and Anaerobic Systems

Anchoring Phenomenon: A Serengeti cheetah eats a gazelle to get energy. But the cheetah only captures about 10% of the energy that was in the gazelle. Where did the other 90% go — and does it matter for the whole ecosystem?

Indiana Standards	Performance Expectations (Source: IDOE 2023 IAS Biology)
Standards	HS-LS2-3 (ESSENTIAL): Cycling of matter and flow of energy in aerobic and anaerobic conditions HS-LS2-4 (Standard): Mathematical representations for cycling of matter and flow of energy HS-LS2-5 (Standard): Model of photosynthesis and cellular respiration in carbon cycling
Learning Objectives	(1) Construct and revise an explanation for the 10% energy rule using aerobic respiration chemistry; (2) Use mathematical representations (energy pyramids) to explain why food webs have fewer top predators; (3) Model how carbon cycles through producers, consumers, and decomposers; (4) Compare aerobic and anaerobic conditions and explain why anaerobic decomposition releases less energy.
Materials	Energy pyramid building materials (blocks, blocks with numbers) Carbon cycle simulation cards (producers, consumers, decomposers, atmosphere, soil) Computer: Concord Consortium 'Food Web' simulation (free: concord.org) HHMI 'Carbon and Energy in Ecosystems' activity Open SciEd B.2 Student Notebook Calculator

5E Lesson Schedule

Phase	Time	Teacher & Student Actions
Engage	10 min	Teacher presents data: 'A Serengeti ecosystem has 1,000,000 kcal of grass. Using the 10% rule, how many kcal are available at each trophic level? How many wolves could this support?' Students calculate. 'Why is there so much grass and so few lions?' Anchor: 'Where does energy go?'
Explore	18 min	Carbon cycle simulation: Each student receives a role card (CO2 in atmosphere, carbon in plant glucose, carbon in animal protein, carbon in

		decomposer, carbon in soil). Move through stations based on rules (photosynthesis, respiration, eating, decomposition — aerobic vs. anaerobic). Track: how many times does C pass through each station? Record results.
Explain	15 min	Teacher leads construction of class carbon + energy flow model. Key teaching: (1) energy FLOWS through ecosystem (not recycled); (2) matter CYCLES. Introduce aerobic vs. anaerobic: 'In a swamp with no oxygen, decomposition is slower and releases less energy (methane instead of CO ₂).' Show energy balance equations. Connect to HS-LS2-3(E) — the ECA Essential PE.
Elaborate	12 min	Students use Concord Consortium Food Web simulation to test: 'What happens to carbon cycling if the decomposer population crashes?' Run 3 scenarios; record data; write a claim with 3 pieces of evidence about what would happen to soil carbon, atmospheric CO ₂ , and plant growth.
Evaluate	10 min	ILEARN ECA Practice: Full item cluster — scenario about a wetland ecosystem switching from aerobic to anaerobic conditions due to flooding. Students: (1) model change in decomposition rate; (2) predict carbon accumulation in soil; (3) construct explanation for why methane increases. Score and debrief.

<p>Assessment / ECA Prep</p> <p>Energy pyramid calculation accuracy (SEP5 Math + CCC5 Energy/Matter + DCI HS-LS2-3(E)). Carbon cycle simulation data and claim. ILEARN item cluster practice (graded with 3D rubric).</p>	<p>Differentiation</p> <p>ELL: Sentence frame for CER — 'The evidence shows that when ____, the carbon in ____ increases/decreases because ____.' Below level: partially completed energy pyramid with first two levels filled Above level: calculate the exact amount of methane produced per kilogram of organic matter decomposed anaerobically using provided equations</p>	<p>Open Resources</p> <p>OpenSciEd B.2 Unit — free: opencied.org HHMI 'Carbon and Energy in Ecosystems' (biointeractive.org) Concord Consortium Food Web Simulation (concord.org) Amoeba Sisters 'Ecosystems' Khan Academy 'Energy flow in ecosystems'</p>
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LESSON PLAN 2.3 (Unit 2, Lesson 3) | Legacy Learning Center | Grade 9 Biology | 2025–2026

What Happens When Humans Disrupt Ecosystems? — Biodiversity, Human Impact, and Engineering Solutions

*Anchoring Phenomenon: The Indiana bat (*Myotis sodalis*) population has declined by over 90% due to habitat loss, pesticides, and white-nose syndrome. Indiana listed it as endangered in 1967. The decline is still continuing. What can be done?*

Indiana Standards	Performance Expectations (Source: IDOE 2023 IAS Biology)
Standards	HS-LS2-7 (ESSENTIAL): Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity HS-LS2-2 (Standard): Factors affecting biodiversity HS-LS4-6 (Standard): Create or revise a simulation to test a solution to mitigate adverse impacts
Learning Objectives	(1) Evaluate the claims and evidence that human activities reduce biodiversity; (2) Design an engineering solution to reduce a specific human impact on an Indiana species; (3) Test the solution using a simulation or data model; (4) Refine the solution based on test results and evaluate its feasibility using criteria and constraints.
Materials	Indiana bat population data (IDNR.in.gov) Engineering design challenge cards (criteria + constraints) OpenSciEd B.1 engineered solution materials Computer: HHMI 'Human Impact on Biodiversity' or EPA biodiversity data Markers and poster paper for solution designs Simulation tools (paper or Concord)

5E Lesson Schedule

Phase	Time	Teacher & Student Actions
Engage	10 min	Indiana bat population graph projected. 'This is a real species in our state.'

