

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

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INTRODUCTION

The Chemistry Collaboration Cohort consisted of five colleges. Three of the colleges are all working on the same pathway, the Chemistry Associate of Science for Transfer (AS-T) degree. The Transfer Model Curriculum that provides the structure for this degree provides little flexibility, consequently all Chemistry AS-T degrees consist of:

- A year of general chemistry
- A year of organic chemistry
- A year of calculus
- A year of calculus-based physics

COLLABORATION COHORT PURPOSE

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

CHEMISTRY COLLABORATION COHORT – MEMBER COLLEGES AND ZTC PATHWAYS

The following colleges participated in the Chemistry Collaboration Cohort. Three are working on establishing a Chemistry Associate of Science for Transfer (AS-T) Zero Textbook Cost (ZTC) pathway. The target pathways for each of the colleges are specified below.

- Barstow College – Chemistry AS-T
- Cosumnes River College (CRC) – Chemistry Associate of Science
- Evergreen Valley College (EVC) - Foundational Chemistry Certificate of Achievement
- Southwestern College (SWC) - Chemistry AS-T
- Victor Valley College (VVC) - Chemistry 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 Chemistry AS-T consists of the foundational courses for future study in the discipline, the courses were grouped using the Chemistry Transfer Model Curriculum (TMC) to identify commonalities.

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

The status and plans for the required Chemistry AS-T courses are listed below. The Chemistry AS-T requires a two-semester sequence in each of the following:

- general chemistry,
- organic chemistry,
- calculus, and
- calculus-based physics.

While the focus of the cohort was on the chemistry courses, establishing a ZTC pathway requires the college to assure that all courses in the pathway have a ZTC option. Consequently, data were gathered for all the courses specified in the Chemistry Transfer Model Curriculum.

General Chem for Science Majors Sequence A (C-ID CHEM 120S)

- ZTC – Barstow, ZTC
- Adapting [Map: A Molecular Approach \(Tro\)](#) – CRC
- Adapting or Adopting [OpenStax Chemistry 2e \(Flowers et al.; 2019\)](#) – EVC, SWC, VVC
- Collaborating with cohort to curate and create homework problems in ADAPT – CRC, EVC, SWC, VVC
- Creating Lab Manual - VVC

Organic Chem for Science Majors Sequence A (C-ID CHEM 160S)

- Adapting [Organic Chemistry: A Tenth Edition \(McMurry, 2023\) – OpenStax](#) – Barstow, EVC, SWC, VVC
- Collaborating with cohort to curate and create problems in ADAPT – CRC, EVC, SWC, VVC
- Creating supplemental materials – VVC

Calculus (C-ID MATH 210 and 220, C-ID MATH 211 and 221, or C-ID MATH 900S)

- ZTC – Barstow ([Calculus Volume I OpenStax](#) and [Calculus Volume II OpenStax](#))
- Adapting existing OER ([Math 400: Calculus I - Differential Calculus](#) and [Math 401: Calculus II - Integral Calculus](#) and [OpenStax Calculus Vol. 3](#)) - CRC
- OER starting point to be determined – SWC, VVC

Calculus-Based Physics (PHYS 205 and PHYS 210)

- ZTC – Barstow ([University Physics Volume 1 – OpenStax](#))
- Adopting existing OER ([Electricity and Magnetism](#)) – CRC
- OER starting point to be determined – SWC, VVC

CONCLUSIONS

The Chemistry Collaboration Cohort convened synchronously via Zoom on April 5, 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. A follow-up meeting was held to discuss collaborative opportunities on September 19, 2024.

The Chemistry Collaboration Cohort identified openly-licensed homework as the primary need to convert chemistry courses, yet few of the colleges reported having adopted a ZTC text for these courses. The Cohort has resulted in collaborative efforts around homework curation and creation in the ADAPT homework system for both the General Chemistry and Organic Chemistry series. 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.

The lack of specificity with respect to the plans for a number of courses is concerning and a potential barrier to achieving the stated ZTC goals of the colleges.

APPENDIX 1 – COURSES SPECIFIED IN THE CHEMISTRY TRANSFER MODEL CURRICULUM

Title	C-ID Designation
General Chemistry for Science Majors Sequence A	CHEM 120S
Organic Chemistry for Science Majors Sequence A	CHEM 160S
Single Variable Calculus I – Early Transcendentals and Single Variable Calculus II – Early Transcendentals OR Single Variable Calculus I – Late Transcendentals and Single Variable Calculus II – Late Transcendentals OR Single Variable Calculus Sequence	MATH 210 MATH 220 MATH 211 MATH 221 MATH 900S
Calculus-Based Physics for Scientists and Engineers: A and B	PHYS 205 and PHYS 210

APPENDIX 2 – RESOURCES IN USE OR IDENTIFIED BY CHEMISTRY COLLABORATION COHORT COLLEGES

Resource	Course(s)	College(s)
OpenStax Chemistry 2e (Flowers et al.; 2019) (CC BY)	General Chem for Science Majors Sequence A (C-ID CHEM 120S)	Barstow, Evergreen Valley
Organic Chemistry: A Tenth Edition (McMurry, 2023) – OpenStax (CC BY-NC-SA)	Organic Chem for Science Majors Sequence A (C-ID CHEM 160S)	Barstow, Evergreen Valley, and Southwestern

APPENDIX 3 – AVAILABLE OER FOR CHEMISTRY

The following list provides examples of existing Open Educational Resources (OER) that can be used for the indicated courses. The structure presented here aligns with the [Chemistry Transfer Model Curriculum](#). Access curated collections of resources for Chemistry at [Open Educational Resources and Chemistry](#) and [OER and the Chemistry TMC](#). The following is not intended to be comprehensive.

