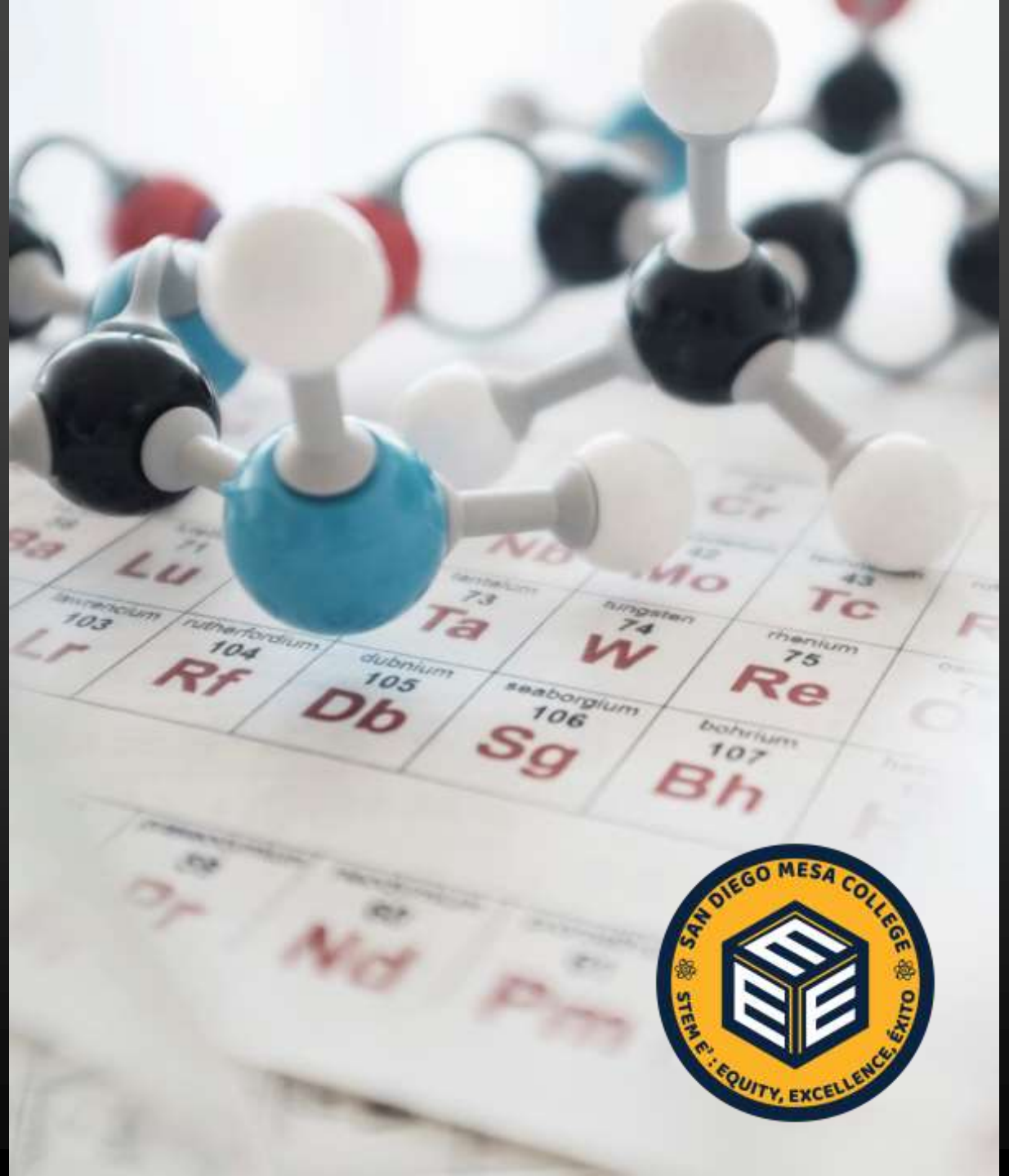
HSI Title III STEM E³: Equity, Excellence, & Éxito

Dr. Donna Budzynski
Dr. Paula Gustin
Dr. Amanda Hernandez
Dr. Irena Stojimirovic

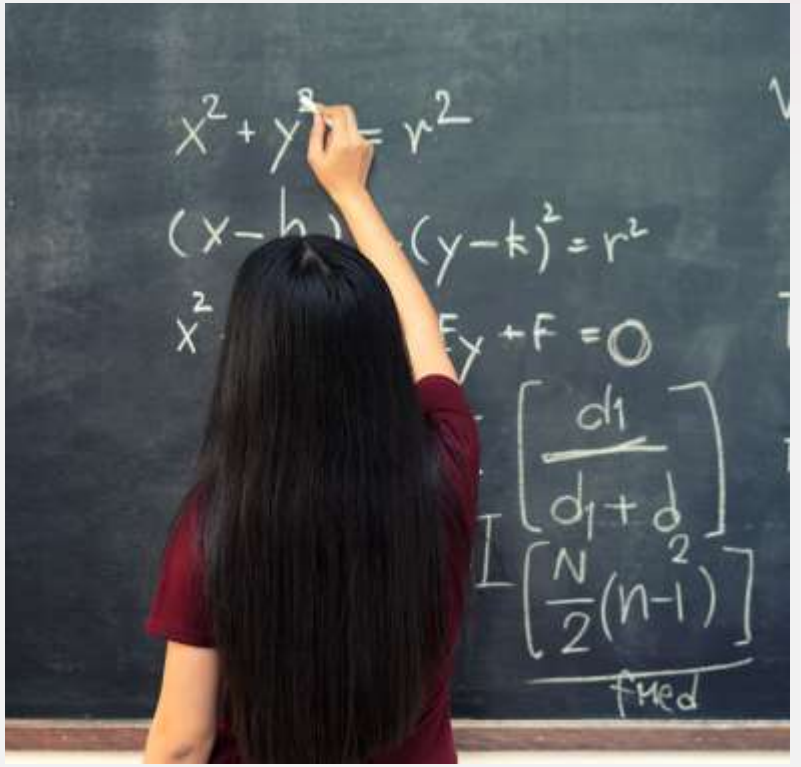


Free Online Homework Being Developed

- Wrote free online HW for Chem 152 (Introduction to General Chemistry) and Chem 20 (Introduction to General Chemistry Refresher)
  - Three semesters of Chem 152
  - Two semesters of Chem 20

- How much money does it save students?
  - Online HW costs ~$65 per student
  - There are 48 students per section and ~17 sections per year

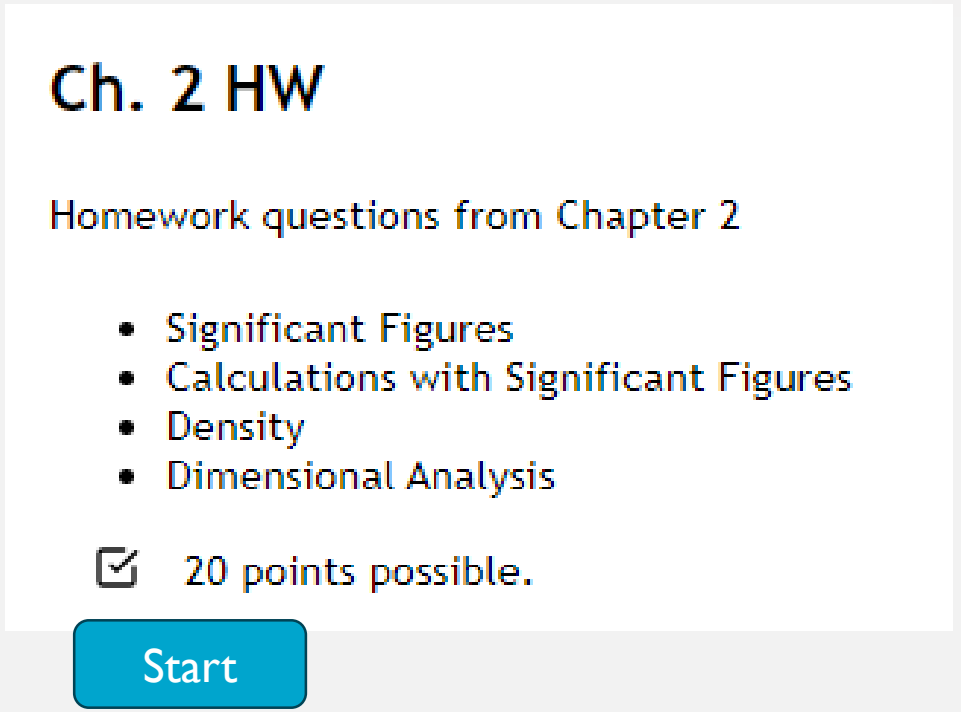
- Chem 152 Homework
  - Wrote questions for 10 chapters
  - ~20 questions per chapter (200 questions)



