Maximizing Student Success in an Academically-Diverse Mathematics Classroom

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Maximizing Student Success in an Academically-Diverse Mathematics Classroom

- **How student-centered instruction helps manage an academically-diverse mathematics classroom**
- Mathematics Corequisite Just-in-Time Remediation
- Classroom Redesign
- Pedagogy and Active Learning Techniques/Activities
- Affective Domain Support and Growth Mindset
- Community of Practice, Embedded Tutors, and Institutional Research
- Questions

Why Do Students Need a Student-Centered Classroom?

Many college students:

- Have academically-diverse educational backgrounds
- Have low socioeconomic status
- Attended a low performing high school
- Did not receive many enrichment/extracurricular activities
- Is likely to be employed part-time or full-time
- May have dependents, either take care of their children or parents/elders
- Oftern drops classes when times get tough blaming their responsibilities and other stressors (instead of persisting)

"This class has served as a second chance because right after high school I didn't go straight to college, I lost some time...math was always my weakest subject."

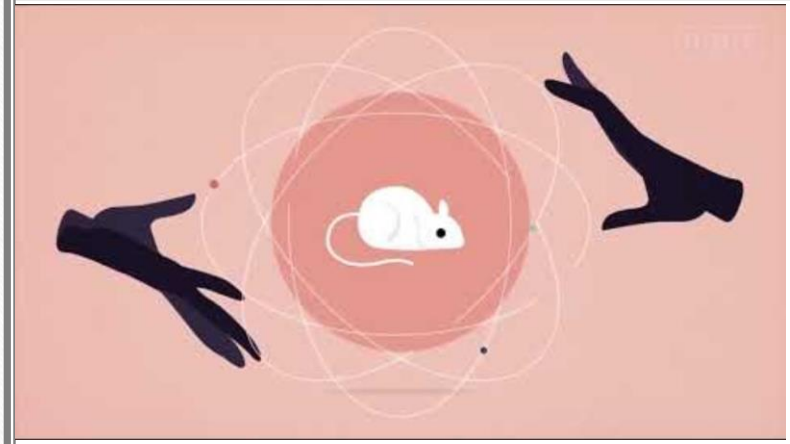
- **Rosalia**

Belief in Student Capacity

- Students' negative experiences in elementary and high school math classes has left them hopeless with insecure feeling about education
  - Stop trying in school
  - See no value in education
  - Act out in school
- Few encouraging mentors (home or school)
- Some parents force their students to attend college after high school
- Don't know how to be successful college students
- Negative views of tutoring

Expectations

NPR's The Power of Expectation
https://www.youtube.com/watch?v=hbhwlRRW_3o



Student-Centered and Active Learning

- Instructor-guided (Guide on the Side, not Sage on the Stage)
- Students own their learning
- First level of help provided by peers, then the instructor if needed (stuck)
- Embedded tutors (adjunct faculty) circle the room & help groups if needed
- Students develop leadership skills