		90% gone.' Read 1 paragraph from Indiana DNR on white-nose syndrome, habitat loss, and pesticides. Anchor: 'This is a real engineering problem. Can it be solved? How would we even know if a solution works?'
Explore	18 min	Small groups: each group receives a different 'cause' (habitat loss / white-nose fungus / pesticides / light pollution). Research cause using provided data cards. Identify: (1) which human activities cause this; (2) what are the effects on bat population; (3) what criteria should a solution meet? Record using engineering design template.
Explain	12 min	Teacher introduces engineering design cycle (define → develop → test → refine). 'A good solution must meet criteria AND stay within constraints — cost, time, feasibility, political.' Class develops shared criteria list for bat solutions. Teacher presents 2 real solutions: artificial roost boxes + fungicide treatment. 'Which better meets criteria? What data would tell us?'
Elaborate	15 min	Groups design their own solution for their assigned 'cause.' Must include: (1) description of solution; (2) criteria it meets; (3) constraints it faces; (4) data they would collect to test it; (5) how they would refine if first test fails. Present 2-minute design pitch to class. Peers evaluate using criteria rubric.
Evaluate	10 min	ILEARN ECA Practice: Scenario — 'A pesticide company proposes reducing pesticide concentration by 50% as a solution to bat decline. Evaluate this proposed solution using the evidence provided.' Students: (1) evaluate the claim; (2) suggest a refinement; (3) describe data needed to determine success. Score and debrief.

<p>Assessment / ECA Prep</p> <p>Engineering solution design (SEP6 Design + CCC2 Cause/Effect + DCI HS-LS2-7(E)). Design pitch peer evaluation rubric. ILEARN practice item. Science notebook design documentation.</p>	<p>Differentiation</p> <p>ELL: Engineering design template with sentence starters for each section Below level: choose from 3 pre-designed solutions and evaluate rather than create Above level: contact Indiana DNR or local conservation organization and propose real solution; calculate population viability using provided models</p>	<p>Open Resources</p> <p>OpenSciEd B.1 Unit — free: opencied.org Indiana DNR bat data: in.gov/dnr/fish-and-wildlife/wildlife-resources/animals/bats HHMI 'Human Impact on Biodiversity' (biointeractive.org) EPA Biodiversity data Next Generation Science Storylines ecosystem units: nextgenstorylines.org</p>
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LESSON PLAN 2.4 (Unit 2, Lesson 4) | Legacy Learning Center | Grade 9 Biology | 2025–2026

Unit 2 ILEARN ECA Review — Ecosystems Item Cluster Practice & Group Behavior Investigation

Anchoring Phenomenon: Meerkats take turns standing guard while others eat, even though the sentry faces greater predator risk. African wild dogs share food with injured pack members. How does group behavior affect a species' survival — and what does the math tell us?

Indiana Standards	Performance Expectations (Source: IDOE 2023 IAS Biology)
Standards	HS-LS2-8 (Standard): Role of group behavior on survival and reproduction HS-LS2-3(E) HS-LS2-7(E) — Both Essential PEs reviewed All Unit 2 PEs reviewed
Learning Objectives	(1) Evaluate evidence for how group behavior increases individual and species survival probability; (2) Complete and score a full ILEARN Biology ECA item cluster for HS-LS2; (3) Apply probability mathematics to group behavior survival advantage; (4) Synthesize Unit 2 DCI into a comprehensive ecosystem model.
Materials	Meerkat sentinel behavior data (HHMI BioInteractive or pre-compiled) Probability calculation worksheet Full ILEARN-style HS-LS2 item cluster (teacher-designed from released items) Scoring rubric Student Unit 2 science notebooks Large paper for class ecosystem synthesis model

5E Lesson Schedule

Phase	Time	Teacher & Student Actions
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Engage	8 min	Show 3-minute BBC Planet Earth clip of meerkat sentry behavior. 'The sentinel stands apart and calls warnings. This behavior increases the sentinel's risk. Why would natural selection preserve this?' Anchor: 'What's the mathematical advantage of group behavior?'
Explore	15 min	Students analyze meerkat survival data: (1) survival rate of solitary meerkats vs. group members vs. sentinels; (2) calculate probability of predation for each; (3) calculate net reproductive benefit of sentinel behavior. 'Is the sentry's sacrifice mathematically advantageous to its genetic relatives? By how much?'
Explain	12 min	Teacher connects meerkat case to HS-LS2-8: group behavior + kin selection + inclusive fitness. 'The math shows why altruistic behavior can evolve through natural selection.' Students add to science notebooks. Class builds synthesis ecosystem model connecting all Unit 2 PEs: energy flow + matter cycling + population dynamics + human impact + group behavior.
Elaborate	10 min	Full Unit 2 ILEARN item cluster practice (12–15 minutes). Scenario: 'A grassland ecosystem faces drought conditions. Wolves have been removed. A new fungus kills 30% of decomposers.' Students: (1) model energy flow changes; (2) predict population shifts; (3) design a solution; (4) evaluate group behavior advantage for remaining species.
Evaluate	20 min	Score item cluster with 3D rubric. Class debrief: identify most common errors. Individual Unit 2 written performance task: 'Your school board is considering allowing development of a wetland adjacent to school grounds. Write a science-based argument (CER, 3D) for or against the development, citing at least 2 Essential PE standards.'