Free Online HW for Chem 152

Link to Homework found on Homepage of Canvas and found imbedded in the Modules

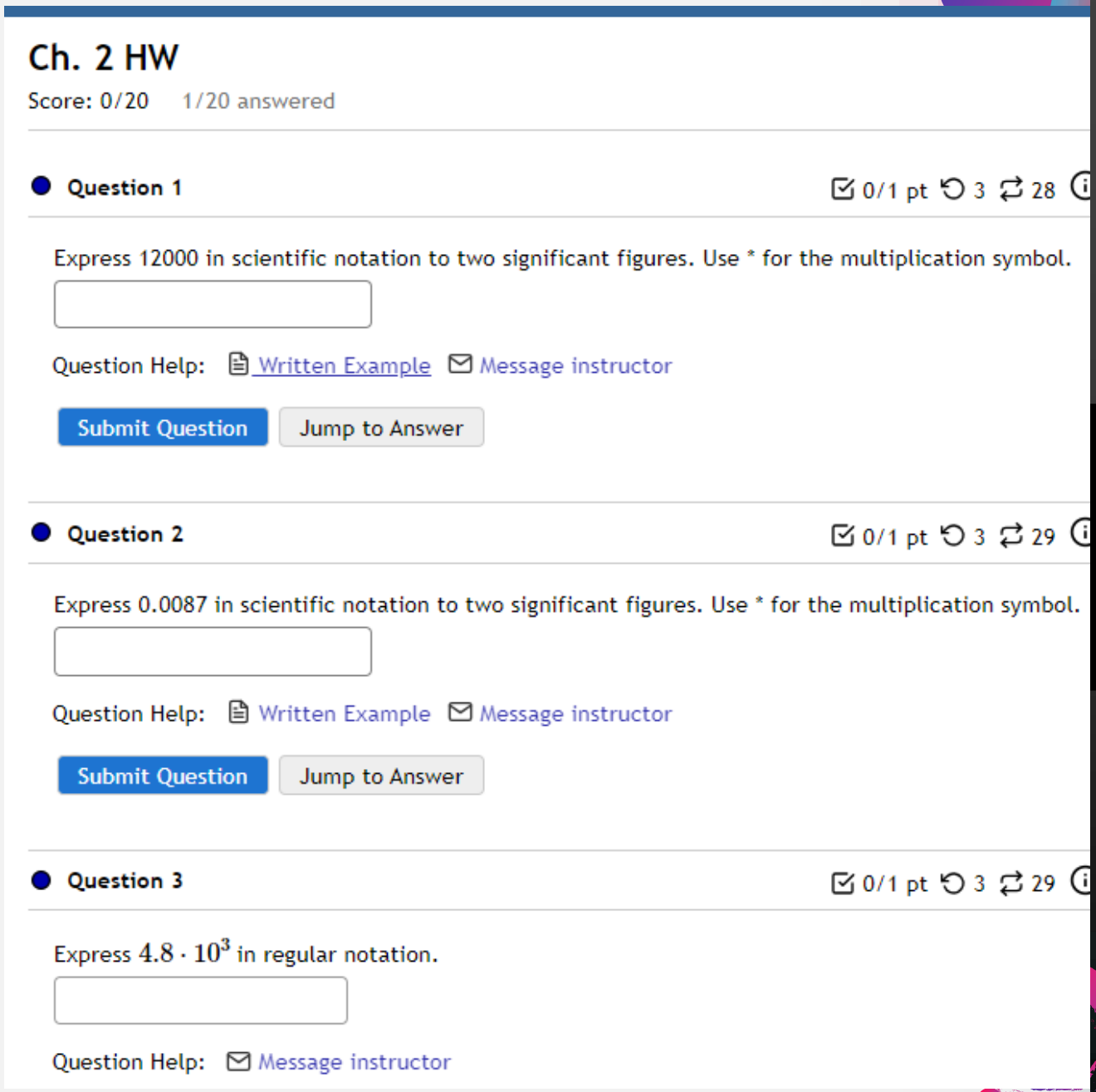
Homework for Exam 1	Homework for Exam 2
• Ch. 2 due 9/5	• Ch. 6 due 9/28
• Ch. 3 due 9/12	• Ch. 9 due 10/5
• Ch. 4 due 9/14	• Ch. 5 due



Free Online HW

Each HW assignment has built in support for each question. Including:

- Written Example
- Answers
- Detailed Solutions
- Links to Resources
- Message Instructor



Free Online HW

Written Example: A similar question with an explanation of how to approach the problem

Written Example of a similar problem

Express 4500000 in scientific notation to two significant figures. Use * for the multiplication symbol.

- Sceintific Notation:
  - Rember that 4500000 has an implied decimal at the end.
  - When converting to scientific notation you want the coefficient between 1 and 10.
    - This means that you want to move the decimal between the 4 and 5
  - The number of places you have to move it is equal to the exponent.
    - You had to move it 6 places therefore the exponent is equal to 6

Ch. 2 HW

Score: 0/20 1/20 answered

Question 1 0/1 pt 3 28

Express 12000 in scientific notation to two significant figures. Use * for the multiplication symbol.

Question Help: Written Example Message instructor

estion Jump to Answer

0/1 pt 3 29

87 in scientific notation to two significant figures. Use * for the multiplication symbol.

p: Written Example Message instructor

estion Jump to Answer

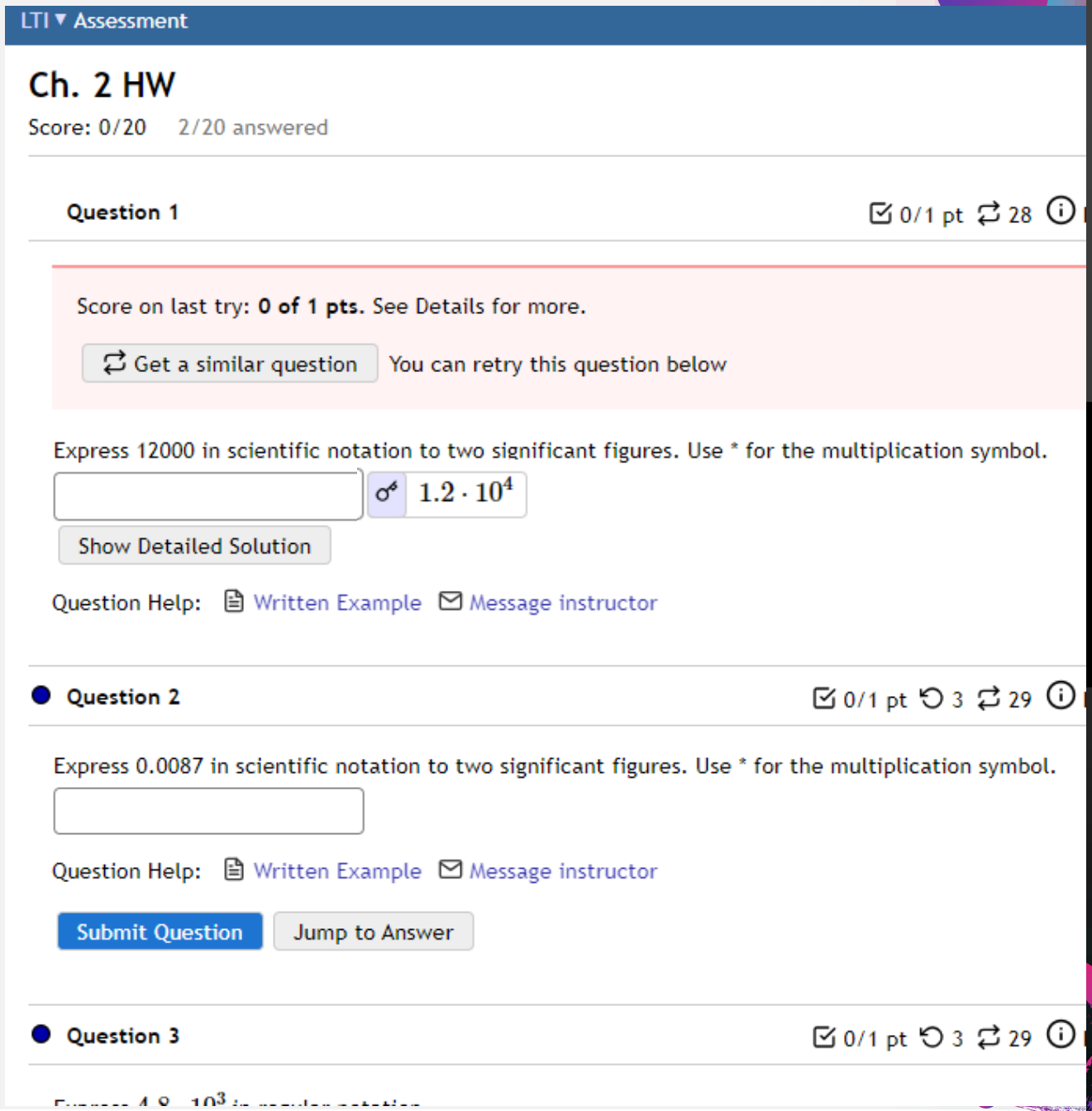
0/1 pt 3 29

Express $4.8 \cdot 10^3$ in regular notation.