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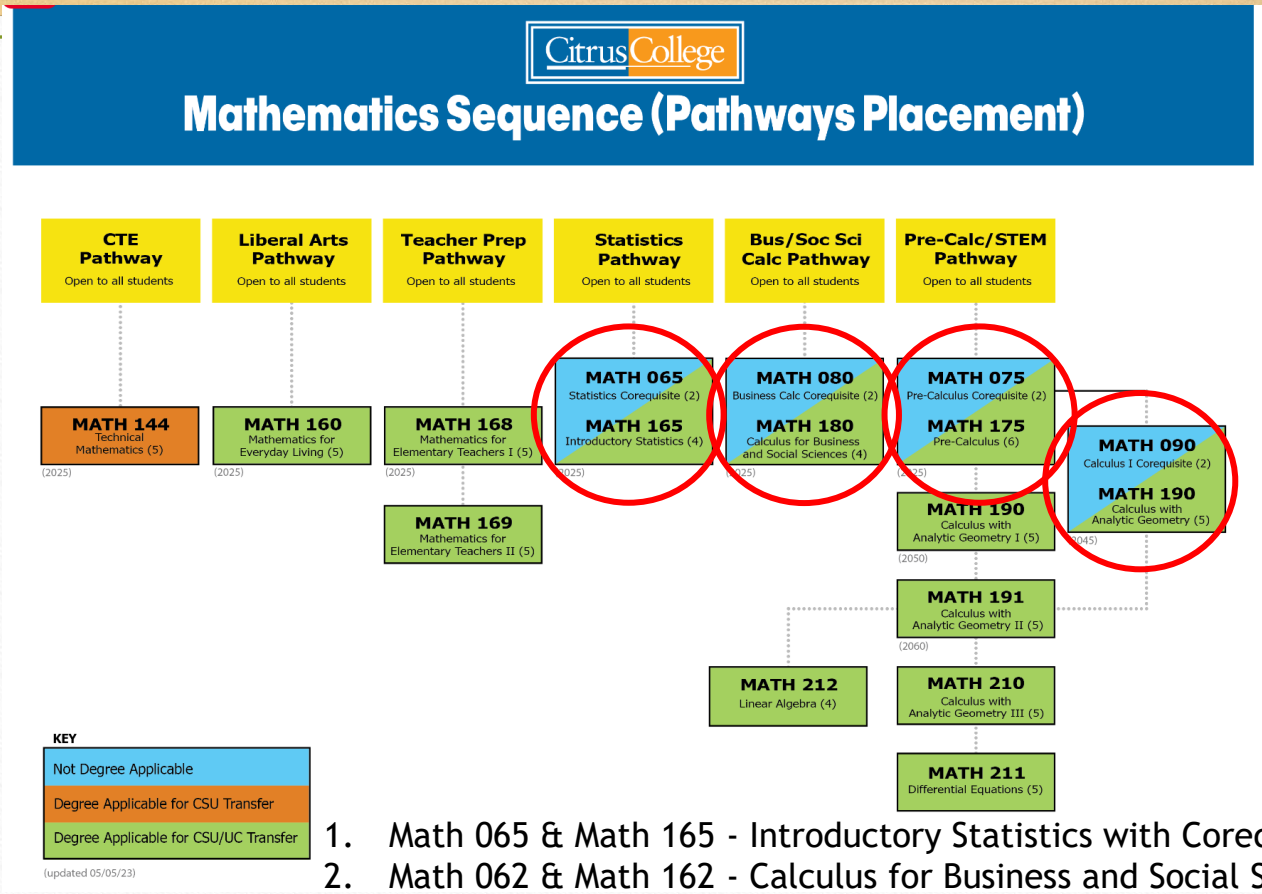
