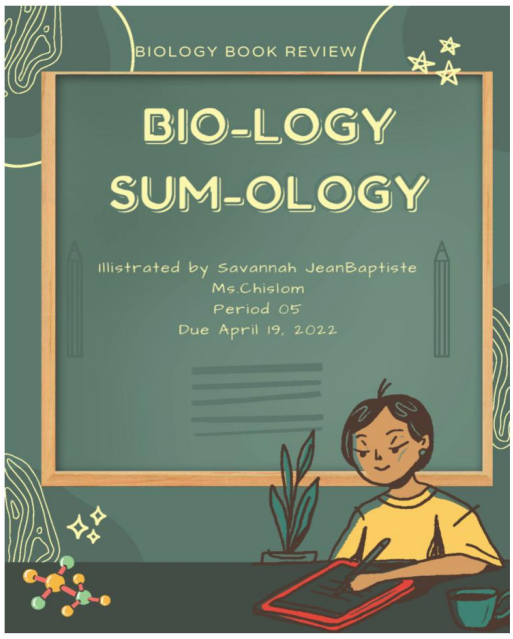
FROM LEARNER TO AUTHOR

Creating Student-Designed Biology Workbooks Through Project-Based Learning

A Replicable High School Biology Project for Research, Writing, Design, and Peer Teaching



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1. Project Overview and Rationale

Project Summary

From Learner to Author is a project-based biology experience in which high school students transform their course knowledge into a complete instructional workbook designed for a younger audience. Students research, synthesize, explain, illustrate, organize, assess, revise, and publish biology content rather than simply completing a conventional review assignment.

The model is grounded in an authentic question: How can I use what I know about biology to create a resource that helps a younger student understand biology?

Why the project works

- Students must retrieve and apply prior knowledge before identifying what they need to research.
- Students practice scientific research and source evaluation while developing accurate explanations.
- Students translate complex biology into language and visuals appropriate for a middle school learner.
- Students create activities that allow another learner to practice the concept.
- Students publish a tangible product, giving the work an authentic purpose and audience.
- Students receive feedback, revise, and reflect on both biology mastery and communication.

2. Goals and Student Learning Objectives

Overall Goal

Students will demonstrate biology content mastery by creating an accurate, organized, visually engaging instructional workbook that can be used to teach essential biology concepts to a younger learner.

Students will:

- Activate and document prior knowledge before beginning new research.
- Identify content gaps and formulate research questions.
- Locate and evaluate credible science information.
- Paraphrase and synthesize information rather than copy sources.
- Explain biology concepts accurately in age-appropriate language.
- Organize content into chapters, lessons, examples, visuals, and activities.
- Develop and apply scientific vocabulary.
- Create learning activities and questions that reinforce content.
- Use citations and compile a bibliography.
- Participate in peer review and revise for accuracy, clarity, and organization.
- Produce and present a final bound workbook.
- Reflect on how the process changed their understanding of biology and their ability to communicate science.

Cognitive outcomes

Students analyze, evaluate, synthesize, and create. The project requires them to make decisions about what information is essential, how concepts should be sequenced, what examples will help a younger learner, and how understanding can be checked.

Affective outcomes

Students develop ownership, confidence, persistence, creativity, and a sense of purpose by producing an authentic product that represents their learning.

3. Florida Standards Alignment

The following standards are used to anchor the science, inquiry, and communication demands of the project. Science standards are verified against CPALMS; the project also intentionally integrates literacy skills through research, explanatory writing, vocabulary, and source citation.

Standard	Connection to the Project
SC.912.N.1.1	Students define a biology problem/topic, pose questions, conduct systematic research/investigation, communicate results, and evaluate explanations produced by others.
SC.912.N.1.4	Students identify sources of information and assess reliability according to standards of scientific investigation.
SC.912.L.14.1	Students describe cell theory and connect its development to the process of science; cell concepts may become workbook chapters.
SC.912.L.17.5	Students analyze population size, limiting factors, and carrying capacity; these concepts may be developed into explanatory lessons and activities.
SC.912.L.17.9	Students use food webs to distinguish producers, consumers, and decomposers and explain energy transfer through trophic levels.

