

Zero Textbook Cost (ZTC) Acceleration Grant Collaboration Cohort Biology Final Report

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INTRODUCTION

The Biology Collaboration Cohort consisted of five colleges. Three of the five colleges are working on the Biology Associate in Science for Transfer (AS-T), three are working on local biology degrees, and one is working on both.

The Biology Collaboration Cohort convened synchronously via Zoom on March 19, 2024. The ASCCC OERI presented the cohort with the results of the data collection process and asked for clarity where data were missing. In addition, the ASCCC OERI presented available OER for the cohort's consideration. An Anatomy and Physiology Subgroup was created and convened on April 8, 2024 and May 9, 2024 to discuss potential collaboration. These biology courses, as well as microbiology, are not part of the Biology AS-T, but are required courses in other certificates and degrees.

COLLABORATION COHORT PURPOSE

The Academic Senate for California Community Colleges (ASCCC) Open Educational Resources Initiative (OERI) facilitated the work of the ZTC Acceleration Grant Biology Collaboration Cohort. Although this process was introduced to prevent the duplication of effort, it also provides a means to ensure the awareness of available OER and other sustainable means of achieving ZTC status, share OER development plans, and identify opportunities for collaboration across colleges. At the conclusion of the cohort process, the OERI will provide a report to the California Community Colleges Chancellor's Office (CCCCO) that will document the work of the cohort, verify the absence of duplicative plans, and/or delineate how duplication will be prevented or minimized.

BIOLOGY COLLABORATION COHORT – MEMBER COLLEGES AND ZTC PATHWAYS

The Biology Collaboration Cohort consisted of the following colleges that were working on the indicated pathways:

- Berkeley City College - Biology Associate in Science for Transfer (AS-T)
- City College San Francisco (CCSF) - Biological Sciences (Emphasis Health Science) Associate of Science (AS)
- Cosumnes River College (CRC) - Biology AS-T and Biology: Pre-Nursing Option AS
- Fresno City College - Human Biology AS
- Palomar College - Biology AS-T

STATUS OF BIOLOGY REQUIRED CORE COURSES SPECIFIED IN THE BIOLOGY TRANSFER MODEL CURRICULUM AT COHORT COLLEGES WORKING ON THE BIOLOGY AS-T

The Biology Transfer Model Curriculum (TMC) specifies various course combinations that provide the content necessary for the Biology AS-T. At present, all three colleges that are working on the AS-T report having established the core courses as ZTC. Two, however, report on-going efforts to address the cost of lab manuals and the need to update some resources.

- Berkeley – Currently using locally created materials and OER. Exploring ways to make lab manual's ZTC due to printing costs.
- CRC – Currently ZTC. Will be updating and revising materials including openly licensing the homegrown lab manual.
- Palomar – Currently ZTC

STATUS OF BIOLOGY LIST A COURSES SPECIFIED IN THE BIOLOGY TRANSFER MODEL CURRICULUM AT COHORT COLLEGES AT COHORT COLLEGES WORKING ON THE BIOLOGY AS-T

General Chemistry for Science Majors

- Berkeley – ZTC will be established when the need for a printed lab manual has been addressed.
- CRC – Adapting or adopting existing OER.
- Palomar – Currently ZTC.

Calculus

- Berkeley – Currently ZTC.
- CRC – Adopting existing OER.
- Palomar – OER starting point has yet to be determined.

Physics

- Berkeley – Currently ZTC.
- CRC – Adopted [College Physics \(OpenStax on LibreTexts, OER\)](#). Faculty working to adopt/create open homework through ADAPT.
- Palomar – OER starting point has yet to be determined.

STATUS OF COURSES IN OTHER BIOLOGY DEGREES FOR TRANSFER COHORT COLLEGES

Anatomy and Physiology (various C-ID designations)

- CCSF – Adapting in-house lab manual. Collaborating on lab manual and text revisions/additions for physiology courses with FCC.
- CRC – Adapting [Anatomy and Physiology 2e \(OpenStax\) \(CC BY\)](#)
- Fresno – Adapting [Anatomy and Physiology 2e \(OpenStax\) \(CC BY\)](#). Collaborating on lab manual and text revisions/additions for physiology courses with CCSF.