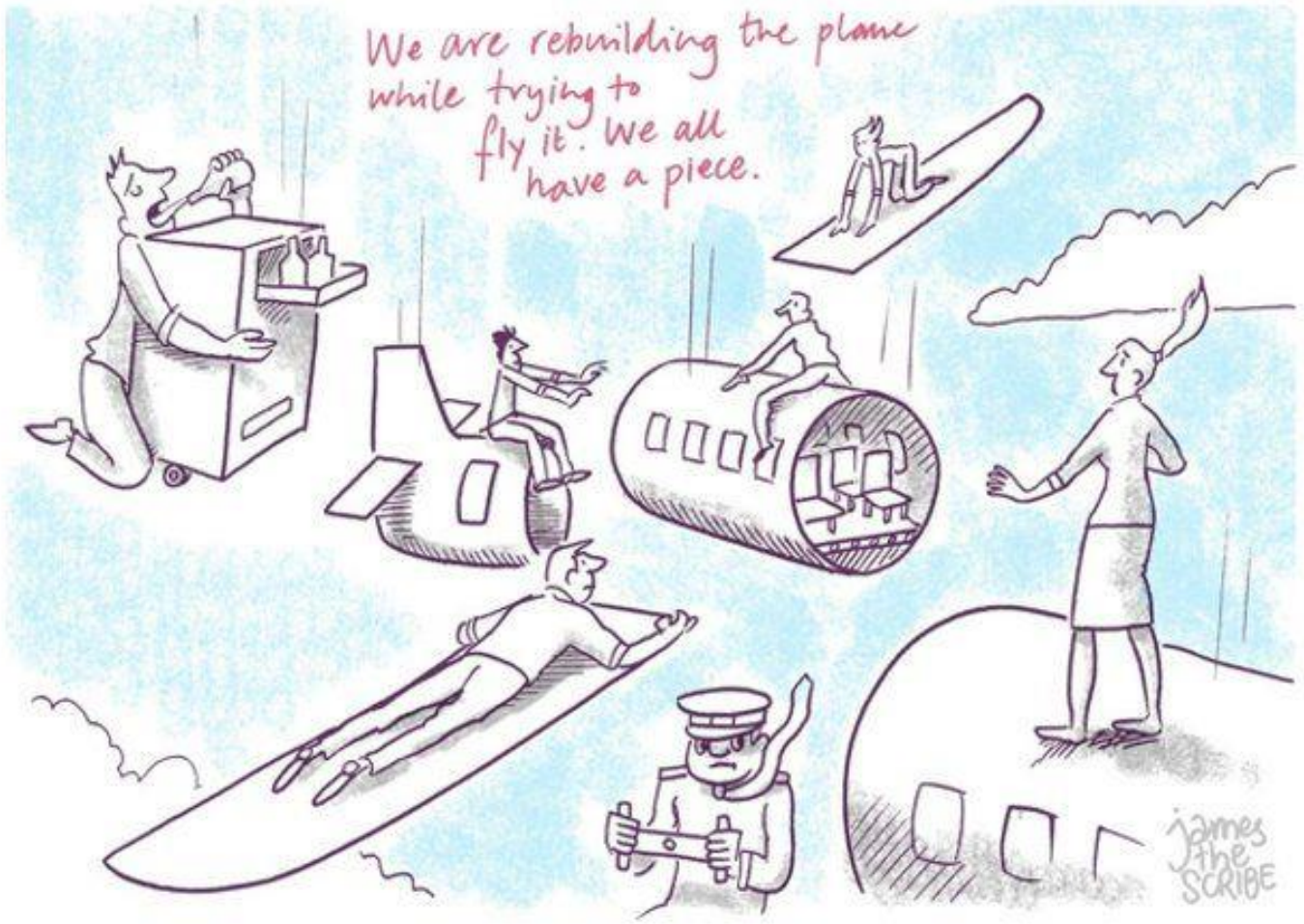
Citrus College Math Sequencing