Question Help: Message instructor

Free Online HW

Answer plus a detailed solution



Free Online HW

Detailed Solution Explains How to Solve their Question

- They get a similar question with new variables
- Each new variation has the detailed solution available with the details from the question

Determine the mass of iron(II) hydroxide that is produced when 8.05 g of iron(II) chloride is reacted with 8.75 g lithium hydroxide. Answer each part for this double replacement reaction:

- Write the balanced chemical equation (do not include state symbols)

Show Detailed Solution

This is an example of a stoichiometry problem.

Write a balanced chemical equation (do not include state symbols)

- Write the chemical formula of iron(II) chloride: $FeCl_2$
- Write the chemical formula of lithium hydroxide: LiOH
- Predict the products of the double replacement reaction: $LiOH + FeCl_2 \rightarrow LiCl + Fe(OH)_2$
- Balance the chemical equation: $2\ LiOH + FeCl_2 \rightarrow 2\ LiCl + Fe(OH)_2$

Determine the limiting reactant:

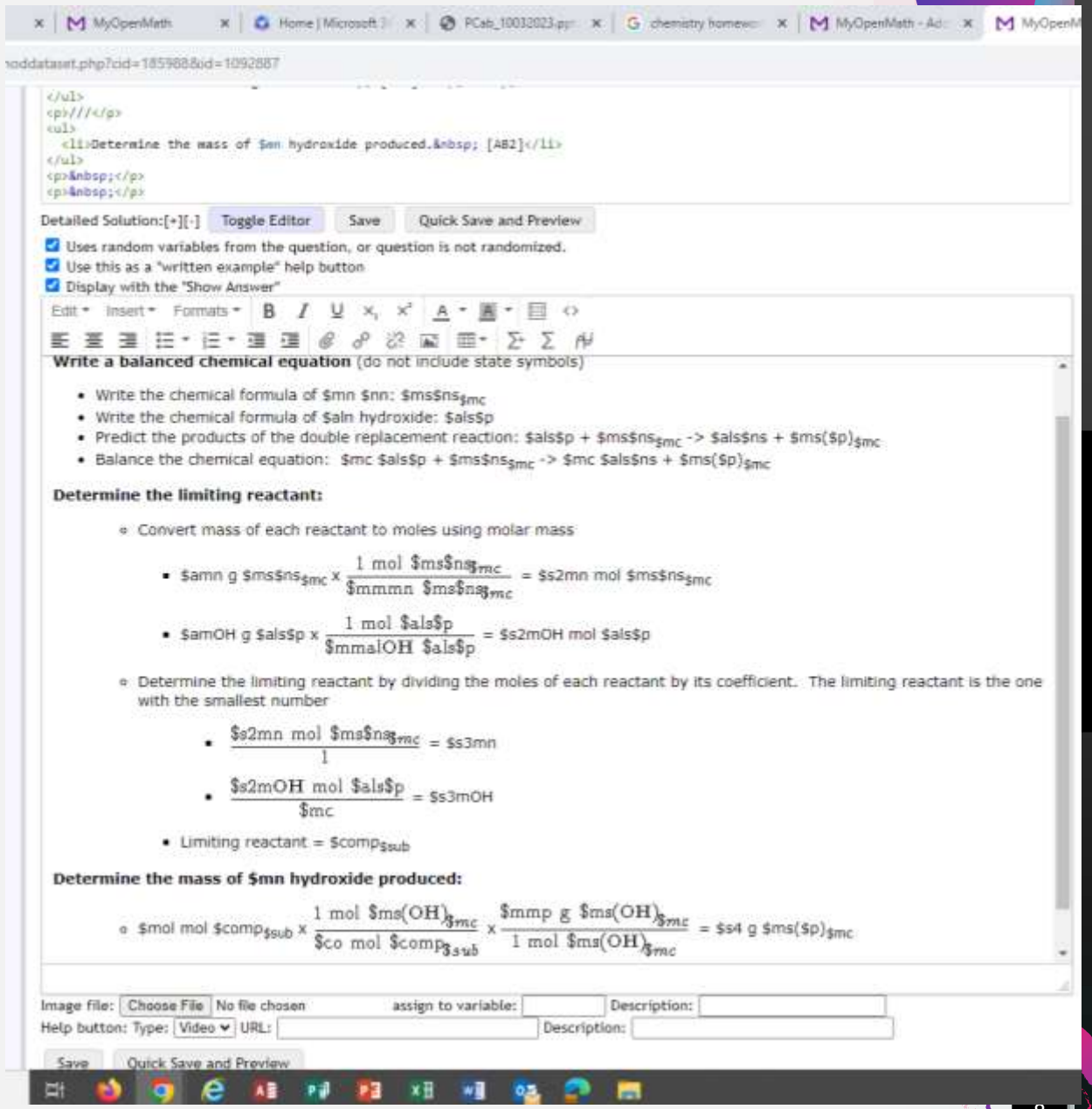
- Convert mass of each reactant to moles using molar mass
  - $8.05\ g\ FeCl_2 \times \frac{1\ mol\ FeCl_2}{126.75\ FeCl_2} = 0.06351\ mol\ FeCl_2$
  - $8.75\ g\ LiOH \times \frac{1\ mol\ LiOH}{23.951\ LiOH} = 0.3653\ mol\ LiOH$
- Determine the limiting reactant by dividing the moles of each reactant by its coefficient. The limiting reactant is the one with the smallest number
  - $\frac{0.06351\ mol\ FeCl_2}{1} = 0.06351$
  - $\frac{0.3653\ mol\ LiOH}{2} = 0.1827$
  - Limiting reactant = $FeCl_2$

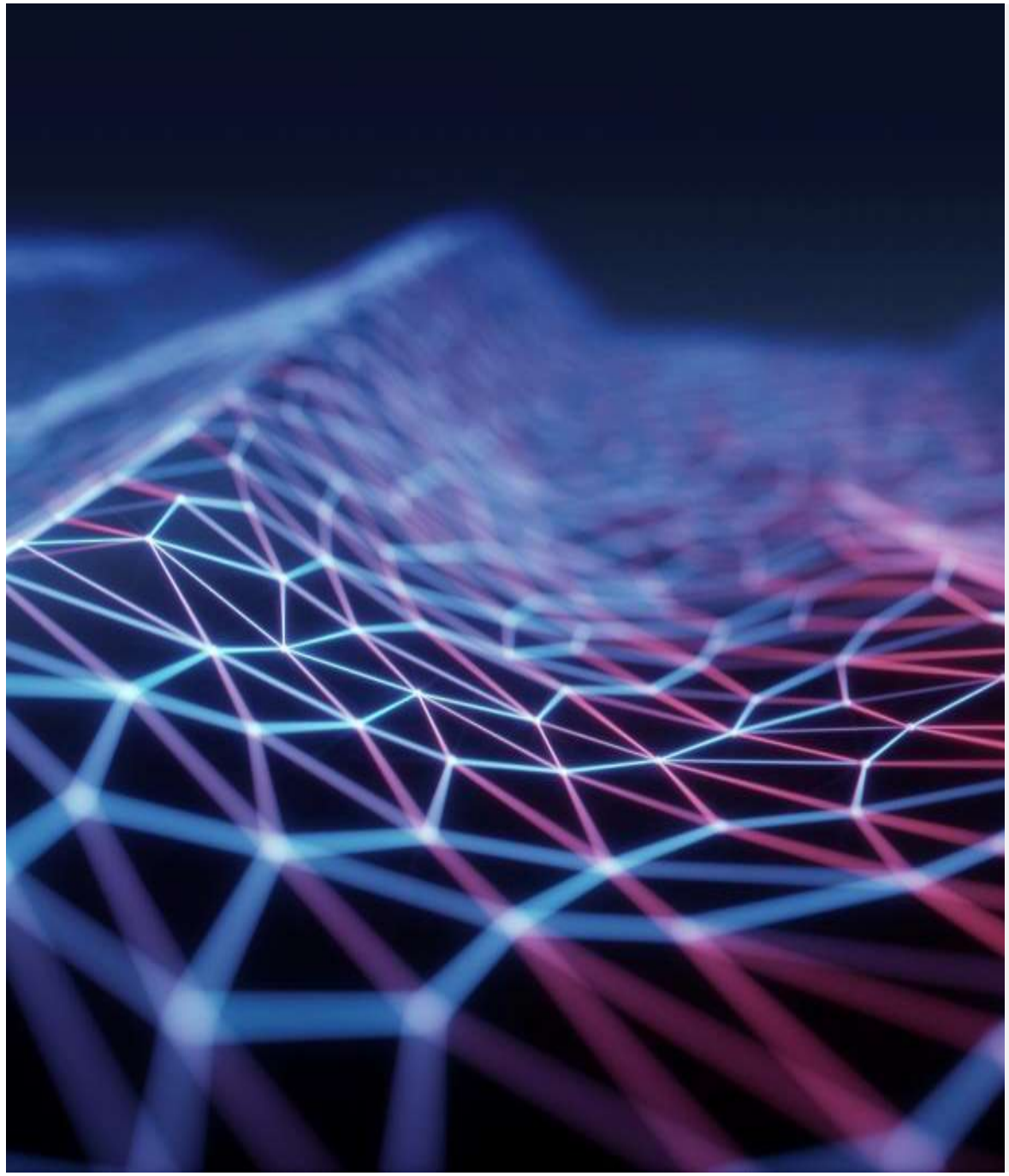
Determine the mass of iron(II) hydroxide produced:

- $0.06351\ mol\ FeCl_2 \times \frac{1\ mol\ Fe(OH)_2}{1\ mol\ FeCl_2} \times \frac{89.870\ g\ Fe(OH)_2}{1\ mol\ Fe(OH)_2} = 5.71\ g\ Fe(OH)_2$

The Code behind the HW

```
$metal =
array("calcium","magnesium","barium","copper(II)","iron(II)","iron(III)","aluminum","cobalt(III)","chromium(II)","chromium(III)
")
$mcharge = array(2,2,2,2,2,3,3,3,2,3)
$mmass = array(40.08,24.31,137.33,63.55,55.85,55.85,26.98,58.93,52.00,52.00)
$msym = array("Ca","Mg","Ba","Cu","Fe","Fe","Al","Co","Cr","Cr")

$alk = array("sodium","potassium","lithium")
$alkm = array(22.99,39.10,6.941)
$alks = array("Na","K","Li")

$nsymbol = array("Cl","I","Br")
$nmass = array(35.45,126.90,79.90)
$nname = array("chloride","iodide","bromide")

$aln,$alm,$als = jointrandfrom($alk,$alkm,$alks)

$mn,$mc,$mm,$ms = jointrandfrom($metal,$mcharge,$mmass,$msym)

$nn,$nm,$ns = jointrandfrom($nname,$nmass,$nsymbol)
$p = "OH"

$amn = rrand(8,15,0.01)
$amn = prettysigfig($amn,3)
$amOH = rrand(1,9,.01)
$amOH = prettysigfig($amOH,3)

$mmalOH = $alm+17.01
$mmalOH = prettysigfig($mmalOH,5)

$mmmn = ($nm*$mc)+$mm
$mmmn = prettysigfig($mmmn,5)

$mmp = $mm+(17.01*$mc)
$mmp = prettysigfig($mmp,5)

$answerformat[0] = "reaction"
$answer[0] = "$mc $als$p + $ms$ns _$mc -> $mc $als$ns + $ms($p) _$mc"
$answerboxsize[0] = 30

$s2mn = $amn/$mmmn
$s2mn = prettysigfig($s2mn,4)
$s2mOH = $amOH/$mmalOH
$s2mOH = prettysigfig($s2mOH,4)

$s3mn = $s2mn
$s3mOH = $s2mOH/$mc
$s3mOH = prettysigfig($s3mOH,4)

$mnf = "$ms$ns<sub>$mc</sub>"

if ($s2mn > $s2mOH / $mc) {
  $choices[1] = array("$als$p", "$mnf")
  $mol = $s2mOH
  $comp = "$als$p"
  $co = $mc
  $sub = ""
} else{
  $choices[1] = array("$mnf", "$als$p")
  $mol = $s2mn
  $comp = "$ms$ns"
  $co = 1
  $sub = $mc
```



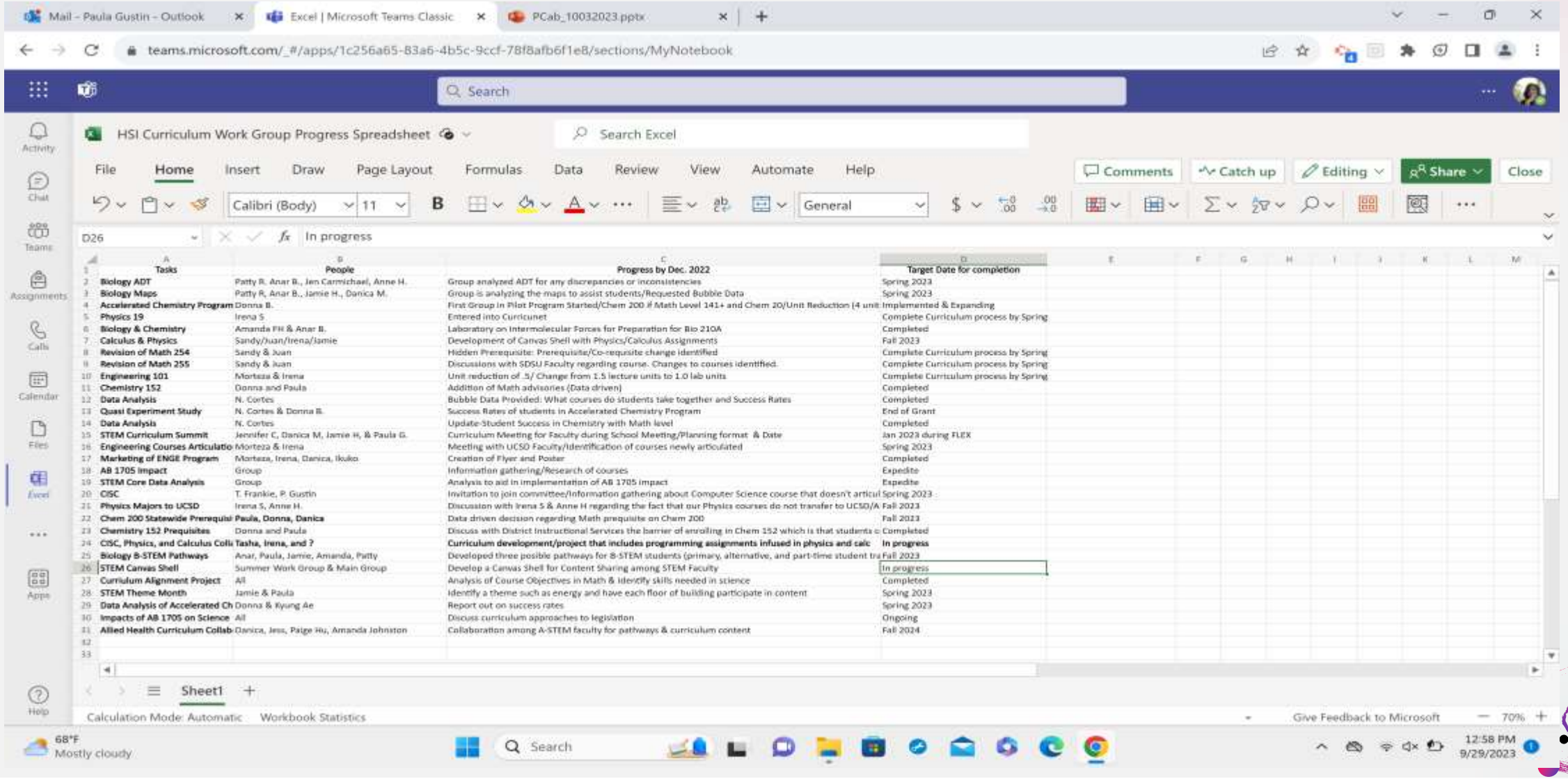


Curriculum Work Group

Interdisciplinary collaboration towards improving equitable student success

- Paula Gustin (Faculty Lead)
- Biology: Anar Brahmbhatt & Paige Hu
- Chemistry: Donna Budzynski, Fatemeh Chadegani, Synthia Chang, Amanda Fusco, Danica Moore, Jess Sardo
- Counseling: Patricia Rodriguez
- Engineering: Morteza Mohssenzadeh
- Math: Sandra Belew, Juan Bernal, Shane Briggs, Alison Damoose, Christina Huynh, Ken Kuniyuki, Katherine Naimark, Phyllis Meckstroth
- Physics: James Hinton, Whitney Ryan, Irena Stojimirovic
- Institutional Effectiveness: Kyung Ae Jun (IE)
- Past Members: Nancy Cortes (IE), Tasha Frankie(CISC)

Projects:



Tasks	People	Progress by Dec. 2022	Target Date for completion
Biology ADT	Patty R. Anar B., Jen Carmichael, Anne H.	Group analyzed ADT for any discrepancies or inconsistencies	Spring 2023
Biology Maps	Patty R, Anar B., Jamie H., Danica M.	Group is analyzing the maps to assist students/Requested Bubble Data	Spring 2023
Accelerated Chemistry Program	Donna B.	First Group in Pilot Program Started/Chem 200 # Math Level 141+ and Chem 20/Unit Reduction (4 unit	Implemented & Expanding
Physics 19	Irena S	Entered into Curricunet	Complete Curriculum process by Spring
Biology & Chemistry	Amanda FH & Anar B.	Laboratory on Intermolecular Forces for Preparation for Bio 210A	Completed
Calculus & Physics	Sandy/Juan/Irena/Jamie	Development of Canvas Shell with Physics/Calculus Assignments	Fall 2023
Revision of Math 254	Sandy & Juan	Hidden Prerequisite: Prerequisite/Co-requisite change identified	Complete Curriculum process by Spring
Revision of Math 255	Sandy & Juan	Discussions with SDSU Faculty regarding course. Changes to courses identified.	Complete Curriculum process by Spring
Engineering 101	Morteza & Irena	Unit reduction of .5/ Change from 1.5 lecture units to 1.0 lab units	Complete Curriculum process by Spring
Chemistry 152	Donna and Paula	Addition of Math advisories (Data driven)	Completed
Data Analysis	N. Cortes	Bubble Data Provided: What courses do students take together and Success Rates	Completed
Quasi Experiment Study	N. Cortes & Donna B.	Success Rates of students in Accelerated Chemistry Program	End of Grant
Data Analysis	N. Cortes	Update Student Success in Chemistry with Math level	Completed
STEM Curriculum Summit	Jennifer C, Danica M, Jamie H, & Paula G.	Curriculum Meeting for Faculty during School Meeting/Planning format & Date	Jan 2023 during FLEX
Engineering Courses Articulatio	Morteza & Irena	Meeting with UCSD Faculty/Identification of courses newly articulated	Spring 2023
Marketing of ENGE Program	Morteza, Irena, Danica, Ikuko	Creation of Flyer and Poster	Completed
AB 1705 Impact	Group	Information gathering/Research of courses	Expedite
STEM Core Data Analysis	Group	Analysis to aid in implementation of AB 1705 impact	Expedite
CISC	T. Frankie, P. Gustin	Invitation to join committee/Information gathering about Computer Science course that doesn't articul	Spring 2023
Physics Majors to UCSD	Irena S, Anne H.	Discussion with Irena S & Anne H regarding the fact that our Physics courses do not transfer to UCSD/A	Fall 2023
Chem 200 Statewide Prerequisi	Paula, Donna, Danica	Data driven decision regarding Math prequisite on Chem 200	Fall 2023
Chemistry 152 Prequisites	Donna and Paula	Discuss with District Instructional Services the barrier of enrolling in Chem 152 which is that students c	Completed
CISC, Physics, and Calculus Coll	Tasha, Irena, and ?	Curriculum development/project that includes programming assignments infused in physics and calc	In progress
Biology B-STEM Pathways	Anar, Paula, Jamie, Amanda, Patty	Developed three posible pathways for B-STEM students (primary, alternative, and part-time student tra	Fall 2023
STEM Canvas Shell	Summer Work Group & Main Group	Develop a Canvas Shell for Content Sharing among STEM Faculty	In progress
Curriculum Alignment Project	All	Analysis of Course Objectives in Math & Identify skills needed in science	Completed
STEM Theme Month	Jamie & Paula	Identify a theme such as energy and have each floor of building participate in content	Spring 2023
Data Analysis of Accelerated Ch	Donna & Kyung Ae	Report out on success rates	Spring 2023
Impacts of AB 1705 on Science	All	Discuss curriculum approaches to legislation	Ongoing
Allied Health Curriculum Collab	Danica, Jess, Paige Hu, Amanda Johnston	Collaboration among A-STEM faculty for pathways & curriculum content	Fall 2024

STEM Faculty are Problem Solvers!

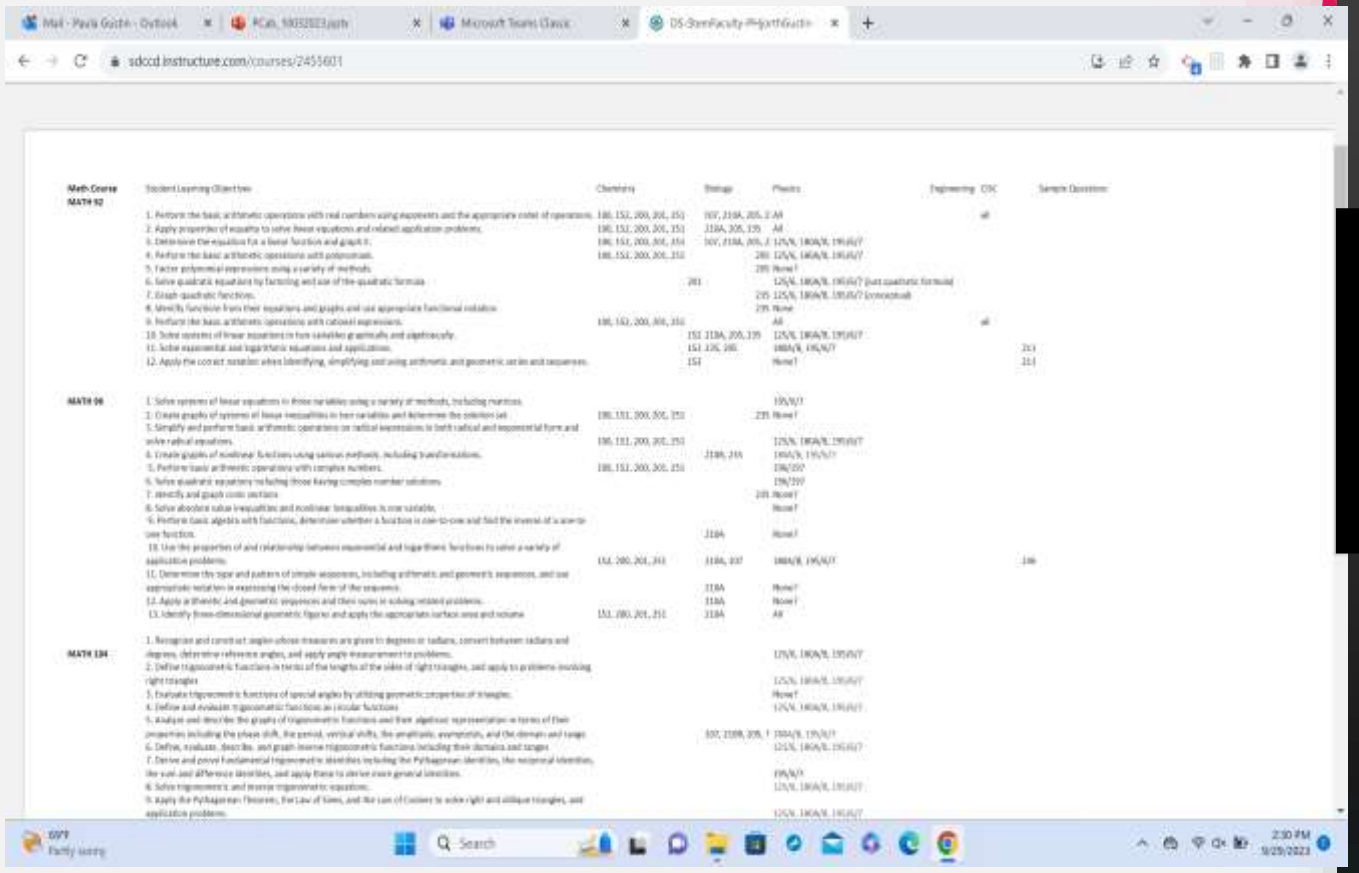
- Curriculum changes for unit reductions for STEM majors
- Updated pathways/maps for top majors
  - Biology STEM (B-STEM)
  - Engineering STEM (E-STEM)
  - Allied Health STEM (A-STEM)
- Bubble Data Analysis & Counseling

STEM Faculty are Problem Solvers!