<p>Assessment / ECA Prep</p> <p>Full ILEARN-style item cluster (scored with official 3D rubric). Unit 2 written performance task (persuasive CER with standards citations). Probability calculation accuracy. Science notebook synthesis model.</p>	<p>Differentiation</p> <p>ELL: CER sentence frame with standard citations format Below level: provide item cluster in printed format with key vocabulary highlighted Above level: research Hamilton's rule (kin selection mathematics) and apply to meerkat data to calculate coefficient of relatedness</p>	<p>Open Resources</p> <p>HHMI BioInteractive 'Meerkat Social Behavior' (biointeractive.org) OpenSciEd B.1 + B.2 assessments IDOE Released ILEARN Biology Items (Indiana Assessment Portal) BBC Planet Earth clip Khan Academy 'Animal behavior and evolution'</p>
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UNIT 3

HEREDITY & EVOLUTION

ILEARN Biology ECA Coverage: ≈ 33% of ILEARN Biology ECA (6 items)

4 Lesson Plans Lesson Plans | 2023 Indiana Academic Standards (NGSS-Based) | 3-Dimensional Instruction

UNIT 3 OVERVIEW: Students investigate how traits are inherited, how genetic variation arises, and how natural selection drives evolution over time. Primary phenomenon: 'A group of boys in a small village in the Dominican Republic are born appearing female, but at puberty, they rapidly develop male physical characteristics. Why?' OpenSciEd Units B.3 (Evolution by Natural Selection) and B.4 (Genetics & Heredity).

Unit 3 Essential PEs — ILEARN ECA Guaranteed Clusters

HS-LS3-1 (ESSENTIAL): Ask questions to clarify relationships about the role of DNA and chromosomes in coding the instructions for characteristic traits passed from parents to offspring.

HS-LS3-2 (ESSENTIAL): Make and defend a claim based on evidence that inheritable genetic variations may result from: (1) new genetic combinations through meiosis, (2) viable errors during replication, (3) mutations caused by environmental factors.

HS-LS4-2 (ESSENTIAL): Construct an explanation based on evidence that the process of evolution results from four factors: (1) potential for species to increase in number, (2) heritable genetic variation, (3) competition for limited resources, (4) proliferation of organisms better able to survive.

All three Essential PEs receive at least one item cluster each on ILEARN Biology ECA. Begin ECA practice for Unit 3 Essential PEs in February.

LESSON PLAN 3.1 (Unit 3, Lesson 1) | Legacy Learning Center | Grade 9 Biology | 2025–2026

Why Do Children Look Like Their Parents — But Not Exactly? — DNA, Chromosomes, Meiosis, and Inheritance

Anchoring Phenomenon: Identical twins have exactly the same DNA but can develop different diseases, personalities, and physical features over time. Non-identical twins share only about 50% of their DNA. How does inheritance work — and why is genetic variation so important?

Indiana Standards	Performance Expectations (Source: IDOE 2023 IAS Biology)
Standards	HS-LS3-1 (ESSENTIAL): DNA and chromosomes coding for characteristic traits passed from parents to offspring HS-LS3-2 (ESSENTIAL): Sources of inheritable genetic variation — meiosis, replication errors, environmental mutations HS-LS3-3 (Standard): Statistics and probability to explain variation and distribution of traits
Learning Objectives	(1) Ask and investigate questions about how DNA sequences code for traits; (2) Model meiosis and crossing-over as sources of new genetic combinations; (3) Distinguish between mutations, replication errors, and epigenetic modifications as sources of variation; (4) Apply statistics and probability (Punnett squares, Hardy-Weinberg) to predict trait distributions.
Materials	Yarn and beads for meiosis model Coin for probability simulation OpenSciEd B.4 Student Notebook Computer: Concord Consortium 'Genetics' simulation or HHMI 'Genetic Variation' activity Punnett square practice worksheet Population genetics data for Hardy-Weinberg Colored pipe cleaners for crossing-over model

5E Lesson Schedule

Phase	Time	Teacher & Student Actions
Engage	10 min	Present identical twin case: 'Twin A develops Type 1 diabetes. Twin B does not. Same DNA.' Anchor: 'If they have the same DNA, why did only one get the disease?' And: 'Non-identical twins. Different DNA. Where did the different

