

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

Table of Contents

Zero Textbook Cost (ZTC) Acceleration Grant Collaboration Cohort Physics Final Report.....	1
Introduction	3
Collaboration Cohort Purpose.....	3
Physics Collaboration Cohort – Member Colleges and ZTC Pathways	3
Status of Courses Specified in the Physics Transfer Model Curriculum at cohort colleges	4
Calculus Based Physics for Scientists and Engineers: ABC (C-ID PHYS 200S or C-ID PHYS 205, C-ID PHYS 210, and C-ID PHYS 215).....	4
Single Variable Calculus Sequence and Multivariable Calculus (MATH 900S and MATH 230 or MATH 210, MATH 220, and MATH 230 or MATH 211. MATH 221, and MATH 230)	4
Physics Collaboration Cohort Projects.....	5
Homework Collaborative Project	5
Text and Image Revisions Collaborative Project	5
Individual College Projects	6
Conclusions	6
Appendix 1 – The Physics Transfer Model Curriculum.....	7
Appendix 2 – The Environmental Science Transfer Model Curriculum	8
Appendix 3 – Resources in use or Identified by Physics Collaboration Cohort Colleges.....	9
Appendix 4 – Available OER for the Physics Transfer Model Curriculum.....	10
Appendix 5 – Available OER for the Environmental Science Transfer Model Curriculum	12
Biology and Chemistry.....	12
Intro to Environmental Science (C-ID ENVS 100).....	12
Geology or Geography	13
Introduction to Statistics (C-ID MATH 110)	13
Single Variable Calculus I – Early Transcendentals (C-ID MATH 210), Single Variable Calculus I – Late Transcendentals (C-ID MATH 211), or Business Calculus (C-ID MATH 140).....	13
Principles of Microeconomics (C-ID ECON 201).....	13
Physics Algebra/Trigonometry – Based Physics AB (C-ID PHYS 100S) or Calculus-Based Physics for Scientists and Engineers: A (C-ID PHYS 205) and Calculus-Based Physics for Scientists and Engineers: B (C-ID PHYS 210)	14
Appendix 6 – Anticipated New Open Educational Resources.....	15

Appendix 7 – ZTC Acceleration Grant Physics Collaboration Cohort Memo	16
Cohort Participants and Data Collection	16
Cohort Convening.....	16
Findings	16
Calculus Based Physics for Scientists and Engineers: ABC (C-ID PHYS 200S or C-ID PHYS 205, C-ID PHYS 210, and C-ID PHYS 215).....	17
Calculus	17
Conclusions	18

INTRODUCTION

Seven colleges participated in the Physics Collaboration Cohort and all but one, Yuba College, are working on establishing a Physics Associate of Science for Transfer (AS-T) Zero Textbook Cost (ZTC) pathway. Yuba is working on establishing an Environmental Science AS-T ZTC pathway. Although there is minimal overlap between the Physics and Environmental Science degrees, it was determined that the Physics Collaboration Cohort would be able to facilitate Yuba's work.

The Physics AS-T requires two 3-semester series:

- Calculus Based Physics for Scientists and Engineers and
- Single-Variable Calculus.

While the Environmental Sciences AS-T contains some physics and calculus courses, it only requires two semesters of physics and allows for algebra-based physics to be used. In addition, it only requires one term of calculus. In addition, it requires one environmental science course, one economics course, biology, chemistry, and geology or geography. Plans and OER adoptions for courses outside of the physics and math disciplines are included in Appendix 3 and Appendix 6.

COLLABORATION COHORT PURPOSE

The Academic Senate for California Community Colleges (ASCCC) Open Educational Resources Initiative (OERI) facilitated the work of the ZTC Acceleration Grant Physics 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.

PHYSICS COLLABORATION COHORT – MEMBER COLLEGES AND ZTC PATHWAYS

The following colleges participated in the Physics Collaboration Cohort. The target pathways for each of the colleges are specified below.