Literacy integration: Students read informational science sources, paraphrase and synthesize information, develop domain-specific vocabulary, write explanations, and cite references. If the teacher uses a district-specific ELA benchmark list, those local benchmarks can be added without changing the project structure.

4. Course Outline and Workbook Architecture

The student workbook follows the original classroom project structure while allowing teachers to adapt the number and sequence of chapters to their current Biology course outline.

Workbook Section	Student Product
Cover Page	Creative title, image, author, teacher/subject, period and due date
Optional Dedication	Short personal statement about the student's learning journey
Table of Contents	Chapters, lessons/activity sheets, glossary, bibliography and page numbers
Chapters & Lessons	Student-written explanations of biology content with visuals and activities
Activity Sheets	Questions, diagrams, mini-investigations, vocabulary practice, or other learning tasks
Glossary	Alphabetized biology vocabulary with student-friendly definitions
Bibliography	Sources used for research and visuals
Final Production	Page numbering, proofreading, printing and binding

The original rubric awards points for the cover, optional dedication, table of contents, chapters/lesson reviews, glossary, bibliography, and binding, for a maximum of 50 points.

Model evidence: The sample student's table of contents lists chapters and activity sheets and ends with glossary and bibliography sections

5. Project-Based Learning Framework

“How can I use what I know about biology to create a resource that helps a younger student understand biology?”

Authentic roles

- Researcher
- Scientist
- Writer
- Curriculum Designer
- Illustrator/Designer
- Assessment Writer
- Peer Reviewer
- Teacher/Peer Educator
- Author

Learning cycle

Phase	**Student Thinking**	**Evidence**
Connect	What do I already know?	Concept map / K-W-L / pre-assessment
Question	What do I still need to know?	Research questions
Research	Which sources are credible?	Source notes and citations
Synthesize	What is essential?	Outline and paraphrase
Design	How should I teach it?	Lesson + visual + activity
Test	Will another student understand it?	Peer review / mini-teaching
Revise	What should I improve?	Edited draft
Publish	Can I present this professionally?	Bound workbook
Reflect	What did I learn by teaching it?	Reflection

Core instructional shift: students move from “show me that you know it” to “show me that you understand it well enough to teach it.”

6. Step-by-Step Implementation Guide

Step 1 — Launch with the Model

Show students a completed workbook and ask what makes it useful to a younger learner.

Step 2 — Activate Prior Knowledge

Use a K-W-L, concept map, quick-write, vocabulary inventory, or pre-assessment.

Step 3 — Map the Course

Students identify the chapters/lessons required by the teacher's course outline.

Step 4 — Research

Students consult class materials and teacher-approved credible sources; they record source information as they work.

Step 5 — Draft the Lesson

Students explain the biology concept, add examples, vocabulary, and a visual.

Step 6 — Create an Activity

Students design a task that requires the younger learner to use the concept.

Step 7 — Peer Review

Students use a checklist to test accuracy, clarity, age-appropriateness, and completeness.

Step 8 — Revise and Edit

Students correct science, writing, citations, visuals, and formatting.

Step 9 — Assemble the Workbook

Students finalize page numbers, table of contents, glossary and bibliography.

Step 10 — Publish and Share

Students print/bind the workbook and, when possible, teach a selected lesson to a younger audience.

Teacher checkpoint system

- Checkpoint A: topic/content map approved.
- Checkpoint B: research notes and sources reviewed.
- Checkpoint C: one completed lesson/activity reviewed.
- Checkpoint D: peer-review evidence collected.
- Checkpoint E: final publication checklist completed.