Analysis & recommendations for course content alignment

- Math to science courses
- Science to science

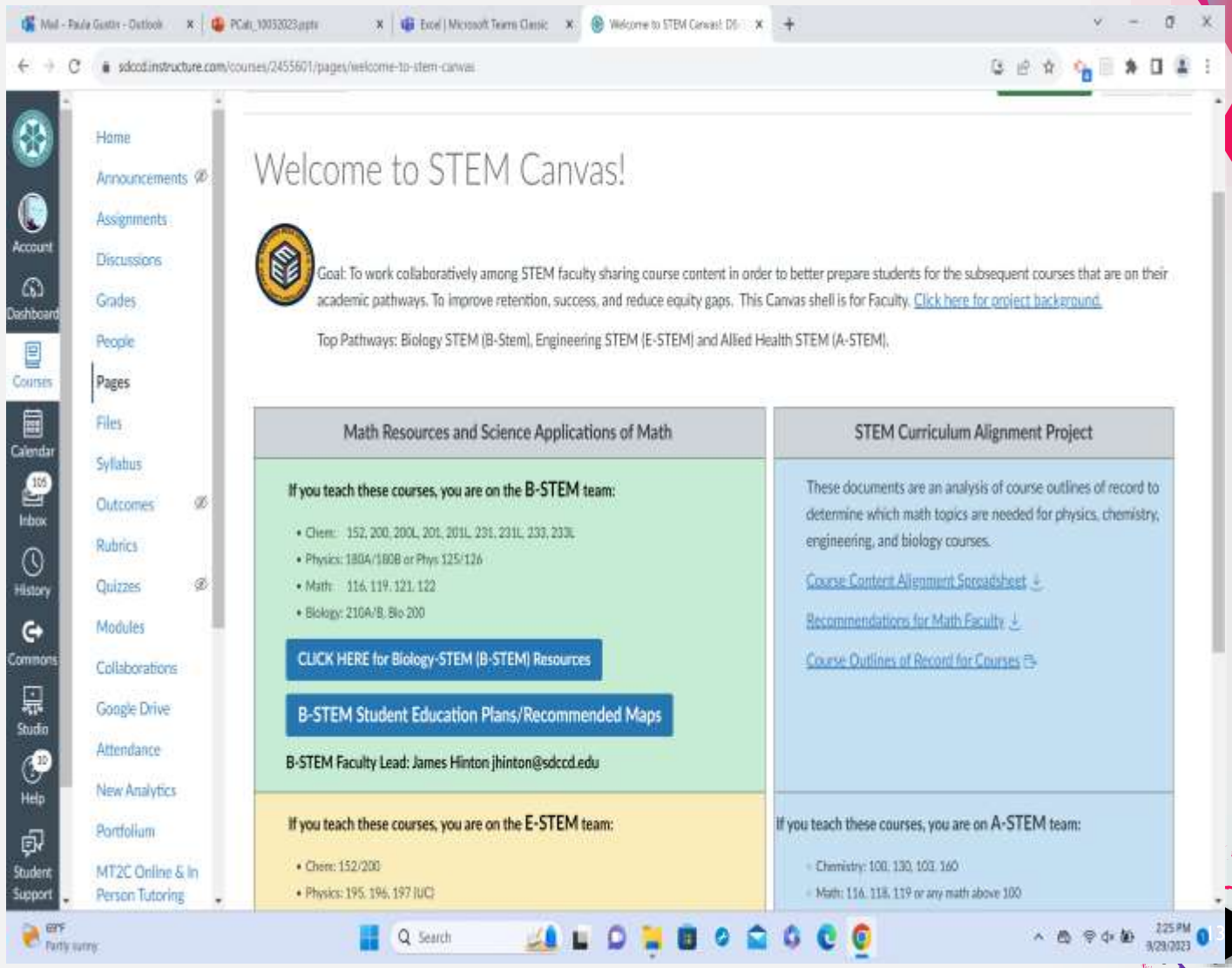
Identify impacts of AB 1705 on science majors & recommend solutions



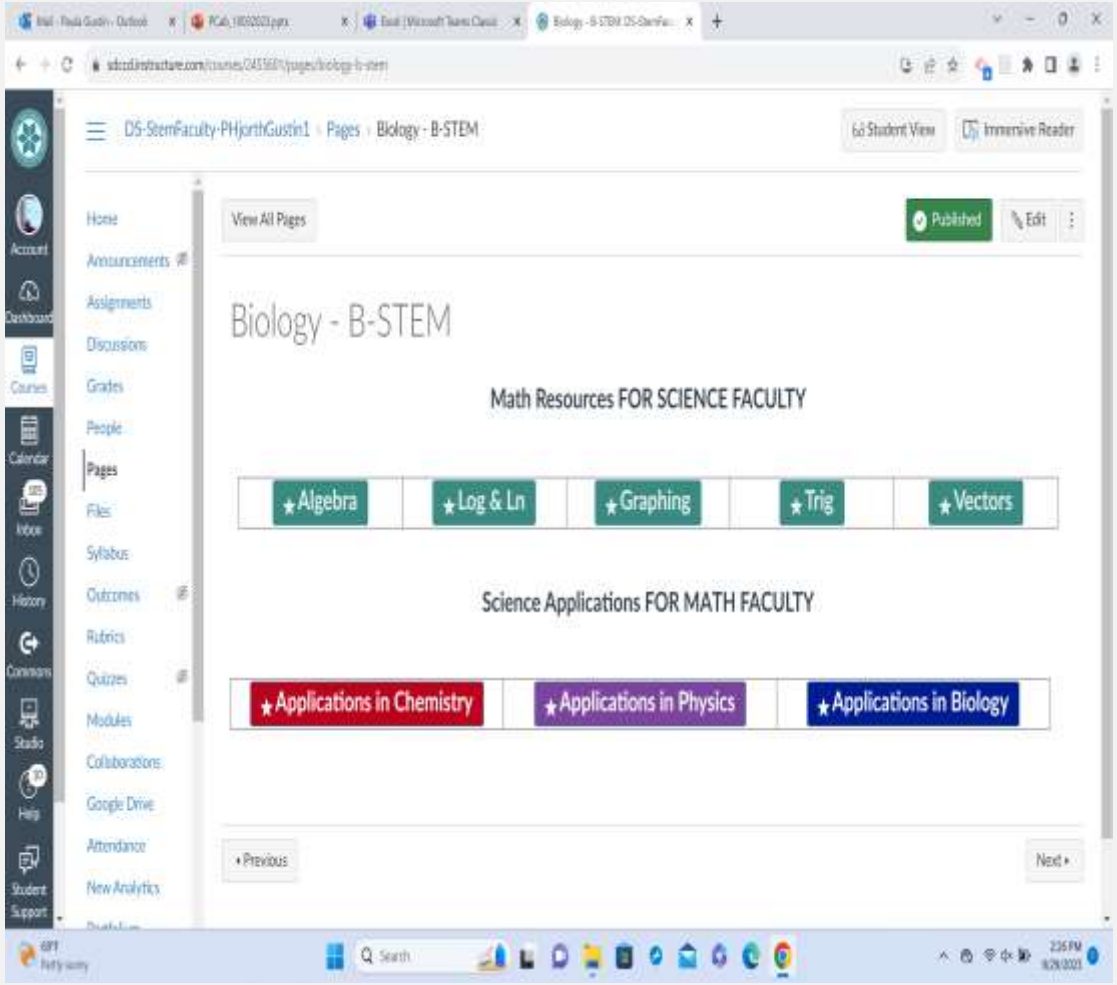
STEM Faculty are Problem Solvers!