- Cosumnes River College (CRC) – Physics AS-T
- Cuyamaca College – Physics AS-T
- Los Angeles Mission College (LAMC) – Physics AS-T
- Napa Valley College (Napa) – Physics AS-T
- Riverside City College (RCC) – Physics AS-T
- West Valley College (WVC) – Physics AS-T
- Yuba College - Environmental Science AS-T

The ASCCC OERI collected course level data for each of the courses in the pathway including current ZTC status, adopted resources, and plans to convert a course to ZTC

to identify overlap and areas of potential collaboration. As the Physics AS-T consists of the foundational courses for future study in the discipline, the courses were grouped using the Physics Transfer Model Curriculum (TMC) to identify commonalities.

STATUS OF COURSES SPECIFIED IN THE PHYSICS TRANSFER MODEL CURRICULUM AT COHORT COLLEGES

As homework systems are a commonly reported barrier to achieving ZTC status for courses in the physics discipline, identification of a course as being ZTC in the context of this report is an indication that a course's textbook needs are being met.

Calculus Based Physics for Scientists and Engineers: ABC (C-ID PHYS 200S or C-ID PHYS 205, C-ID PHYS 210, and C-ID PHYS 215)

C-ID PHYS 200S

- ZTC [[University Physics Volume 1 \(OpenStax, 2020\) \(CC BY 4.0\)](#); [University Physics Volume 2 \(OpenStax, 2020\) \(CC BY 4.0\)](#); [University Physics Volume 3 \(OpenStax, 2020\) \(CC BY 4.0\)](#)] – LAMC (additional adaptations planned), Napa, RCC
- Adopting existing OER [[University Physics Volume 1 \(OpenStax, 2020\) \(CC BY 4.0\)](#); [University Physics Volume 2 \(OpenStax, 2020\) \(CC BY 4.0\)](#); [University Physics Volume 3 \(OpenStax, 2020\) \(CC BY 4.0\)](#)] – WVC

C-ID PHYS 205

- ZTC - Yuba
- Adapting existing OER – CRC ([Classical Mechanics](#))

C-ID PHYS 210

- ZTC - Yuba
- Adapting existing OER – CRC ([Electricity and Magnetism](#))

C-ID PHYS 215

- Adapting existing OER – CRC ([University Physics, OpenStax](#))

Single Variable Calculus Sequence and Multivariable Calculus (MATH 900S and MATH 230 or MATH 210, MATH 220, and MATH 230 or MATH 211. MATH 221, and MATH 230)

C-ID MATH 900S

- ZTC – LAMC, WVC

C-ID MATH 210

- ZTC – CRC (Enhancing homework in MyOpenMath and adding remediation videos to remixed version of [Math 400: Calc I - Differential Calc](#)), Cuyamaca
- Adapting [Calculus Volume 1 \(OpenStax\)](#) - Yuba
- Plan pending – RCC, Napa

C-ID MATH 220

- ZTC – CRC (Enhancing homework in MyOpenMath and adding remediation videos to remixed version of [Math 401: Calculus II - Integral Calculus](#)), Cuyamaca
- Plan pending – RCC, Napa

C-ID MATH 230

- ZTC – CRC, LAMC, WVC
- Plan pending – RCC, Napa
- Creating new OER: *Interactive Calculus III on Canvas*. The textbook will embed MyOpenMath within Canvas - Cuyamaca

PHYSICS COLLABORATION COHORT PROJECTS

The Physics Collaboration Cohort has resulted in two collaborative projects for the Calculus-Based Physics for Scientists and Engineers Series.

Homework Collaborative Project

Participants:

CRC, LAMC, Napa, RCC, WVC, and Yuba

Description:

Create homework solution that pairs with a calculus-based physics series (e.g., [University Physics, OpenStax](#)). The homework solution should have the following features:

- auto-graded problems so that students can get immediate feedback on their work.
- problems at a variety of difficulty/mastery levels.
- solutions to the problems should be available in an accessible format

Text and Image Revisions Collaborative Project

Participants:

Cuyamaca, LAMC, Napa, RCC, WVC, and Yuba

Description:

All chapters of the OpenStax University Physics textbook, Volumes 1, 2, and 3 will be reviewed. Inadequate images and gaps will be identified. The group will also review all images of humans in the textbook from a DEI perspective. Replacement images will be created and stored in an open repository for reuse and remixing.

Individual College Projects

- Napa: Revising locally developed resources for weekly problem-solving sessions for accessibility. The work currently lives in PDF format and contains equations, symbols, and diagrams which are laborious to convert to an accessible format.
- Yuba: Updating locally curated and created materials such as lectures, homework, and exams in Canvas.