Microbiology (No C-ID)

- CCSF - Creating new openly licensed microbiology ancillaries in collaboration with Palo Verde College and College of the Canyons
- CRC – Adapting [Microbiology \(OpenStax\)](#)
- Fresno – Creating new OER

Introduction to Chemistry (C-ID CHEM 101)

- CCSF – No information provided
- CRC – [Adapting Fundamentals of General Organic and Biological Chemistry \(LibreTexts\)](#)
- Fresno – Adapting existing OER (not specified)

Other Courses

- Introduction to Nutrition Science (C-ID NUTR 110)
 - CRC - Adapting [Human Nutrition 2nd Ed.](#)
- Introductory Psychology (C-ID PSY 110)
 - CCSF – No information provided
 - CRC - [Adapting Introductory Psychology 1e \(OpenStax\)](#)
- Introduction to Lifespan Development (C-ID PSY 180)
 - CCSF – No information provided
 - CRC - [Adapting Human Development Life Span \(Overstreet\)](#)
- Introduction to Statistics (C-ID MATH 110)
 - CCSF – No information provided
- Elements of Public Speaking (C-ID COMM 110)
 - CCSF – No information provided
- Interpersonal Communication (C-ID COMM 130)
 - CCSF – No information provided

CONCLUSIONS

Courses within the Biology discipline appear to be well-served by OER with most plans consisting of adapting existing OER to meet local needs. However, a significant barrier for colleges converting lab courses to ZTC is lab printing costs. The ASCCC OERI recommends participants advocate to institutionalize covering printing costs for lab manuals.

The Biology Collaboration Cohort has resulted in a collaborative project for Anatomy and Physiology courses. All cohort participants have access to the collaborative plans to ensure they can consider adopting the products upon completion.

The ASCCC OERI recommends that any college with “No information provided” listed in the sections above review the cohort plans and consider adoption before OER creation. There is no evidence for duplication of efforts amongst the proposed plans.

APPENDIX 1 – COURSES SPECIFIED IN THE BIOLOGY TRANSFER MODEL CURRICULUM (TMC)

Course Title	C-ID Designation (if applicable)
Biology TMC Required Core	
Biology Sequence for Majors OR	BIOL 135S
Cell and Molecular Biology and Organismal Biology OR	BIOL 190 and BIOL 140
Cell and Molecular Biology and Organismal Biology, Ecology and Evolution OR	BIOL 190 and BIOL 130S
Cell and Molecular Biology and Zoology/Animal Diversity and Evolution and Botany/Plant Diversity and Ecology	BIOL 190, BIOL 150, and BIOL 155
Biology TMC - List A Required Courses	
General Chemistry for Science Majors Sequence A	CHEM 120S
Single Variable Calculus I – Early Transcendentals, Single Variable Calculus I – Late Transcendentals, or Calculus for Life and Social Sciences	MATH 210, MATH 211, or other articulated course (no C-ID)
Physics: Algebra/Trigonometry-Based Physics A and B or Calculus-Based Physics for Scientists and Engineers: A and B or Algebra/Trigonometry-Based Physics: AB	PHYS 105 and PHYS 110 or PHYS 205 and PHYS 210 or PHYS 100S

APPENDIX 2 – OPEN EDUCATIONAL RESOURCES AND THE BIOLOGY TRANSFER MODEL CURRICULUM

Access additional resources at [OER and the Biology TMC](#) .