1. Math 065 & Math 165 - Introductory Statistics with Corequisite Support
2. Math 062 & Math 162 - Calculus for Business and Social Sciences with Corequisite Support
3. Math 075 & Math 175 - Precalculus with Corequisite Support
4. Math 090 & Math 190 – Calculus with Analytic Geometry I with Corequisite Support


We are rebuilding the plane while trying to fly it. We all have a piece.
James the SCRIBE

Victoria's Typical Class Day

(4 unit transfer-level class + 2 unit corequisite
3 hour, 20 minute classes, twice a week)

1. Students come in to class, find their *name tags with group cards* on the desks. Students borrow TI-84 calculators (with Student ID).
2. Introduction/review from prior class day
3. 20-30 minute lecture when introducing a new concept
4. Groupwork practice
    a. Instructor & Embedded Tutor wander around to answer questions
    b. Encourage groups to stay together on-task
    c. Assign quick students to help struggling groups

Victoria's Typical Class Day

6. SWITCH GROUPS 1-2 more times
7. Continue with lecture, groupwork, and/or start homework
8. 1-minute text breaks!
9. Classroom Activities
10. Group Quizzes (low-stakes, formative assessments)

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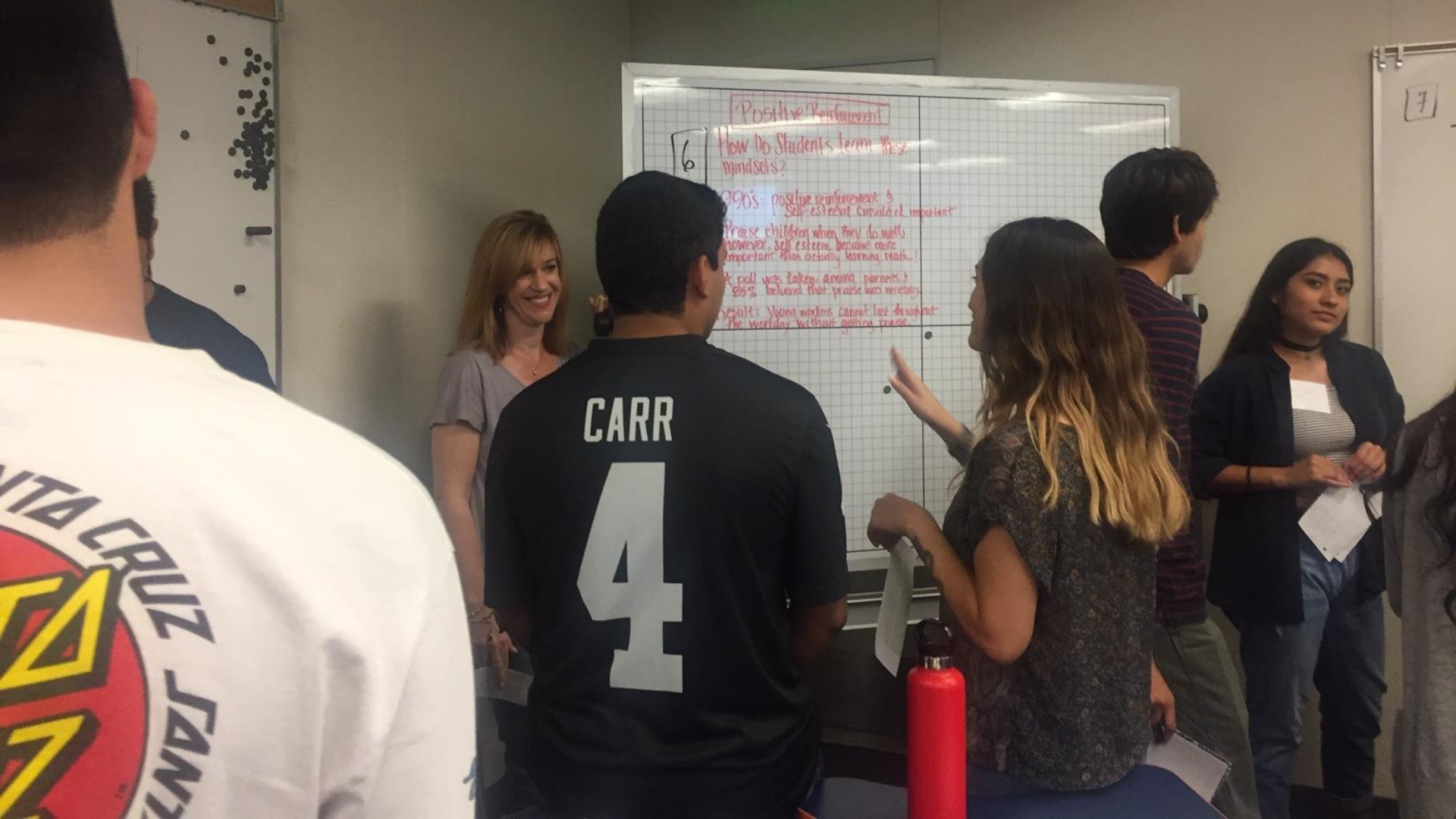
Citrus College, April 19, 2019


Electrophysiology


n=20
Bringback Practice
Problems 4, 6
Tuesday, 4/23/19


Positive Reinforcement
How Do Students learn these mindsets?
6
1990's: positive reinforcement &
Self esteem Considered important
Praise children when they do well
however, self esteem became more
important than actually learning math.
poll was taken among parents
85% believed that praise was necessary
Result: Young workers cannot last throughout
the workday without getting praise.
CARR
4
7

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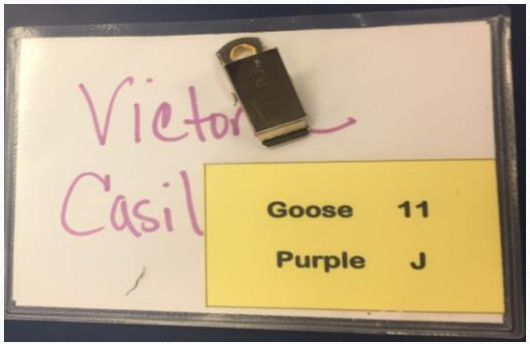
Pedagogy and Active Learning Techniques/Activities

Group Cards

- Cards attached to name tags containing an animal, a color, a number and a letter
  - ✓ Can regroup students up to 4 times each class
  - ✓ Group size 3
- Students complete the name tags on day 1
  - ✓ One side is their name
  - ✓ Opposite side is 3 interesting facts about them
    - ✓ Favorite color/animal/ice cream/food (nothing controversial!)



"If sometimes I don't understand something, my team helps me, or I help someone understand too."