CONCLUSIONS

The Physics Collaboration Cohort convened synchronously via Zoom on April 24, 2024. The ASCCC OERI presented the group 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. Two follow-up meetings were held to discuss collaborative opportunities on September 16, 2024 and October 25, 2024.

The Physics Collaboration Cohort identified openly-licensed homework as the primary need to convert physics courses. The Cohort has resulted in collaborative efforts around homework and image revisions. All cohort participants have access to the collaborative plans to ensure they can consider adopting the products upon completion. A description of each project will be provided in the final report for the field's consideration. In addition, several colleges plan to adapt existing openly-licensed texts. These projects are focused on adapting materials to meet the needs of their individual courses and are therefore non-duplicative.

APPENDIX 1 – THE PHYSICS TRANSFER MODEL CURRICULUM

Title	C-ID Designation
Calculus Based Physics for Scientists and Engineers: ABC or <ul style="list-style-type: none"> • Calculus Based Physics for Scientists and Engineers: A and • Calculus Based Physics for Scientists and Engineers: B and • Calculus Based Physics for Scientists and Engineers: C 	PHYS 200S or <ul style="list-style-type: none"> • PHYS 205 and • PHYS 210 and • PHYS 215 and
<ul style="list-style-type: none"> • Single Variable Calculus Sequence and • Multivariable Calculus or <ul style="list-style-type: none"> • Single Variable Calculus I – Early Transcendentals and • Single Variable Calculus II – Early Transcendentals and • Multivariable Calculus or <ul style="list-style-type: none"> • Single Variable Calculus I – Late Transcendentals and • Single Variable Calculus II – Late Transcendentals and • Multivariable Calculus 	<ul style="list-style-type: none"> • MATH 900S and • MATH 230 or <ul style="list-style-type: none"> • MATH 210 and • MATH 220 and • MATH 230 or <ul style="list-style-type: none"> • MATH 211 and • MATH 221 and • MATH 230

APPENDIX 2 – THE ENVIRONMENTAL SCIENCE TRANSFER MODEL CURRICULUM

Title	C-ID Designation
Biology Sequence for Majors and General Chemistry for Science Majors I, with Lab or Cell and Molecular Biology and General Chemistry for Science Majors Sequence A	BIOL 135S and CHEM 110 or BIOL 190 and CHEM 120S
Introduction to Environmental Science	ENVS 100
Physical Geology and Physical Geology Lab or Physical Geology with Lab or Introduction to Physical Geography and Physical Geography Laboratory Introduction to Physical Geography, with Lab	GEOL 100 and 100 L or GEOL 101 or GEOG 110 and 111 or GEOG 115
Introduction to Statistics	MATH 110
Single Variable Calculus I – Early Transcendentals or Single Variable Calculus I – Late Transcendentals or Business Calculus	MATH 210 or MATH 211 or MATH 140
Principles of Microeconomics	ECON 201
Algebra/Trigonometry – Based Physics AB or Calculus-Based Physics for Scientists and Engineers: A and Calculus-Based Physics for Scientists and Engineers: B	PHYS 100S or PHYS 205 and PHYS 210