Biology Required Core (Select one option):

Option 1 - Biology Sequence for Majors ([C-ID BIOL 135S](#))

- [Biology I Laboratory Manual \(Faculty of College of the Redwoods and Tidewater Community College, n.d.\) – LumenLearning](#)
- [Principles of Biology I Lab Manual \(Burran and DesRochers, 2015\) – GALILEO \(CC BY-SA 4.0\)](#)
- [Biology 2nd Edition \(Clark et al., 2018\) – OpenStax \(CC BY 4.0\)](#)
- [Biofundamentals \(Klymkowsky and Cooper, 2021\) – LibreTexts \(CC BY-NC-SA 3.0\)](#)

Option 2

Cell and Molecular Biology ([C-ID BIOL 190](#))

- [Principles of Biology \(Bartee et al., n.d.\) – Open Oregon \(CC BY 4.0 International\)](#)
- [Basic Cell and Molecular Biology 4th edition \(Bergtrom, 2020\) – University of Wisconsin, Milwaukee \(CC BY 4.0 International\)](#)

And Organismal Biology ([C-ID BIOL 140](#)) - See “Biology Sequence for Majors”

Option 3

Cell and Molecular Biology ([C-ID BIOL 190](#)) See above

And Organismal Biology, Ecology, and Evolution ([C-ID BIOL 130S](#)) See “Biology Sequence for Majors”

Option 4

Cell and Molecular Biology ([C-ID BIOL 190](#)) See above

And Zoology/Animal Diversity and Evolution ([C-ID BIOL 150](#)) No resources identified.

And Botany/Plant Diversity and Ecology ([C-ID BIOL 155](#))

- [A Photographic Atlas for Botany \(Morrow, 2020\) – ASCCC OERI \(CC-BY-NC\)](#)
- [Inanimate Life \(Briggs, 2021\) – Milne Open Textbooks \(CC BY-SA\)](#)
- [Botany \(Ha et al., 2021\) – LibreTexts \(CC BY-NC\)](#)

List A Supporting Science and Mathematics Courses

General Chemistry for Science Majors ([C-ID CHEM 120S](#))

- [OpenStax Chemistry \(Flowers et al.; 2019\) \(CC BY\)](#)
- [OpenStax Chemistry 2e Atoms First \(Flowers, et al.; 2019\) \(CC BY\)](#)
- [General Chemistry: Principles, Patterns, and Applications \(Averill and Eldredge, 2011\) – LibreTexts \(CC BY-NC-SA\)](#)

Single Variable Calculus I – Early Transcendentals ([C-ID MATH 210](#)) or Single Variable Calculus I – Late Transcendentals ([C-ID MATH 211](#))

- [Contemporary Calculus I \(Hoffman\) \(CC BY\)](#)
- [Community Calculus \(Guichard\) \(CC BY-NC-SA\)](#)
- [APEX Calculus 1 \(Hartman\);](#)
- [Calculus Vol 1 \(Strang, Herman\) – OpenStax](#)

Algebra/Trigonometry-Based Physics A ([C-ID PHYS 105](#)) and B ([C-ID PHYS 110](#)) or Calculus-Based Physics for Scientists and Engineers: ABC ([C-ID PHYS 100S](#))

- [College Physics \(OpenStax, 2020\)](#)
- [Light and Matter \(Crowell, 2020\) \(CC BY-SA 3.0\)](#)
- [Spiral Physics \(D'Alessandris\) \(CC BY-NC-SA\) – LibreTexts](#)

or Calculus-Based Physics for Scientists and Engineers A ([C-ID PHYS 205](#)) and B ([C-ID PHYS 210](#))

- [Classical Mechanics \(Tom Weideman\) – LibreTexts \(CC BY-SA\)](#)
- [Electricity and Magnetism \(Tom Weideman\) – LibreTexts \(CC BY-SA\)](#)
- [University Physics Volume 1 \(OpenStax, 2020\) \(CC BY 4.0\)](#)
- [University Physics Volume 2 \(OpenStax, 2020\) \(CC BY 4.0\)](#)

APPENDIX 3 – OTHER BIOLOGY PATHWAYS

City College San Francisco – Biological Sciences (Emphasis Health Science) Associate of Science