		DNA come from?' Students: 'What do we need to figure out?'
Explore	20 min	Meiosis simulation: (1) Students begin with 4 chromosomes (2 pairs of colored pipe cleaners); (2) model crossing-over by swapping segments; (3) model random assortment at meiosis I and II; (4) count the different possible gamete combinations from 2 chromosome pairs (= 4; scale up: 23 pairs = 2^{23} = ~8 million combinations). Students record and connect to HS-LS3-2(E).
Explain	15 min	Teacher leads: (1) meiosis creates variation through crossing-over and independent assortment; (2) mutation types (substitution, insertion, deletion); (3) environmental mutagens. 'So variation comes from meiosis + mutations + fertilization.' Introduce Hardy-Weinberg: 'In a population of 200 people, 18 have cystic fibrosis (aa). What fraction has allele a?' Students calculate p and q.
Elaborate	10 min	Case study: 5-alpha reductase deficiency (the Dominican Republic phenomenon). Students read 1 paragraph, then ask 5 questions they have. Teacher models tracing the genetic pathway: X-linked vs. autosomal, recessive trait, how the trait is coded in DNA. Connect to HS-LS3-1(E): DNA → chromosomes → trait inheritance.
Evaluate	10 min	ILEARN ECA Practice: Scenario — 'A new mutation in a gene coding for a melanin-producing protein results in albinism.' Students: (1) ask questions about the mutation using HS-LS3-1; (2) make a claim about whether this mutation would be passed to offspring based on HS-LS3-2. Exit ticket: name 3 sources of genetic variation.

<p>Assessment / ECA Prep Meiosis model accuracy (SEP2 + CCC1 Patterns + DCI HS-LS3-2(E)). Hardy-Weinberg calculation. Questions about DNA-trait relationship (SEP1 + HS-LS3-1(E)). ILEARN practice item.</p>	<p>Differentiation ELL: Meiosis vocabulary cards (meiosis, crossing-over, gamete, allele, chromosome) with visual diagrams Below level: pre-drawn meiosis diagram with stages labeled; 2-allele Punnett square only Above level: calculate genetic diversity in a population of 50 individuals using 23 chromosome pairs; research consequences of low genetic diversity in endangered species</p>	<p>Open Resources OpenSciEd B.4 Unit — free: opensci.org HHMI 'Genetic Variation' (biointeractive.org) Concord Consortium Genetics simulation Amoeba Sisters 'Meiosis' Khan Academy 'Mendelian genetics and heredity' Crash Course 'Heredity and Meiosis'</p>
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LESSON PLAN 3.2 (Unit 3, Lesson 2) | Legacy Learning Center | Grade 9 Biology | 2025–2026

Why Are There So Many Different Dog Breeds? — Natural Selection, Artificial Selection, and the Four Factors of Evolution

Anchoring Phenomenon: Wolf → Chihuahua in ~15,000 years of human-directed breeding. In the wild, bacteria evolved resistance to antibiotics in less than 50 years. Are these the same process — and what does this tell us about how evolution works?

Indiana Standards	Performance Expectations (Source: IDOE 2023 IAS Biology)
Standards	HS-LS4-2 (ESSENTIAL): Four factors of evolution by natural selection HS-LS4-3 (Standard): Statistics and probability that advantageous traits increase in proportion HS-LS4-4 (Standard): Natural selection leads to adaptation
Learning Objectives	(1) Construct an explanation of the four factors driving evolution: potential to increase in number, heritable variation, competition, survival of the best-fit; (2) Compare natural selection to artificial selection; (3) Apply probability to show how advantageous traits increase in proportion over generations; (4) Construct evidence-based argument that antibiotic resistance evolution is natural selection in real time.
Materials	Rock pocket mouse simulation (HHMI BioInteractive — free virtual lab) Graph paper or technology Antibiotic resistance data (CDC or published study) OpenSciEd B.3 Student Notebook Darwin's finch beak data cards Population genetics simulation (free at evolution.genetics.washington.edu) Index cards for 'survival cards' simulation

5E Lesson Schedule

Phase	Time	Teacher & Student Actions
Engage	10 min	Show two images: a wolf and a Chihuahua. 'Same species. 15,000 years of human breeding.' Show graph: antibiotic-resistant bacteria 1950 → 2024. Anchor: 'Are these the same process? What made each one work?' Students predict. Introduce driving question: 'What does it actually TAKE for evolution to happen?'
Explore	22 min	HHMI Rock Pocket Mouse Virtual Lab (biointeractive.org): Students analyze data from rock pocket mouse populations on dark vs. light lava fields. Track: (1) variation in coat color (mutation data); (2) survival rates; (3) allele frequency change over 5 generations. Graph allele frequency change. 'Which of Darwin's four factors can you identify in this data?'
Explain	15 min	Teacher leads class to construct the 4-factor explanation (HS-LS4-2(E)) using mouse data as evidence: (1) mice overproduce offspring; (2) coat color varies (mutation = heritable genetic variation); (3) hawks compete for prey; (4) dark mice on dark rock survive more → allele frequency increases. Apply to dogs (artificial selection) and bacteria (same 4 factors, human-directed selection pressure). Hardy-Weinberg deviations = evolution.
Elaborate	10 min	Case analysis: 'A hospital reports that 80% of their MRSA infections are now resistant to methicillin. Using the 4 factors, construct an explanation for how this happened. What data would you need to see as evidence?' Students write CER with 4-factor framework.
Evaluate	8 min	ILEARN ECA Practice: Scenario with Galápagos finch beak data during drought (1977 El Niño drought — published Grants dataset). Students: (1) apply 4 factors to explain beak size increase; (2) use statistics to show advantage; (3) predict what happens if drought ends and small seeds return. Score and debrief.