APPENDIX 3 – RESOURCES IN USE OR IDENTIFIED BY PHYSICS COLLABORATION COHORT COLLEGES

Resource	Course(s)	College(s)
Biology 2e (OpenStax) (CC BY)	C-ID BIOL 1 Principles of Biology	Yuba
Introduction to Statistics in the Psychological Sciences (Cote, et al.) (CC BY-NC-SA)	C-ID MATH 110 Introduction to Statistics	Yuba
Introduction to Statistical Methods (Yuba College) (Webb)	C-ID MATH 110 Introduction to Statistics	Yuba
OpenStax Calc Volume 1 (CC BY-NC-SA)	C-ID MATH 210 Single Variable Calculus I Early Transcendentals	Cosumnes River, West Valley
Interactive Calculus I on Canvas	C-ID MATH 210 Single Variable Calculus I Early Transcendentals	Cuyamaca
Math 400: Calculus I – Differential Calculus (local remix)	C-ID MATH 210 Single Variable Calculus I Early Transcendentals	Cosumnes River
OpenStax Calculus Volume 2 (CC BY-NC-SA)	C-ID MATH 220 Single Variable Calculus II Early Transcendentals	Cosumnes River, West Valley
Interactive Calculus II on Canvas	C-ID MATH 220 Single Variable Calculus II Early Transcendentals	Cuyamaca
Math 401: Calculus II – Integral Calculus (local remix)	C-ID MATH 220 Single Variable Calculus II Early Transcendentals	Cosumnes River
OpenStax Calculus Volume 3 (CC BY-NC-SA)	C-ID MATH 230 Multivariable Calculus	Cosumnes River, West Valley
OpenStax University Physics	C-ID PHYS 200S Calc-Based Physics ABC	Napa, Riverside City
OpenStax University Physics Vol. 1	C-ID PHYS 205 Calc-Based Physics A	LA Mission, West Valley
OpenStax University Physics Vol. 2	C-ID PHYS 210 Calc-Based Physics B	LA Mission, West Valley
OpenStax University Physics Vol. 3	C-ID PHYS 215 Calc-Based Physics C	LA Mission, West Valley

APPENDIX 4 – AVAILABLE OER FOR THE PHYSICS TRANSFER MODEL CURRICULUM

The following provides examples of existing Open Educational Resources (OER) that can be used for the indicated courses. Access curated collections of resources for Physics at [Open Educational Resources and Physics](#) and [OER and the Physics TMC](#). A complete collection of OER for math courses is available at [Open Educational Resources and Math](#). The following is not intended to be comprehensive.

Calculus Based Physics for Scientists and Engineers: ABC ([PHYS 200S](#))

Calculus Based Physics for Scientists and Engineers: A ([PHYS 105](#))

- [Classical Mechanics \(Tom Weideman\) – LibreTexts \(CC BY-SA\)](#)
- [University Physics Volume 1 \(OpenStax, 2020\) \(CC BY 4.0\)](#)
- [Classical Mechanics with Numerical Methods \(Budarz\)](#)
- [Mechanics \(Crowell, 2019\) \(CC BY-SA 3.0\)](#)
- [Calculus-Based Physics I \(Schnick\) \(CC BY-SA 4.0\)](#)
- [University Physics I – Classical Mechanics \(Gea-Banacloche\) \(CC BY-SA 4.0\)](#)
- [Book: Introductory Physics – Building Models to Describe Our World \(Martin et al.\) \(CC BY-SA\)](#)

Calculus Based Physics for Scientists and Engineers: B ([PHYS 210](#))

- [Electricity and Magnetism \(Tom Weideman\) – LibreTexts \(CC BY-SA\)](#)
- [University Physics Volume 2 \(OpenStax, 2020\) \(CC BY 4.0\)](#)
- [Fields and Circuits \(Crowell, 2020\) \(CC BY-SA 3.0\)](#)
- [Calculus-Based Physics II \(Schnick\) \(CC BY-SA 4.0\)](#)

Calculus Based Physics for Scientists and Engineers: C ([PHYS 215](#))

- [University Physics Volume 3 \(OpenStax, 2020\) \(CC BY 4.0\)](#)
- [Modern Physics with Numerical Methods \(Budarz\) \(CC BY-NC-SA\)](#)
- [Modern physics: With waves, thermodynamics, and optics \(Crowell, 2019\) \(CC BY-SA 3.0\)](#)

Calculus Sequence

Single Variable Calculus I Early Transcendentals ([MATH 210](#)) OR Single Variable Calculus I Late Transcendentals ([MATH 211](#))

- [Contemporary Calculus I \(Hoffman\) \(CC BY\)](#)
- [Community Calculus \(Guichard\) \(CC BY-NC-SA\)](#)
- [APEX Calculus 1 \(Hartman\) \(CC BY-NC-SA\)](#)
- [Active Calculus \(Boelkins et al., 2017\) \(CC BY-SA\)](#)
- [Calculus Vol 1 \(Strang, Herman\) – OpenStax \(CC BY-NC-SA\)](#)

Single Variable Calculus II – Early Transcendentals ([MATH 220](#)) OR Single Variable Calculus II – Late Transcendentals ([MATH 221](#))