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

OER Textbooks for Chemistry 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 \(CC BY-NC-SA\)](#)

Additional OER for Chemistry 120S

- [Chemistry 11 Lab Manual \(Santa Monica College; 2021\) in LibreTexts \(CC BY-NC\)](#)
- [Chemistry 12 Lab Manual \(Santa Monica College; 2021\) in LibreTexts \(CC BY-NC\)](#)
- [Structure and Reactivity in Organic, Biological, and Inorganic Chemistry \(Schaller, 2019\) ; Structure and Reactivity in Organic, Biological, and Inorganic Chemistry \(Schaller, 2019\) – LibreTexts \(CC BY-NC\)](#)
- [CLUE: Chemistry, Life, the Universe, and Everything \(Cooper and Klymkowsky, 2019\); CLUE: Chemistry, Life, the Universe, and Everything \(Cooper and Klymkowsky, 2019\) – LibreTexts \(CC BY-NC-SA\)](#)

Organic Chemistry for Science Majors Sequence A ([C-ID CHEM 160S](#))

OER Textbooks for Chemistry 160S

- [Organic Chemistry: A Tenth Edition \(McMurry, 2023\) – OpenStax \(CC BY-NC-SA\)](#)
- [LibreTexts Organic Chemistry \(Morsch et al.\) \(LibreTexts, 2022\) \(CC BY-SA\)](#)

Additional OER for Chemistry 160S

- [Structure and Reactivity in Organic, Biological, and Inorganic Chemistry \(Schaller, C.; 2019\); Structure and Reactivity in Organic, Biological and Inorganic Chemistry in Chemistry LibreTexts \(CC BY-NC-3.0\)](#)
- [O-CLUE: Organic Chemistry, Life, the Universe, and Everything \(Cooper and Klymkowsky, 2019\) \(CC BY-NC-SA 4.0\)](#)
- [LibreTexts Organic Chemistry \(LibreTexts, 2022\) \(CC BY-SA\)](#)

APPENDIX 4 – AVAILABLE OER FOR PHYSICS AND CALCULUS COURSES

Calculus-Based Physics for Scientists and Engineers: A and B ([C-ID PHYS 205](#) and [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 \(OpenStax, 2020\) \(CC BY 4.0\)](#)
- [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 \(Martin et al.\) \(CC BY-SA\)](#)
- [Fields and Circuits \(Crowell, 2020\) \(CC BY-SA 3.0\)](#)
- [Calculus-Based Physics II \(Schnick\) \(CC BY-SA 4.0\)](#)

Calculus Sequence ([C-ID MATH 900S](#))

Single Variable Calculus I

- [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

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

APPENDIX 5 – ANTICIPATED NEW OPEN EDUCATIONAL RESOURCES

Course(s) (C-ID is listed if applicable)	Project	College(s)
CHEM 120S General Chemistry Series	Curating and creating homework problems in ADAPT.	Cosumnes River, Evergreen Valley, Southwestern, Victor Valley
CHEM 120S General Chemistry Series	Creating lab manual	Victor Valley
CHEM 160S Organic Chemistry Series	Curating and creating homework problems in ADAPT.	Cosumnes River, Evergreen Valley, Southwestern

APPENDIX 6 – ZTC ACCELERATION GRANT CHEMISTRY COLLABORATION COHORT MEMO



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for California Community Colleges
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SUBJECT: Chemistry 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 Chemistry Collaboration Cohort. Three are working on establishing a Chemistry Associate of Science for Transfer (AS-T) Zero Textbook Cost (ZTC) pathway. The target pathways for each of the colleges are specified below.

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Cohort Convening

The Chemistry Collaboration Cohort convened synchronously via Zoom on April 5, 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. A follow-up meeting was held to discuss collaborative opportunities on September 19, 2024.

Findings

The status and plans for the required Chemistry AS-T courses are listed below.

Required Core Courses

General Chem for Science Majors Sequence A (C-ID CHEM 120S)

- Barstow – ZTC
- CRC – Adapting [Map: A Molecular Approach \(Tro\)](#). Collaborating with cohort to curate and create homework problems in ADAPT.

- EVC – Adapting [OpenStax Chemistry 2e \(Flowers et al.; 2019\)](#). Collaborating with cohort to curate and create homework problems in ADAPT.
- SWC – Adapting [OpenStax Chemistry 2e \(Flowers et al.; 2019\)](#). Collaborating with cohort to curate and create homework problems in ADAPT.
- VVC – Collaborating with cohort to curate and create homework problems in ADAPT.

Organic Chem for Science Majors Sequence A (C-ID CHEM 160S)

- Barstow – Adapting [Organic Chemistry: A Tenth Edition \(McMurry, 2023\) – OpenStax](#) (CC BY-NC-SA)
- CRC – Collaborating with cohort to curate and create problems in ADAPT.
- EVC – Adapting [Organic Chemistry: A Tenth Edition \(McMurry, 2023\) – OpenStax](#) (CC BY-NC-SA). Collaborating with cohort to curate and create problems in ADAPT.
- SWC – Adapting [Organic Chemistry: A Tenth Edition \(McMurry, 2023\) – OpenStax](#) (CC BY-NC-SA). Collaborating with cohort to curate and create problems in ADAPT.
- VVC – Creating new textbook

Conclusions

The Chemistry Collaboration Cohort identified openly-licensed homework as the primary need to convert chemistry courses. The Cohort has resulted in collaborative efforts around homework curation and creation in the ADAPT homework system for both the General Chemistry and Organic Chemistry series. 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.