- CHEM 32 - Introduction to Medical Chemistry or CHEM 101A - General College Chemistry (C-ID CHEM 110)
- MATH 80 - Probability and Statistics (C-ID MATH 110)
- BIO 108 - General Human Anatomy (C-ID BIO 110B)
- BIO 112 - Introduction to Human Physiology (C-ID BIO 102B)
- BIO 120 - Introduction to Microbiology
- CMST 1A - Elements of Public Speaking (C-ID COMM 110) or CMST 20 - Interpersonal Communication (C-ID COMM 130)
- PSYC 1 - General Psychology (C-ID PSY 110) or PSYC 21 - Lifespan Development (C-ID PSY 180)

Cosumnes River College: Biology: Pre-Nursing Option Associate of Science

- BIOL 440 - General Microbiology
- BIOL 430 - Anatomy and Physiology (C-ID BIOL 115S)
- BIOL 431 - Anatomy and Physiology (C-ID BIOL 115S)
- CHEM 305 - Introduction to Chemistry (C-ID CHEM 101)
- NUTRI 300 - Nutrition (C-ID NUTR 110)
- FCS 324 - Human Development: A Life Span (C-ID PSY 180)
- PSYC 300 - General Principles (C-ID PSY 110)

Fresno City College: Human Biology AS

- BIOL 31 - Microbiology
- CHEM 3A - Introductory General Chemistry (C-ID CHEM 101)
- Select one Anatomy and Physiology Sequence:
 - BIOL 20, Human Anatomy AND BIOL 22, Human Physiology C-ID BIOL 110B and 120B) OR
 - BIOL 21A, Human Anatomy & Physiology I and BIOL 21B, Human Anatomy & Physiology II (C-ID BIOL 115S)

APPENDIX 4 – OPEN EDUCATIONAL RESOURCES FOR BIOLOGY COURSES SPECIFIED IN OTHER BIOLOGY COLLABORATION COHORT PATHWAYS

Human Anatomy with Lab ([C-ID BIOL 110B](#))

Lecture Materials

- [Human Anatomy \(Menefee et al., 2021\) – LibreTexts \(CC-BY\)](#)

APPENDIX 5 – RESOURCES IN USE OR IDENTIFIED BY BIOLOGY COLLABORATION COHORT COLLEGES

Resource	Course(s)	College(s)
Botany (Ha, Morrow, and Algiers) (CC BY-NC)	Botany/Plant Diversity and Ecology (C-ID BIOL 155)	CRC
A Photographic Atlas for Botany (CC BY-NC)	Botany/Plant Diversity and Ecology (C-ID BIOL 155)	CRC
Biology 2e (OpenStax) (CC BY)	Bio Sequence for Majors (C-ID BIOL 135S)	CRC, BCC
Microbiology (OpenStax) (CC BY)	Microbiology	CCSF
Anatomy and Physiology 2e (OpenStax) (CC BY)	Anatomy and Physiology	CCSF, CRC
Chemistry: A Molecular Approach (Tro) (CC BY-NC-SA)	General Chemistry for Science Majors Sequence A (C-ID CHEM 120S)	CRC
Map: Fundamentals of General Organic and Biological Chemistry	Intro to Chemistry (C-ID CHEM 101)	CRC
Calculus Volume 1 (OpenStax) (CC BY-NC-SA)	Single Variable Calculus I – Early Transcendentals (C-ID MATH 210)	BCC
Math 400: Calculus I - Differential Calculus	Single Variable Calculus I – Early Transcendentals (C-ID MATH 210)	CRC (adapting)
College Physics 2e (OpenStax) (CC BY)	Physics: Algebra/Trigonometry-Based Physics A (PHYS 105); Physics: Algebra/Trigonometry-Based Physics B (PHYS 110)	BCC
Introductory Psychology (OpenStax) (CC BY)	Introductory Psychology (C-ID PSY 110)	CRC (adapting)
Human Development Life Span (Overstreet) (CC BY)	Introduction to Lifespan Development (C-ID PSY 180)	CRC (adapting)
Human Nutrition 2nd Ed. (CC BY-NC-SA)	Introduction to Nutrition Science (C-ID NUTR 110)	CRC (adapting)