7. Prior Knowledge, Research, and Scientific Literacy

The project deliberately begins with what students already know. Prior knowledge is not treated as the final answer; it becomes the starting point for identifying questions and research needs.

Student Prompt	**Instructional Purpose**
What do I already know?	Retrieval and metacognition
What am I unsure about?	Identify misconceptions and knowledge gaps
What do I need to research?	Formulate focused questions
Which sources can I trust?	Evaluate reliability
How can I explain this without copying?	Paraphrase and synthesize
What evidence supports my explanation?	Scientific reasoning
How would I teach this to a younger student?	Audience awareness and communication

Research mini lesson

- Model the difference between a source and a claim.
- Show students how to record author/title/site information while researching.
- Require students to paraphrase before writing the final lesson.
- Have students compare two sources and justify which is more reliable.
- Require a bibliography entry for every source used.
- Teach students to distinguish their own explanation from information taken from a source.

8. Classroom Activities and Student Workshop Tasks

Prior-Knowledge Concept Map

Students place a biology topic in the center and map facts, vocabulary, examples, and questions they already have.

60-Second Scientist

Students explain one concept from memory in 60 seconds, then identify what their explanation was missing.

Source Detective

Students compare teacher-provided sources and rank them for credibility, explaining their reasoning.

Teach It Younger

Students rewrite one technical paragraph so that a middle school learner could understand it without losing scientific accuracy.

Make It Visual

Students turn a written process into a labeled diagram, flowchart, model, or sequence.

Create the Learning Check

Students write three multiple-choice questions, two vocabulary questions, and one application question.

Peer-Teacher Test

A partner reads the lesson and identifies confusing language, missing information, or unanswered questions.

Glossary Challenge

Students select essential terms and write concise, student-friendly definitions in alphabetical order.

Gallery Walk

Students display draft pages; classmates leave feedback on scientific accuracy, clarity, visuals, and engagement.

Publication Day
Students assemble, number, proofread, bind, and present their finished workbooks.

9. Assessment, Rubric, and Evidence of Learning

Original 50-point student rubric

Component	Points
Cover Page	5
Optional Dedication	1
Table of Contents	5
Chapter/Lesson Reviews	20
Glossary	5
Bibliography/References	2
Binding	10
Total	50

The original rubric converts the 50-point project into a course grade and emphasizes both academic content and the quality of the completed book.

Recommended formative assessment evidence

- Prior-knowledge organizer
- Research/source log
- Chapter outline
- Draft lesson
- Activity prototype
- Peer-review checklist
- Revision evidence
- Final workbook
- Student reflection

Recommended teacher feedback categories

Category	Look For
Accuracy	Biology is scientifically correct.
Research	Sources are credible, relevant, and cited.
Communication	Explanation is clear and audience-appropriate.
Design	Visuals support understanding.
Engagement	Activities require students to use the concept.
Revision	Feedback results in visible improvement.

10. Differentiation and Student Support

Learner Need	Possible Scaffold
Needs writing support	Sentence starters, paragraph frames, teacher conference, model lesson
Needs research support	Curated source bank, source-evaluation checklist, guided notes
Needs organization support	Chapter planner, checklist, color-coded milestones
English learners	Visual vocabulary, bilingual glossary option, oral rehearsal before writing
Advanced learners	Primary-source research, data interpretation, additional application task
Students who prefer collaboration	Partner chapter, peer-editor role, shared research plan
Students with technology limitations	Paper templates, printed sources, hand-drawn visuals

Universal design choices

- Offer print or digital drafting.
- Allow students to choose visual formats.
- Provide multiple ways to demonstrate understanding.
- Break the final product into small checkpoints.
- Use peer teaching to provide an authentic reason for revision.

Teacher note: differentiation should change the support pathway, not the expectation that students understand, explain, and communicate biology.