- [Contemporary Calculus I \(Hoffman\) \(CC BY\)](#)
- [Community Calculus \(Guichard\) \(CC BY-NC-SA\)](#)
- [APEX Calculus 1 \(Hartman\) \(CC BY-NC-SA\)](#)
- [Active Calculus \(Boelkins et al., 2017\) \(CC BY-SA\)](#)
- [Calculus Vol 1 \(Strang, Herman\) – OpenStax \(CC BY-NC-SA\)](#)

Multivariable Calculus ([MATH 230](#))

- [Active Calculus \(Boelkins et al., 2017\) \(CC BY-SA\)](#)
- [Calculus Volume 3 \(Strang and Herman, 2022\) – OpenStax \(CC BY-NC-SA\)](#)

APPENDIX 5 – AVAILABLE OER FOR THE ENVIRONMENTAL SCIENCE TRANSFER MODEL CURRICULUM

The following provides examples of existing Open Educational Resources (OER) that can be used for the indicated courses. Access the complete collection of resources for the Environmental Science Transfer Model Curriculum (TMC) at [OER and the Environmental Science TMC](#). Please find all potential OER identified for the various disciplines in this TMC at [OER by Discipline](#). Please note that the structure presented here aligns with the [Environmental Science TMC](#).

Biology and Chemistry

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](#)
- [Biology 2nd Edition \(Clark et al., 2018\) – OpenStax \(CC BY 4.0\)](#)
- [Biofundamentals \(Klymkowsky and Cooper, 2021\) – LibreTexts \(CC BY-NC-SA 3.0\)](#)

General Chemistry for Science Majors I, with Lab ([C-ID CHEM 110](#))

- [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 \(CC BY-NC-SA\)](#)

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 \(CC BY 4.0 International\)](#)

General Chemistry for Science Majors Sequence A ([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 \(CC BY-NC-SA\)](#)

Intro to Environmental Science ([C-ID ENVS 100](#))

- [Environmental Science \(Ha and Schleiger\) \(ASCCC OERI\) – LibreTexts \(CC BY-NC\)](#)

Geology or Geography

Physical Geology and Physical Geology Lab ([C-ID GEOL 100](#) and [GEOL 100L](#)) or Physical Geology with Lab ([C-ID GEOL 101](#))

- [Physical Geology Laboratory \(Johnson\) \(CC BY-SA\)](#)
- [Historical Geology: A free online textbook for Historical Geology Courses \(Affolter et al., 2020\) \(CC BY-NC 4.0\)](#)
- [GEOS: A Physical Geology Lab Manual for California Community Colleges \(Branciforte and Haddad, 2021\) – LibreTexts \(CC BY-SA\)](#)
- [Laboratory Manual for Introductory Geology \(Deline, Harris, and Tefend, 2019\) \(CC BY-NC-SA\)](#)

Introduction to Physical Geography and Physical Geography Laboratory (C-ID GEOG 110 and GEOG 111) or Introduction to Physical Geography, with Lab (C-ID GEOG 115)

- [Physical Geography \(Patrich, 2024\) – College of the Canyons \(CC BY\)](#)
- [Physical Geography Lab Manual \(Ray et al., 2020\) \(CC BY-NC 4.0\) – LibreTexts](#)
- [Physical Geography Lab Manual \(Pesses, Welsh, and Adams, 2017\) \(CC BY 4.0\)](#)
- [The Physical Environment: an Introduction to Physical Geography \(Ritter, 2021\) \(CC BY-SA 4.0\)](#)
- [Physical Geography and Natural Disasters \(Dastrup, 2021\) – Open Geography Education \(CC BY-NC-SA\)](#)
- [Physical Geography – Version 1 \(Patrich and Radtke, 2020\)](#)

Introduction to Statistics ([C-ID MATH 110](#))

Please see [Open Educational Resources and Math](#)

Single Variable Calculus I – Early Transcendentals ([C-ID MATH 210](#)), Single Variable Calculus I – Late Transcendentals ([C-ID MATH 211](#)), or Business Calculus ([C-ID MATH 140](#))

Please see [Open Educational Resources and Math](#)

Principles of Microeconomics ([C-ID ECON 201](#))

- [Principles of Microeconomics 3e \(Greenlaw and Shapiro, 2022\) \(OpenStax\) \(CC BY 2.0\)](#)