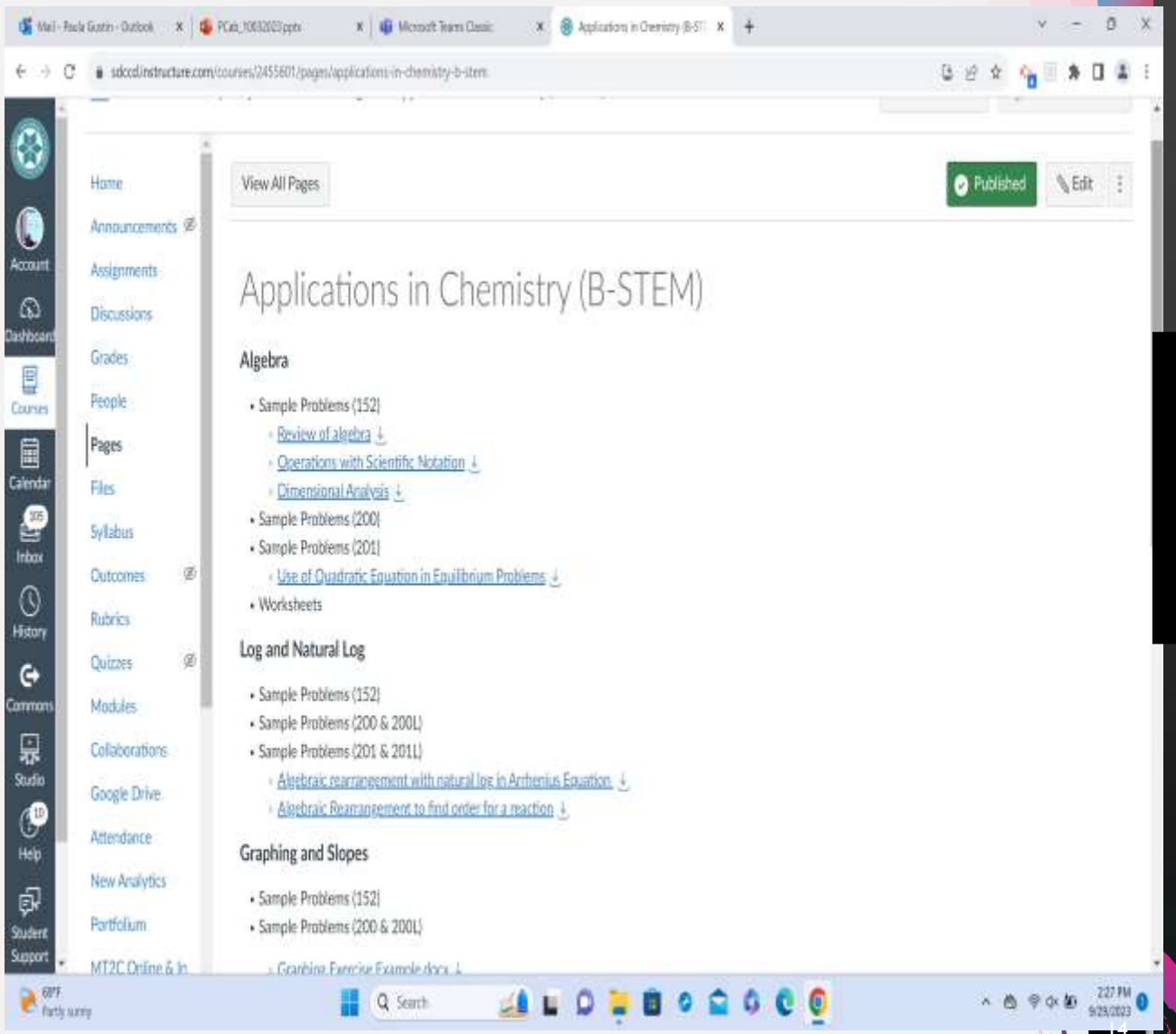
STEM Canvas for Faculty

Enhanced faculty communication regarding course content



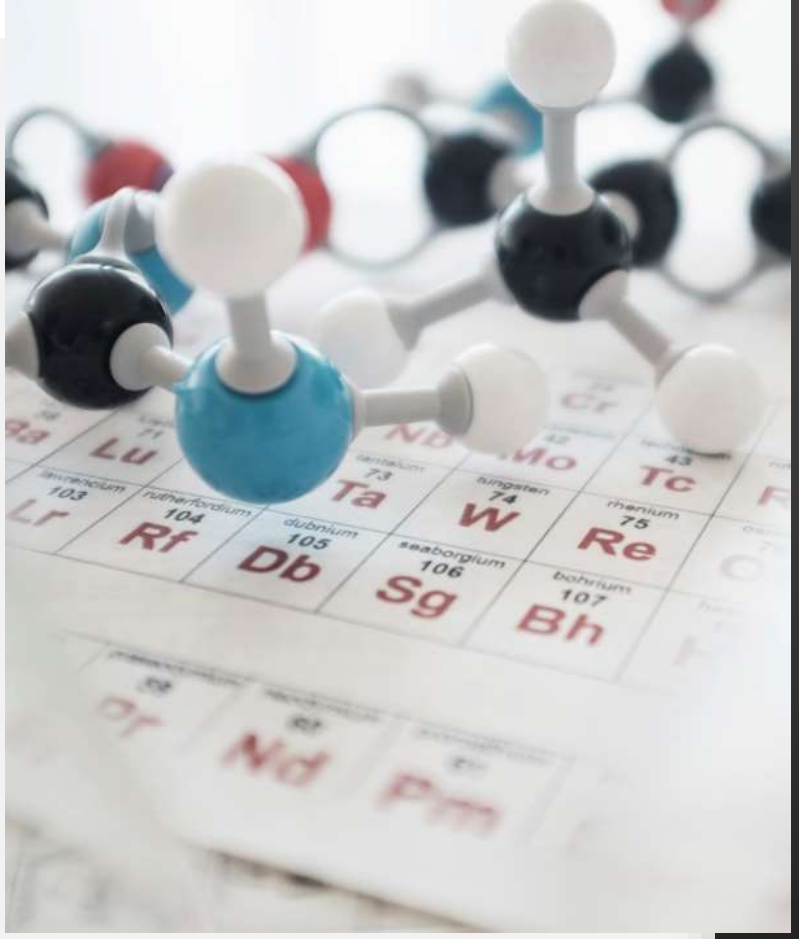
STEM Canvas


DS-StemFaculty-PHjorthGustin1 › Pages › Biology - B-STEM
63 Student View
Immersive Reader
Home
Announcements
Assignments
Discussions
Grades
People
Pages
Files
Syllabus
Outcomes
Rubrics
Quizzes
Modules
Collaborations
Google Drive
Attendance
New Analytics
View All Pages
Published
Edit
Biology - B-STEM
Math Resources FOR SCIENCE FACULTY
★Algebra
★Log & Ln
★Graphing
★Trig
★Vectors
Science Applications FOR MATH FACULTY
★Applications in Chemistry
★Applications in Physics
★Applications in Biology
‹ Previous
Next ›


Home
Announcements
Assignments
Discussions
Grades
People
Pages
Files
Syllabus
Outcomes
Rubrics
Quizzes
Modules
Collaborations
Google Drive
Attendance
New Analytics
Portfolium
View All Pages
Published
Edit
Applications in Chemistry (B-STEM)
Algebra
• Sample Problems (152)
◦ Review of algebra
◦ Operations with Scientific Notation
◦ Dimensional Analysis
• Sample Problems (200)
• Sample Problems (201)
◦ Use of Quadratic Equation in Equilibrium Problems
• Worksheets
Log and Natural Log
• Sample Problems (152)
• Sample Problems (200 & 200L)
• Sample Problems (201 & 201L)
◦ Algebraic rearrangement with natural log in Arrhenius Equation
◦ Algebraic Rearrangement to find order for a reaction
Graphing and Slopes
• Sample Problems (152)
• Sample Problems (200 & 200L)

Accelerated Chem 200

- Chem 200 is General Chemistry I Lecture (3 units)
  - Chem 200L coreq (2 unit lab)
  - Chem 152/L prereq (3 + 1 = 4 units) or pass Challenge Exam
  - Required for many STEM majors: Chem, Biol, Phys, Enge, Kinesiology
- Accelerated Chem 200
  - Students who have passed Math 121 or higher can skip Chem 152/L
  - Chem 20 support class coreq (0.5 units) and Chem 200L coreq
  - Saves them 3.5 units
- Fall 22 + Spring 23:
  - One section each semester; mixed class with non-Acc students
  - Total 36 Acc Chem 200 students; approximately half Enge majors, a quarter Biol majors.
  - Success rate 75% (Average overall Chem 200 success rate is 70%)
  - Acc Chem 200 Demographics: 31% Asian, 19% Latinx, 39% White
    - Overall Chem 200: 15% Asian, 36% Latinx, 31% White
- Fall 23: one section; 24 Acc students
- Spring 24: two sections



STEM Peer Mentoring Program

- Piloted in the Fall 2018 to support students in the STEM classes with low success rates.
- Currently 19 mentors (Mesa STEM students).
- Distinct hiring (in collaboration with faculty), training (subject + no ED 100) and delivery (collaborative work).
- We provide academic support and mentorship for STEM college success.
- Serving 700/305 unique STEM students in the Spring 2023/Fall 2022.
- Student surveys reflect need for more mentors and high satisfaction with program.

SAN DIEGO MESA COLLEGE

Course Outcomes & Equity Gap Analysis

Select Academic Year(s): 2022/23 | Select Term(s): (All) | Select Characteristic: Overall | Select Outcome: Course Success Rate, Including EW Grades