11. Materials, Technology, and Estimated Costs

Resource	Purpose	Approximate Cost
Biology textbook/class notes	Content reference and course alignment	Existing classroom resource
Computer/tablet	Research, writing and design	Existing school resource
Google Docs / Microsoft Word	Drafting and editing	Typically existing/available
Canva or comparable design tool	Optional visual design	Free/education access if available
Printer + paper	Final production	Approx. $3–$8/student depending on length
Color cover paper	Professional presentation	Approx. $0.25–$1/student
Binding service	Final publication	Approx. $2–$7/student
Graphic/diagram supplies	Hand-drawn visuals	Approx. $0–$3/student
Estimated total		

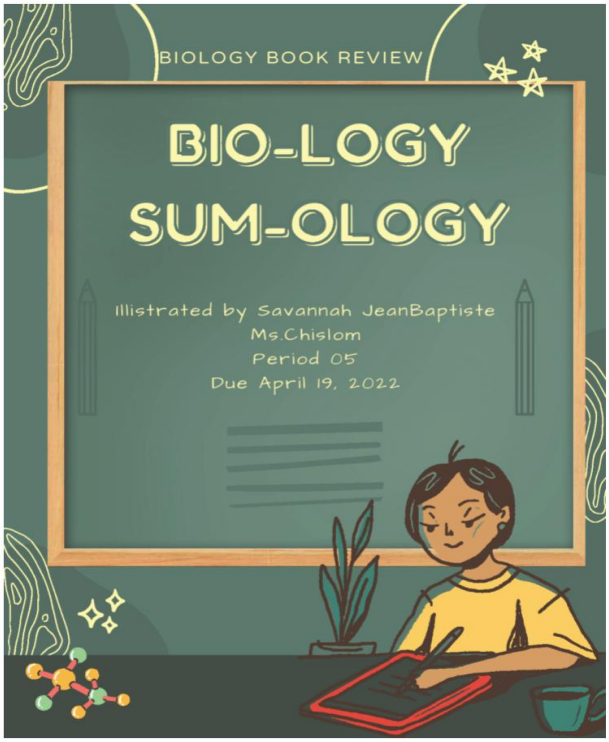
$5 – $15 per student

Cost varies with page count, color printing, and whether binding is completed at school or through a copy/binding service. Teachers can substantially reduce costs by using black-and-white printing or a digital final product.

Resource categories required by the Education Fund guidelines include books, mobile devices, apps, internet sites, audiovisual/software resources, supplies, supplemental materials, suppliers and approximate prices, and applicable organizations/field trips/speakers.

12–13. Student Work Sample and Teacher Replication Guide

Student Work Sample



The student sample is a completed Biology Book Review with a student-created title page. The larger project contains a table of contents, chapter explanations, activity sheets, glossary, and bibliography.

Teacher Replication Guide

- Choose the biology course outline or unit sequence students must cover.
- Decide whether students work individually, in pairs, or as chapter teams.
- Provide the 50-point rubric and convert it into milestone checklists.
- Create a teacher-approved research/source list.
- Schedule weekly checkpoints so the project does not become a last-minute compilation.
- Require one complete lesson and activity before students produce the remaining chapters.
- Use peer review to test the workbook from the learner's perspective.
- Finish with publication, presentation, or a peer-teaching opportunity.

14–15. Implementation Timeline, Reflection and Copyright Notes

Suggested 8-week implementation

Week	Milestone
1	Launch project; examine model; activate prior knowledge; map chapters
2	Research skills; source evaluation; research notes
3	Draft first chapter/lesson
4	Create visuals and activity sheets
5	Peer review and revision
6	Complete remaining chapters and glossary
7	Bibliography, editing, formatting, page numbering
8	Print, bind, present, and reflect

Teacher reflection questions

- What evidence shows that students' biology understanding has deepened?
- Which research skills improved?
- Did students become better at explaining science to another audience?
- Which activity produced the strongest engagement?
- What scaffolds were most effective?
- How could the final workbook be used by another class or younger learners?