<p>Assessment / ECA Prep</p> <p>Rock pocket mouse graph + 4-factor identification (SEP4 + CCC2 Cause/Effect + DCI HS-LS4-2(E)). MRSA CER with 4-factor framework. Finch data ILEARN practice item.</p>	<p>Differentiation</p> <p>ELL: 4-factor framework chart to fill in with sentence frames Below level: pre-built population simulation showing 3 generations; identify factors that apply Above level: calculate selection coefficient from provided data and model allele frequency change over 10 generations</p>	<p>Open Resources</p> <p>HHMI 'Rock Pocket Mouse' Virtual Lab — free: biointeractive.org HHMI 'Battling Antibiotic Resistance' (biointeractive.org) OpenSciEd B.3 Unit: opensci.org Evolution simulation: evolution.genetics.washington.edu/po pgen Grant + Grant Galápagos finch dataset: any published science ed resource Khan Academy 'Natural selection and Darwin'</p>
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LESSON PLAN 3.3 (Unit 3, Lesson 3) | Legacy Learning Center | Grade 9 Biology | 2025–2026

How Do We Know All Life Is Related? — Evidence for Evolution and Common Ancestry

Anchoring Phenomenon: A whale has a pelvis and tiny vestigial leg bones buried inside its body. A human hand, a bat wing, a dolphin flipper, and a bird wing all have the same bones. Whale embryos look nearly identical to dog embryos in early development. What does all this evidence mean?

Indiana Standards	Performance Expectations (Source: IDOE 2023 IAS Biology)
Standards	HS-LS4-1 (Standard): Multiple lines of empirical evidence supporting common ancestry and biological evolution HS-LS4-4 (Standard): Natural selection leads to adaptation HS-LS4-5 (Standard): Changes in environmental conditions resulting in species change
Learning Objectives	(1) Communicate scientific information using at least 4 lines of evidence for evolution (fossil record, comparative anatomy, embryology, molecular/DNA); (2) Analyze DNA sequence data to construct a phylogenetic tree; (3) Evaluate the strength of different types of evidence for common ancestry; (4) Construct an explanation for how natural selection produces adaptation in response to environmental change.

Materials	Comparative anatomy cards (homologous structures) Embryo comparison images DNA sequence comparison printouts (or HHMI 'Evidence for Evolution' activity) Phylogenetic tree construction template OpenSciEd B.3 Student Notebook Computer: HHMI 'Got Lactase? The Co-evolution of Genes and Culture' Fossil record timeline (paper or projected)
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5E Lesson Schedule

Phase	Time	Teacher & Student Actions
Engage	10 min	Teacher holds up skeleton cast image of a whale pelvis. 'Why does a whale have a pelvis if it has no legs?' Show embryo comparison (fish, chicken, human — all look identical at early stage). 'What do you notice? Why would they look the same?' Anchor: 'Is there one explanation that connects all of this evidence?'
Explore	18 min	Evidence stations (students rotate 10 min): Station 1 — Fossil record timeline (construct a mini-cladogram from 5 fossils with provided features); Station 2 — DNA sequence comparison (4 species, align sequences, count differences, decide which are most related); Station 3 — Homologous structures (label identical bones in human hand, bat wing, whale flipper); Station 4 — Embryo comparison (describe 5 similarities in early embryo images). Record evidence from all stations.
Explain	15 min	Class shares evidence. Teacher leads: 'All four types point to the same conclusion: common ancestry with modification by natural selection.' Build shared phylogenetic tree from DNA data (Station 2). HHMI 'Got Lactase?' (8 min) — shows molecular evidence for recent human evolution in lactase persistence. 'This is evolution we can measure today.'
Elaborate	12 min	Students choose ONE example of environmental change → adaptation (options: industrial melanism in moths, beak evolution in Galápagos, HIV drug resistance, dog domestication). Construct a scientific argument: 'The evidence shows that ___ evolved through natural selection because ___. This is supported by ___ (name the type of evidence).' Must include 2+ evidence types.
Evaluate	10 min	ILEARN ECA Practice: 'Scientists discover a new deep-sea fish with vestigial eye structures. Present your claim, with evidence from at least 2 lines, that this fish shares a common ancestor with surface-dwelling fish.' Students: (1) identify evidence types; (2) construct explanation; (3) propose what data would strengthen the argument.