- **Melissa**

Pedagogy and Active Learning Techniques/Activities

Group Cards (continued)

- Faculty has index cards with all animals/colors/numbers/letters
- Place one index card on the group tables before the students regroup
- Recommend regrouping students after each 2 hours of class
  - ✓ Randomized grouping, eliminates cliques and many discipline issues
- Students get the hang of it and regroup quickly!

Pedagogy and Active Learning Techniques/Activities

Scavenger Hunts

- Syllabus Scavenger Hunt
  - Group Activity on Day 1
  - Asks important questions
  - Gives students the opportunity to ask questions
  - Students create an ad hoc study group

SYLLABUS SCAVENGER HUNT

Review the class syllabus with your team, and look for answers to the following questions:

1. **Class Policies:**
   a. What are the days and hours of our class?
   b. What is my professor's name (spelling!) and e-mail address?
   c. What materials do you need for the class?
   d. What is the calculator policy for this class?
   e. What is the minimum point total to pass the class?
   f. How many class days can you miss before you are dropped from the class?

2. **Homework:**
   a. How many homework assignments will be collected?
   b. How will homework be graded?
   c. When is homework due?
   d. Can homework be turned in late??

3. **Quizzes and Exams:**
   a. How many quizzes will be given?
   b. How many quizzes are dropped from your grade?
   c. How many exams will be given?
   d. What happens if you miss an exam?
   e. How many exams are dropped from your grade?

4. **Participation Points:**
   a. How do you earn participation points?
   b. How many participation points can you earn?
   c. How do you lose participation points?

5. **Student Behavior:**
   a. Name two actions that can lead to disciplinary measures.
   b. What happens if you miss class during the add/drop period (the first two weeks of the semester)?

What questions do you have that were not answered in the syllabus?

1.
2.
3.

List the names and contact information for THREE classmates – form a study group NOW and decide when you will have your first meeting!

1. 2. 3.

Pedagogy and Active Learning Techniques/Activities

Scavenger Hunts (continued)

- Campus Scavenger Hunt (2 weeks)
  - With a group on own time, visit:
    - Student Health Center
    - Counseling Services
    - Learning Center
    - Cafeteria
    - Bookstore
    - MORE!

CITRUS COLLEGE SCAVENGER HUNT ACTIVITY – WORTH 25 POINTS

1. Visit the Citrus College library and get a student ID. Take a group selfie holding your student IDs (picture side showing).
2. Visit the librarian in the library and take a group selfie holding a book when you ask how to borrow books.
3. Visit the TECs Help Desk in the center of the 1st floor of SS or in IS 103 and take a group selfie in front of the computer when you:
   a. Log in to your Citrus College email
   b. Forward your Citrus College email to your personal email address

http://www.citruscollege.edu/tecs/Pages/default.aspx (scroll to the bottom, left side, for Help Desk information)

4. Visit the Student Health Center in SS, 1st floor, and inquire about their services for students: http://www.citruscollege.edu/stdntsrv/healthcntr/Pages/default.aspx. Take a group selfie outside the Student Health Center with their sign in the background.
5. Visit the Counseling Services Desk in SS, 2nd floor, and make an appointment to see a counselor and complete an SEP (Student Educational Plan). Take a group selfie with the Counseling sign in the photo background.
6. Visit the STEM Center in MA 129 and take a photo of the schedule of the STEM Center Hours
7. Visit the Learning Center in P1 and take a photo outside the Learning Center, with their sign showing in the photo. Ask for a copy of the Learning Center schedule for each of you to take home.
8. Visit the Bookstore and take a group selfie outside the bookstore, with the name of the bookstore in the background.
9. Visit the Campus Center/Cafeteria and take a group selfie having a snack (outdoors only).
10. Visit your instructor's office hours (see Syllabus for dates/times/location). Take a group selfie with your instructor in the office.
11. Download the Citrus College Mobile app and ***each group member*** will take a screenshot of their class schedule displayed on the app. http://www.citruscollege.edu/tecs/Pages/MobileApp.aspx
    There should be three different class schedules uploaded, one from each group member
12. Download the Citrus Rave Guardian app (Campus Safety) and ***each group member*** will take a screenshot of the app home page, showing something unique to them on the app: http://www.citruscollege.edu/campussafety/Documents/GuardianApp.pdf#search=Citrus%20mobile%20app