← Select outcome metric here

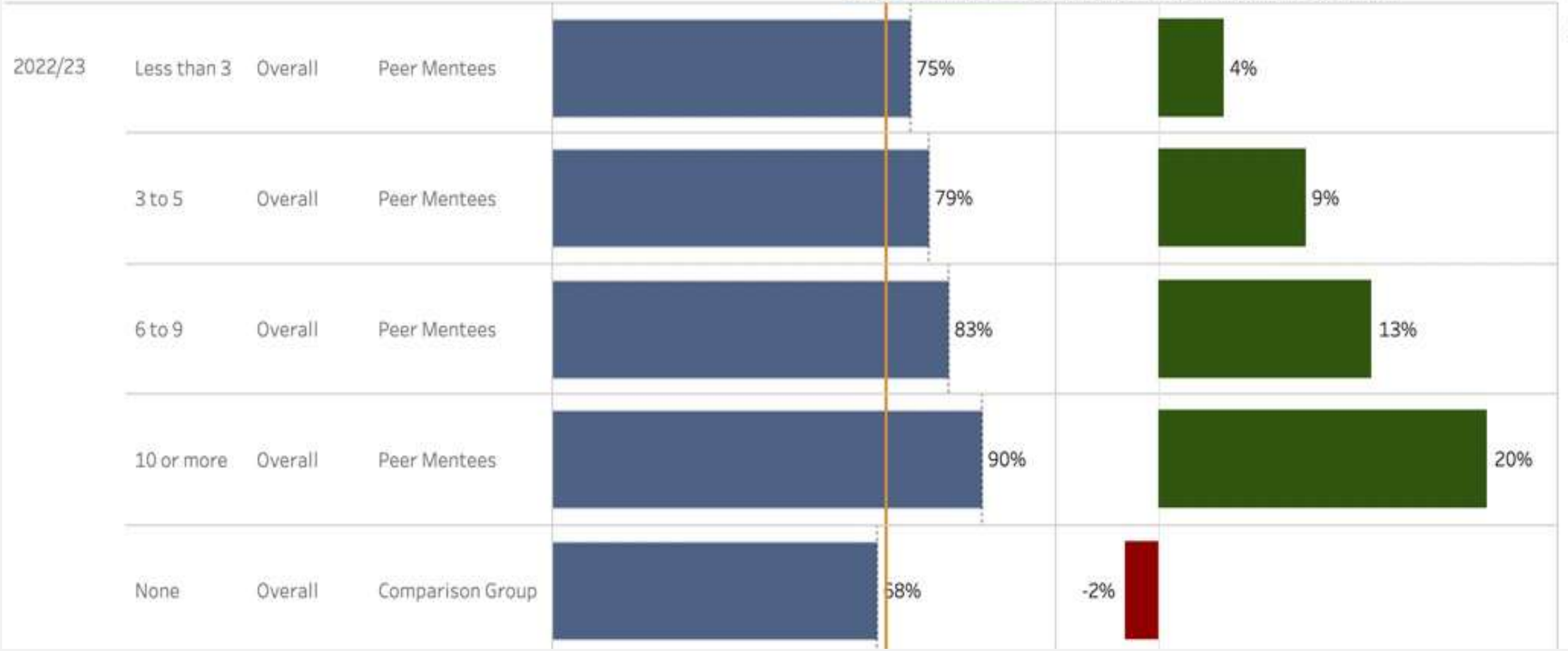
Select View: Total | By Course | By Number of Visits

Course Success Rate by Overall

View: By Number of Visits | **Academic Year(s):** 2022/23 | **Term(s):** All | **Course(s):** All

Annual | Term

Orange Reference Line: Overall outcome for all enrollments on display.



Select Course(s)

- (All)
- BIOL210A
- BIOL210B
- CHEM200
- CHEM201
- CHEM231
- ENGE200
- ENGE250
- MATH104
- MATH116
- MATH150
- MATH151
- MATH252
- PHYS180A
- PHYS180B
- PHYS195
- PHYS196
- PHYS197

SAN DIEGO MESA COLLEGE

Course Outcomes & Equity Gap Analysis

Info

Select Academic Year(s): 2022/23

Select Term(s): (All)

Select Characteristic: Ethnicity

Select Outcome: Course Success Rate | Including EW Grades

← Select outcome metric here

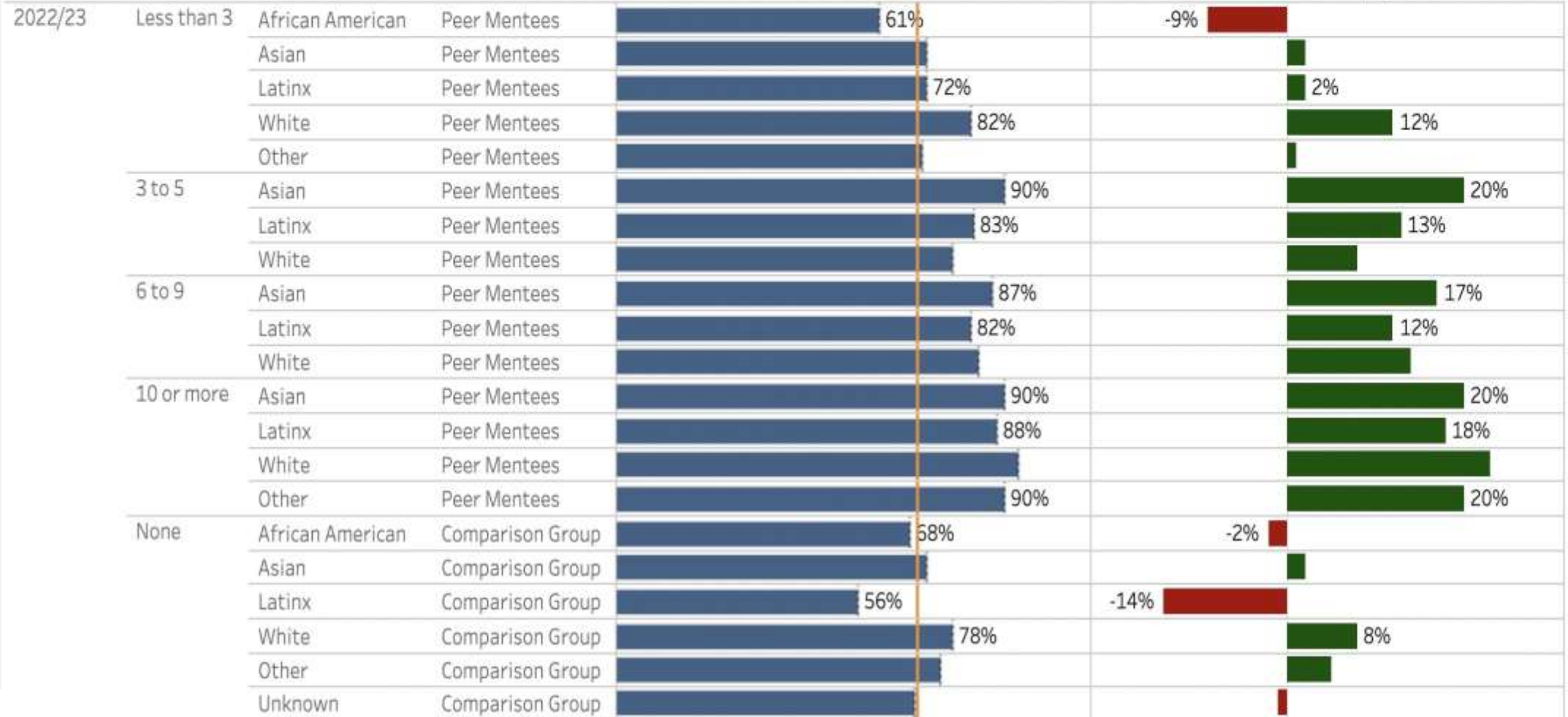
Select View: Total | By Course | By Number of Visits

Course Success Rate by Ethnicity

Annual | Term

View: By Number of Visits | **Academic Year(s):** 2022/23 | **Term(s):** All | **Course(s):** All

Orange Reference Line: Overall outcome for all enrollments on display.



Select Course(s)

- [x] (All)
- [x] BIOL210A
- [x] BIOL210B
- [x] CHEM200
- [x] CHEM201
- [x] CHEM231
- [x] ENGE200
- [x] ENGE250
- [x] MATH104
- [x] MATH116
- [x] MATH150
- [x] MATH151
- [x] MATH252
- [x] PHYS180A
- [x] PHYS180B
- [x] PHYS195
- [x] PHYS196
- [x] PHYS197

Course Outcomes & Equity Gap Analysis

Select Academic Year(s): 2022/23 | Select Term(s): (All) | Select Characteristic: Ethnicity | Select Outcome: Course Success Rate, Including EW Grades ← Select outcome metric here

Select View: Total | By Course | By Number of Visits

Course Success Rate by Ethnicity

Annual | Term

View: By Number of Visits | **Academic Year(s):** 2022/23 | **Term(s):** All | **Course(s):** MATH150, MATH151, PHYS195

Orange Reference Line: Overall outcome for all enrollments on display.

2022/23	Less than 3	Asian	Peer Mentees	55%	-19%
		Latinx	Peer Mentees	73%	0%
		White	Peer Mentees	62%	-11%
	3 to 5	Asian	Peer Mentees	85%	12%
		Latinx	Peer Mentees	71%	-2%
		White	Peer Mentees	63%	-11%
	6 to 9	White	Peer Mentees	86%	13%
	10 or more	Latinx	Peer Mentees	88%	15%
		White	Peer Mentees	94%	21%
	None	African American	Comparison Group	74%	1%
		Asian	Comparison Group	71%	-2%
		Latinx	Comparison Group	62%	-11%
		White	Comparison Group	81%	8%
		Other	Comparison Group	80%	7%
		Unknown	Comparison Group	80%	7%

Select Course(s):

- [ ] (All)
- [ ] BIOL210A
- [ ] BIOL210B
- [ ] CHEM200
- [ ] CHEM201
- [ ] CHEM231
- [ ] ENGE200
- [ ] ENGE250
- [ ] MATH104
- [ ] MATH116
- [x] MATH150
- [x] MATH151
- [ ] MATH252
- [ ] PHYS180A
- [ ] PHYS180B
- [x] PHYS195
- [ ] PHYS196
- [ ] PHYS197

Thank You