Physics Algebra/Trigonometry – Based Physics AB ([C-ID PHYS 100S](#)) or Calculus-Based Physics for Scientists and Engineers: A ([C-ID PHYS 205](#)) and Calculus-Based Physics for Scientists and Engineers: B ([C-ID PHYS 210](#))
Physics Algebra/Trigonometry – Based Physics AB ([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](#)

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

- [Classical Mechanics \(Tom Weideman\) – LibreTexts \(CC BY-SA\)](#)
- [University Physics Volume 1 \(OpenStax, 2020\) \(CC BY 4.0\)](#)
- [Classical Mechanics with Numerical Methods \(Budarz\)](#)
- [Mechanics \(Crowell, 2019\) \(CC BY-SA 3.0\)](#)
- [Calculus-Based Physics I \(Schnick\) \(CC BY-SA 4.0\)](#)
- [University Physics I – Classical Mechanics \(Gea-Banacloche\) \(CC BY-SA 4.0\)](#)
- [Book: Introductory Physics – Building Models to Describe Our World \(Martin et al.\) \(CC BY-SA\)](#)

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

- [Electricity and Magnetism \(Tom Weideman\) – LibreTexts \(CC BY-SA\)](#)
- [University Physics Volume 2 \(OpenStax, 2020\) \(CC BY 4.0\)](#)
- [Fields and Circuits \(Crowell, 2020\) \(CC BY-SA 3.0\)](#)
- [Calculus-Based Physics II \(Schnick\) \(CC BY-SA 4.0\)](#)

APPENDIX 6 – ANTICIPATED NEW OPEN EDUCATIONAL RESOURCES

Course(s) (C-ID is listed if applicable)	Project	College(s)
Calculus Based Physics for Scientists and Engineers: ABC (C-ID PHYS 200S or C-ID PHYS 205, C-ID PHYS 210, and C-ID PHYS 215)	Create homework solution that pairs with a calculus-based physics series, for example that could be used in conjunction with the OpenStax textbook series: University Physics Volume 1, University Physics Volume 2, and University Physics Volume 3. The homework solution should have the following features: <ul style="list-style-type: none"> • instantly graded problems so that students can get immediate feedback on their work • problems at a variety of difficulty/mastery levels • solutions to the problems should be available in an accessible format 	Cosumnes River, LA Mission, Napa, Riverside, West Valley, and Yuba
Calculus Based Physics for Scientists and Engineers: ABC (C-ID PHYS 200S or C-ID PHYS 205, C-ID PHYS 210, and C-ID PHYS 215)	All chapters of the OpenStax University Physics textbook, Volumes 1, 2, and 3 will be reviewed. Inadequate images and gaps will be identified. The group will also review all images of humans in the textbook from a DEI perspective. Replacement images will be created and stored in an open repository for reuse and remixing.	Cuyamaca, LA Mission, Napa, Riverside, West Valley, and Yuba
Algebra/Trigonometry-Based Physics A (C-ID PHYS 105)	Updating locally curated and created materials such as lectures, homework, and exams in Canvas.	Yuba
Algebra/Trigonometry-Based Physics B (C-ID PHYS 110)	Updating locally curated and created materials such as lectures, homework, and exams in Canvas.	Yuba
Single Variable Calculus Sequence – Early Transcendentals (C-ID MATH 900S or C-ID MATH 210 and 220)	Enhancing homework in MyOpenMath and adding remediation videos to remixed version of Math 400: Calc I - Differential Calc and Math 401: Calculus II - Integral Calculus	Cosumnes River
Single Variable Calculus Sequence – Early Transcendentals (C-ID MATH 900S or C-ID MATH 210 and 220)	Created Interactive Calculus I on Canvas and Interactive Calculus II on Canvas which embeds MyOpenMath into Canvas.	Cuyamaca
Multivariable Calculus (MATH 230)	Creating new OER: Interactive Calculus III on Canvas. The textbook will embed MyOpenMath within Canvas.	Cuyamaca

APPENDIX 7 – ZTC ACCELERATION GRANT PHYSICS COLLABORATION COHORT MEMO



ACADEMIC SENATE
for California Community Colleges
LEADERSHIP • EMPOWERMENT • VOICE