Assessment / ECA Prep Phylogenetic tree accuracy (SEP2 + CCC1 Patterns + DCI HS-LS4-1). Scientific argument with 2+ evidence types (SEP7 + CCC2 + DCI HS-LS4-4). ILEARN practice item.	Differentiation ELL: Evidence type vocabulary cards with pictures Below level: partially completed phylogenetic tree with 2 of 4 species placed Above level: access NCBI GenBank and retrieve real DNA sequences for 4 related species; construct an alignment; compare to teacher's cladogram	Open Resources HHMI 'Evidence for Evolution' + 'Got Lactase?' (biointeractive.org) OpenSciEd B.3 Unit: opensci.org UCMP Phylogenetic tree tutorial (ucmp.berkeley.edu) Khan Academy 'Evidence for evolution' Amoeba Sisters 'Evidence of Evolution' NCBI GenBank for real DNA sequences
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LESSON PLAN 3.4 (Unit 3, Lesson 4) | Legacy Learning Center | Grade 9 Biology | 2025–2026

Full-Year ILEARN Biology ECA Final Review — All 3 Reporting Categories — Performance Task & Item Cluster Practice

Anchoring Phenomenon: CRISPR-Cas9 gene editing has been used to cure a 7-year-old girl with leukemia (2015), restore hearing in a child with genetic deafness (2023), and treat sickle cell disease in adults (2024). What are the biology principles that make CRISPR possible — and what are the risks?

Indiana Standards	Performance Expectations (Source: IDOE 2023 IAS Biology)
Standards	ALL 17 ILEARN Biology ECA Performance Expectations reviewed — HS-LS1(E×3) + HS-LS2(E×2) + HS-LS3(E×2) + HS-LS4(E×1) = 8 Essential PEs reviewed across all 3 reporting

	categories
Learning Objectives	(1) Complete and score a comprehensive ILEARN Biology ECA practice with items from all 3 reporting categories; (2) Apply all Unit concepts (DNA/proteins, ecosystems, heredity, evolution) to a real-world biotechnology phenomenon; (3) Identify personal gaps and create a targeted review plan; (4) Demonstrate readiness for ILEARN Biology ECA Spring window.
Materials	Full 3-category ILEARN Biology practice test (teacher-designed from IDOE released items — Indiana Assessment Portal) Official ECA scoring rubric Student science notebooks (all units) Large paper for 'Biology Connections Web' synthesis Computer access for Khan Academy self-review CRISPR 5-minute explainer video (HHMI BioInteractive)

5E Lesson Schedule

Phase	Time	Teacher & Student Actions
Engage	8 min	Play HHMI 3-minute CRISPR explainer. 'CRISPR uses a guide RNA to find a specific DNA sequence and cut it. A repair template adds new sequence.' Ask: 'Which Biology Unit 1 concept does this use? Unit 3? Does this relate to Unit 2 at all?' Students map to specific performance expectations.
Explore	20 min	Full ILEARN Biology practice (3 item clusters + 6 stand-alone items — one per reporting category). Simulate actual ECA conditions: independent work, no notes. ECA items address: Molecules to Organisms (DNA-protein, mitosis) + Ecosystems (energy flow, human impact) + Heredity/Evolution (meiosis sources of variation, 4 factors). Students mark confidence level (1–3) after each item.
Explain	15 min	Self-score with rubric. Class debrief by reporting category. Teacher identifies top 3 most missed Essential PEs across class. Re-teach using 'quick teach' — 5 minutes per Essential PE: CER template + model prompt + key vocabulary. Students annotate science notebooks with corrections.
Elaborate	12 min	CRISPR Performance Task (synthesis): 'Use biology from all three units to evaluate CRISPR gene editing of human embryos. (1) Construct an explanation of the molecular mechanism using Unit 1 DCI. (2) Model the effect on offspring using Unit 3 DCI — meiosis, inheritance. (3) Evaluate the ecosystem/population-level risk if CRISPR-edited humans reproduce using Unit 2 thinking. (4) Make an evidence-based argument (CER) for or against germline gene editing.'
Evaluate	10 min	Final Science Notebook review: students write a 1-page 'Biology Story' — a real-world scenario of their choosing that incorporates at least one concept from each of the 3 ECA reporting categories. Share with partner; partner identifies which standards are demonstrated. Teacher reviews ECA logistics: Indiana Assessment Portal login, testing window dates, accommodations.

<p>Assessment / ECA Prep</p> <p>Full ILEARN practice test score (per reporting category — identify gaps). CRISPR performance task — all 3 reporting categories (3D rubric). 'Biology Story' synthesis writing. Science notebook portfolio review.</p>	<p>Differentiation</p> <p>ELL: CRISPR explainer video with captions; partner read-aloud for item clusters Below level: fewer items (12 items instead of full set); teacher small group for re-teach Above level: research CRISPR ethics debate (He Jiankui case, 2018); write a policy brief citing the Essential PE standards that are most relevant to regulating germline editing</p>	<p>Open Resources</p> <p>IDOE Released ILEARN Biology Items: Indiana Assessment Portal IDOE Biology Test Blueprint: in.gov/doi/files/ILEARN-Biology-Test-Blueprint.pdf HHMI 'CRISPR-Cas9' and 'Editing Genes' (biointeractive.org) OpenSciEd B.3 + B.4 + B.5 + B.6 assessments Khan Academy ILEARN Biology review INassessments@doe.in.gov (317) 232-9050</p>
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Section 6: Tracking, Accountability & Teacher/Principal Sign-Off

Weekly Biology Fidelity Checklist

Mark each week. Submit copy to principal at end of each month.