APPENDIX 6 – ANTICIPATED NEW OPEN EDUCATIONAL RESOURCES

Microbiology

CCSF: Creating new OER microbiology ancillaries in collaboration with Palo Verde College and College of the Canyons (non-cohort colleges)

FCC: Creating new OER

Anatomy and Physiology

CCSF and FCC: Collaborating on lab manual and text revisions/additions to [Anatomy and Physiology 2e \(OpenStax\) \(CC BY\)](#) for standalone Physiology courses

APPENDIX 7 – ZTC ACCELERATION GRANT BIOLOGY COLLABORATION COHORT MEMO



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Cohort Participants and Data Collection

The following colleges participated in the Biology Collaboration Cohort:

- Berkeley City College (BCC) - Biology Associate in Science for Transfer (AS-T)
- Cosumnes River College (CRC) - Biology AS-T and Biology: Pre-Nursing Option Associate of Science (AS)
- Fresno City College (FCC) - Human Biology AS
- Palomar College - Biology AS-T
- City College San Francisco (CCSF) - Biology with Health Emphasis AS
- San Diego City College (SD City) - Allied Health AS (no longer pursuing funding)

The ASCCC OERI collected course level data for each of the pathways including current Zero Textbook Cost (ZTC) status, adopted resources, and plans to convert a course to ZTC to identify overlap and areas of potential collaboration. Since colleges are converting a variety of degrees, the courses were grouped using the Biology (BIOL) Transfer Model Curriculum (TMC) and any other overlapping requirements to identify commonalities.

Cohort Convening

The Biology Collaboration Cohort convened synchronously via Zoom on March 19. The ASCCC OERI presented the cohort with the results of the data collection process and asked for clarity where data were missing. In addition, the ASCCC OERI presented available OER for the cohort's consideration. An Anatomy and Physiology Subgroup was created and convened on April 8 and May 9 to discuss potential collaboration. These biology courses, as well as microbiology, are not part of the Biology AS-T, but are required courses in other certificates and degrees.

Findings

The status and plans for the required Biology AS-T, Microbiology, Anatomy and Physiology courses are listed below.

Biology AS-T Core

- BCC – Currently using locally created materials and OER. Exploring ways to make lab manual's ZTC due to printing costs.
- CRC – Currently ZTC. Will be updating and revising materials including openly licensing the homegrown lab manual.
- Palomar – Currently ZTC

Microbiology

- CCSF - Creating new OER microbiology ancillaries in collaboration with Palo Verde College and College of the Canyons
- CRC – Adapting [Microbiology \(OpenStax\)](#)
- FCC – Creating new OER

Anatomy and Physiology

- CCSF – Adapting in-house lab manual. Collaborating on lab manual and text revisions/additions for Physiology courses with FCC.
- CRC – Adapting [Anatomy and Physiology 2e \(OpenStax\) \(CC BY\)](#)
- FCC – Adapting [Anatomy and Physiology 2e \(OpenStax\) \(CC BY\)](#). Collaborating on lab manual and text revisions/additions for Physiology courses with CCSF.

Conclusions

A significant barrier for colleges converting lab courses to ZTC is lab printing costs. The ASCCC OERI recommends participants advocate to institutionalize covering printing costs for lab manuals.

The Biology Collaboration Cohort has resulted in a collaborative project for Anatomy and Physiology courses. All cohort participants have access to the collaborative plans to ensure they can consider adopting the products upon completion. A description of the project will be provided in the final report for the field's consideration.

The ASCCC OERI recommends that any college with “plan pending” listed in the sections above review the cohort plans and consider adoption before OER creation. There is no evidence for duplication of efforts amongst the proposed plans.