Academic Senate for California Community Colleges
One Capitol Mall, Suite 230 Sacramento, CA 95814
(916) 445-4753 info@asccc.org www.asccc.org

DATE: November 7, 2024
NAME: Chad Funk, Program Specialist
ADDRESS: 1102 Q Street, Sacramento, California 95811
SUBJECT: Physics ZTC Acceleration Grant Collaboration Cohort
ASCCC OERI FACILITATOR: Suzanne Wakim, ASCCC OERI Project Facilitator

Cohort Participants and Data Collection

The following colleges participated in the Physics Collaboration Cohort and are working on establishing a Physics Associate of Science for Transfer (AS-T) Zero Textbook Cost (ZTC) pathway unless otherwise specified:

- Cosumnes River College (CRC)
- Cuyamaca College
- Los Angeles Mission College (LAMC)
- Napa Valley College (Napa)
- Riverside City College (RCC)
- West Valley College (WVC)
- Yuba College - Environmental Science AS-T

The ASCCC OERI collected course level data for each of the courses in the pathway including current ZTC status, adopted resources, and plans to convert a course to ZTC to identify overlap and areas of potential collaboration. Since all colleges are converting the Physics AS-T, the courses were grouped using the Physics Transfer Model Curriculum (TMC) to identify commonalities.

Cohort Convening

The Physics Collaboration Cohort convened synchronously via Zoom on April 24, 2024. The ASCCC OERI presented the group 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. Two follow-up meetings were held to discuss collaborative opportunities on September 16, 2024 and October 25, 2024.

Findings

The Physics AS-T requires the Calculus Based Physics for Scientists and Engineers series and the Single-Variable Calculus Series.

Calculus Based Physics for Scientists and Engineers: ABC (C-ID PHYS 200S or C-ID PHYS 205, C-ID PHYS 210, and C-ID PHYS 215)

The Physics Collaboration Cohort has resulted in two collaborative projects for the Calculus Based Physics for Scientists and Engineers Series.

Homework Collaborative Project

Participants:

CRC, LAMC, Napa, RCC, WVC, and Yuba

Description:

Create homework solution that pairs with a calculus-based physics series, for example that could be used in conjunction with the OpenStax textbook series: University Physics Volume 1, University Physics Volume 2, and University Physics Volume 3. The homework solution should have the following features:

- instantly graded problems so that students can get immediate feedback on their work
- problems at a variety of difficulty/mastery levels
- solutions to the problems should be available in an accessible format

Text and Image Revisions Collaborative Project

Participants:

Cuyamaca, LAMC, Napa, RCC, WVC, and Yuba

Description:

All chapters of the OpenStax University Physics textbook, Volumes 1, 2, and 3 will be reviewed. Inadequate images and gaps will be identified. The group will also review all images of humans in the textbook from a DEI perspective. Replacement images will be created and stored in an open repository for reuse and remixing.

Individual College Projects

- LAMC: Currently ZTC. Adapting [OpenStax University Physics Vol. 1](#), [OpenStax University Physics Vol. 2](#), and [OpenStax University Physics Vol. 3](#) in LibreTexts.
- Napa: Revising locally developed resources for weekly problem-solving sessions for accessibility. The work currently lives in PDF format and contains equations, symbols, and diagrams which are laborious to convert.
- WVC: Adopting [OpenStax University Physics Vol. 1](#), [OpenStax University Physics Vol. 2](#), and [OpenStax University Physics Vol. 3](#)
- Yuba: Updating locally curated and created materials such as lectures, homework, and exams in Canvas.

Calculus

Several colleges indicated that they were focusing on converting the calculus requirements for their degree. All Physics Collaboration Cohort Participants were invited to participate in the Mathematics Collaboration Cohort and their plans will be reported in the Mathematics Final Report.

Conclusions

The Physics Collaboration Cohort identified openly-licensed homework as the primary need to convert physics courses. The Cohort has resulted in collaborative efforts around homework and image revisions. All cohort participants have access to the collaborative plans to ensure they can consider adopting the products upon completion. A description of each project will be provided in the final report for the field's consideration. In addition, several colleges plan to adapt existing openly-licensed texts. These projects are focused on adapting materials to meet the needs of their individual courses and are therefore non-duplicative.