Biology Instructional Expectation	Wk 1	Wk 2	Wk 3	Wk 4	Wk 5	Wk 6	Wk 7	Wk 8
3-Dimensional lesson delivered (SEP + CCC + DCI) — phenomenon-based								
All Essential performance expectations addressed per unit plan								
At least one hands-on investigation or data analysis activity								
Science notebook / model updated by students this week								
Academic vocabulary explicitly taught and used by students								
ILEARN Biology ECA practice item cluster reviewed (weekly from Oct.)								
Formative assessment / exit ticket used ≥ 2 times this week								
Engineering design or real-world application task included this unit								
Week of (date): →	___/___	___/___	___/___	___/___	___/___	___/___	___/___	___/___

Monthly Biology Check-In Log

Complete monthly with principal or science coach. Attach ECA practice data.

Mo.	Unit / Standards Covered	ECA Practice Item % Correct	# Students Below 70%	Lab / Invest. Completed	Instructional Adjustment
Aug		___%	___	___	
Sep		___%	___	___	
Oct		___%	___	___	
Nov		___%	___	___	
Dec		___%	___	___	
Jan		___%	___	___	
Feb		___%	___	___	
Mar		___%	___	___	
Apr		___%	___	___	
May		___%	___	___	
Sign	Principal initials each month: ___ ___ ___ ___ ___ ___ ___ ___				

Quarterly Biology Data Review

Complete at each data team meeting. Principal co-signs. Attach ECA practice reports.

Q1 — Fall | August – October

Focus: Units 1 & 2: Molecules to Organisms + Ecosystems — HS-LS1 Essential PEs; ECA Fall window open

Data Point	Result	% Meeting Target	Action
ECA Practice Item Cluster — % Correct (by reporting category)			
Essential PEs: % students demonstrating mastery			
# Students below 60% on ECA practice cluster			
Lab investigation completion rate			
Science notebook / model quality (rubric avg.)			
# Students needing Tier 2 science support			

Key adjustments next quarter:

1. _____
2. _____
3. _____

Teacher Signature: _____ Date: _____

Principal Signature: _____ Date: _____

Q2 — Winter | November – January

Focus: Unit 2 cont. + Unit 3: Ecosystems + Heredity — HS-LS2 Essential PEs; ECA Winter window open

Data Point	Result	% Meeting Target	Action
ECA Practice Item Cluster — % Correct (by reporting category)			
Essential PEs: % students demonstrating mastery			
# Students below 60% on ECA practice cluster			
Lab investigation completion rate			
Science notebook / model quality (rubric avg.)			
# Students needing Tier 2 science support			

Key adjustments next quarter:

1. _____
2. _____
3. _____

Teacher Signature: _____ Date: _____
 Principal Signature: _____ Date: _____

Q3 — Pre-Spring | February – March

Focus: Unit 3 cont.: Evolution & Heredity — HS-LS3, HS-LS4 Essential PEs; ECA Spring preparation

Data Point	Result	% Meeting Target	Action
ECA Practice Item Cluster — % Correct (by reporting category)			
Essential PEs: % students demonstrating mastery			
# Students below 60% on ECA practice cluster			
Lab investigation completion rate			
Science notebook / model quality (rubric avg.)			
# Students needing Tier 2 science support			

Key adjustments next quarter:

1. _____
2. _____
3. _____

Teacher Signature: _____ Date: _____
 Principal Signature: _____ Date: _____

Q4 — ECA Prep & Review | April – May

Focus: Full review all 3 reporting categories; ECA Spring window; final performance task

Data Point	Result	% Meeting Target	Action
ECA Practice Item Cluster — % Correct (by reporting category)			
Essential PEs: % students demonstrating mastery			
# Students below 60% on ECA practice cluster			
Lab investigation completion rate			
Science notebook / model quality (rubric avg.)			
# Students needing Tier 2 science support			

Key adjustments next quarter:

1. _____
2. _____
3. _____

Teacher Signature: _____	Date: _____
Principal Signature: _____	Date: _____

ECA Testing Window Calendar — 2025–2026

Window	Who Is Eligible	Key Actions	Contact
FALL ECA	Students who completed Biology by end of Q1 (trimester students or accelerated)	Confirm student enrollment in TIDE; review Unit 1 Essential PEs; schedule testing during school day	INassessments@doe.in.gov (317) 232-9050
WINTER ECA	Students who completed Biology by end of Q2 (semester students, trimester Cohort B)	Complete Units 1 & 2 review; ensure all Essential PEs addressed; submit accommodation requests	Test Coordinator Indiana Assessment Portal
SPRING ECA	ALL remaining Biology students (standard-year course completion)	Q4 comprehensive review all 3 reporting categories; full ILEARN practice test in April; submit any outstanding accommodations	INassessments@doe.in.gov IDOE Test Coordinator

ECA Reminders — Must Know

A student may only have ONE test attempt for any given ILEARN assessment — there are NO retest opportunities. Ensure students are READY before scheduling.

Students must be enrolled in the ECA in TIDE before testing. Contact your School Test Coordinator (STC) at least 2 weeks before the testing window.

Accommodations (extended time, read-aloud, etc.) must be documented in the student’s IEP or 504 BEFORE the testing window opens.

ECA is computer-adaptive — no paper option unless documented disability accommodation requires it.

Released items and practice tests: Indiana Assessment Portal (indiana.portal.cambiumast.com) — require teacher/STC login.

Biology Plan Acknowledgment — Teacher & Principal

<p style="text-align: center; margin: 0;">TEACHER — BIOLOGY PLAN</p> <p style="margin: 0;">Grade 9 Biology Legacy Learning Center 2025–2026</p> <p style="margin: 0;"><i>I have read this mandatory Biology plan in full and commit to implementing it with fidelity for 2025–2026.</i></p> <p style="margin: 10px 0 0 0;">Teacher Signature: _____</p> <p style="margin: 10px 0 0 0;">Date: _____</p>	<p style="text-align: center; margin: 0;">PRINCIPAL AUTHORIZATION</p> <p style="margin: 0;">Principal — Legacy Learning Center</p> <p style="margin: 0;"><i>This Biology plan has been reviewed and approved for 2025–2026. The teacher named above must implement it with fidelity.</i></p> <p style="margin: 10px 0 0 0;">Principal Signature: _____</p> <p style="margin: 10px 0 0 0;">Date Issued: _____</p>
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Section 7: Professional Development & IDOE Resources

PD Requirement	Who	Timeline	How to Complete
OpenSciEd HS Biology Curriculum Training	Biology teacher	Before school year begins	Free at opensci.ed.org — Teacher Edition + unit guides + professional learning modules for each unit
HHMI BioInteractive Teacher Training	Biology teacher	Q1 and ongoing	Free webinars + implementation guides at biointeractive.org/training — used in top Indiana high schools
ILEARN Biology ECA Administration & Item Analysis	Biology teacher + Test Coordinator	Before Fall ECA window	Indiana Assessment Portal training + IDOE ILEARN Science FAQ (in.gov/doe/files/ILEARN-Science-Updates-FAQs.pdf) + blueprint review
3-Dimensional Science Instruction (SEP + CCC + DCI)	Biology teacher	Before school year begins	IDOE IN Learning Lab Biology Frameworks: inlearninglab.com — search 'Biology 2023 Frameworks'
NGSS Classroom Design — Phenomenon-Based Teaching	Biology teacher	Year 1 priority	OpenSciEd professional learning (embedded in units) + BSCS 5E model resources (bscs.org)
Indiana Biology Standards Deep Dive	Biology teacher	Before Unit 1	IDOE Biology Standards PDF: media.doe.in.gov/standards/indiana-academic-standards-biology.pdf DCI Vertical Articulation: secure.in.gov/doe/files/Disciplinary-Core-Ideas-9.23.pdf
ILEARN Biology Performance Level Descriptors (PLDs)	Biology teacher	Before Q4 ECA review	IDOE PLDs document — available on Indiana Assessment Portal and inlearninglab.com
Equity in Biology — Supporting ELL and IEP Students	Biology teacher	Year 1	OpenSciEd embedded supports in every unit + BSCS resources + IDOE ELL Science guidance

Key IDOE & Biology Resource Links

Indiana Biology Standards (2023): media.doe.in.gov/standards/indiana-academic-standards-biology.pdf
 ILEARN Biology ECA Test Blueprint: in.gov/doe/files/ILEARN-Biology-Test-Blueprint.pdf
 IDOE Science & CS Standards Page: secure.in.gov/doe/students/indiana-academic-standards/science-and-computer-science/
 IDOE Biology Frameworks (IN Learning Lab): inlearninglab.com (search '2023 Biology Frameworks')
 IDOE DCI Vertical Articulation Guide: secure.in.gov/doe/files/Disciplinary-Core-Ideas-9.23.pdf
 ILEARN Assessment Contact: INassessments@doe.in.gov | (317) 232-9050 | secure.in.gov/doe/students/assessment/ilearn/
 OpenSciEd HS Biology (FREE — All-Green EdReports): opensci.ed.org/curriculum/high-school/
 HHMI BioInteractive (FREE labs + videos + activities): biointeractive.org
 New Visions Biology Curriculum (FREE): newvisions.org/curriculum/science/biology
 BSCS Science Learning (5E model developers): bscs.org
 Amoeba Sisters (FREE videos + worksheets): amoebasisters.com
 Concord Consortium Simulations (FREE): concord.org
 Khan Academy AP Biology (FREE): khanacademy.org/science/ap-biology
 IDOE Teaching and Learning: teachingandlearning@doe.in.gov | General: 1-317-232-6610

School-Wide Biology Authorization

Principal / Head of School Signature: _____ Date: _____ _____	Science Coordinator / Coach Signature: _____ Date: _____ _____	Effective Date School Year: 2025–2026 Standards: 2023 IAS Biology (NGSS)
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