Only one group member needs to submit the assignment:

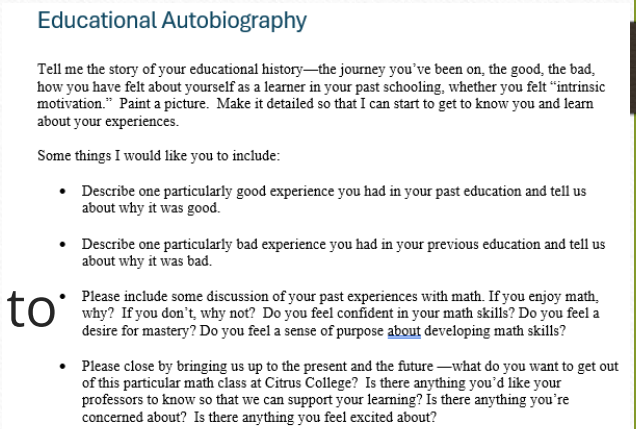
a. One group member should send themselves an email with the photos from this assignment. Open the email and save all the photos to your computer.
b. Copy the photos **in order 1-12 above** into a word document.
c. Save the word document as a .pdf file
d. Attach the .pdf file to the Scavenger Hunt assignment
e. Everyone in the group will receive their own grade for this assignment in the Canvas gradebook

Your Group is:

Pedagogy and Active Learning Techniques/Activities

Educational Autobiography Writing Assignment

- Get to know your class
- Helpful to see where students are coming from
- Assigned during week 2; returned to the student in 1 week with encouraging instructor comments



Educational Autobiography

Tell me the story of your educational history—the journey you've been on, the good, the bad, how you have felt about yourself as a learner in your past schooling, whether you felt "intrinsic motivation." Paint a picture. Make it detailed so that I can start to get to know you and learn about your experiences.

Some things I would like you to include:

- Describe one particularly good experience you had in your past education and tell us about why it was good.
- Describe one particularly bad experience you had in your previous education and tell us about why it was bad.
- Please include some discussion of your past experiences with math. If you enjoy math, why? If you don't, why not? Do you feel confident in your math skills? Do you feel a desire for mastery? Do you feel a sense of purpose about developing math skills?
- Please close by bringing us up to the present and the future —what do you want to get out of this particular math class at Citrus College? Is there anything you'd like your professors to know so that we can support your learning? Is there anything you're concerned about? Is there anything you feel excited about?

Let Learner's Struggle

ANNIE MURPHY PAUL

AUTHOR–JOURNALIST–CONSULTANT–SPEAKER

THE BRILLIANT BLOG

When, And How, To Let Learners Struggle

Monday, February 24, 2014

"Let them eat cake," said Marie Antoinette. Should teachers, parents, and managers say of the learners in their charge, "Let them struggle"?

Allowing learners to struggle will actually help them learn better, according to research on "productive failure" conducted by Manu Kapur, a researcher at the Learning Sciences Lab at the National Institute of Education of Singapore. Kapur's investigations find that while the model adopted by many teachers and employers when introducing others to new knowledge—providing lots of structure and guidance early on, until the students or workers show that they can do it on their own—makes intuitive sense, it's not the best way to promote learning. Rather, it's better to let neophytes wrestle with the material on their own for a while, refraining from giving them any assistance at the start.

Let Learner's Struggle - Questions

Read Annie Murphy's blog post, *When and How to Let Learner's Struggle* and then use the following prompts to write a response.

1) What is the main point of the article? You should be able to answer this question with one short sentence!

2) How are the messages in this article and the two Michael Jordan videos related?

3) What are the three conditions that promote beneficial struggle?

4) Do any of your instructors incorporate the three conditions that promote beneficial struggle into the classroom learning environment? If so, give an example. If not, use this space to write a quick note to one of your instructors explaining the value of *productive failure* and how to set up the three conditions that promote beneficial struggle in the classroom learning environment.

5) Give an example in your own life where failure has been productive and contributed to your success.

Pedagogy and Active Learning Techniques/Activities

Formative practice quizzes

- Students complete a group quiz together
- Class reviews answers together

Followed by…

Graded quizzes

- Individual quiz, three different versions
- Instructor-graded and grades recorded

Pedagogy and Active Learning Techniques/Activities

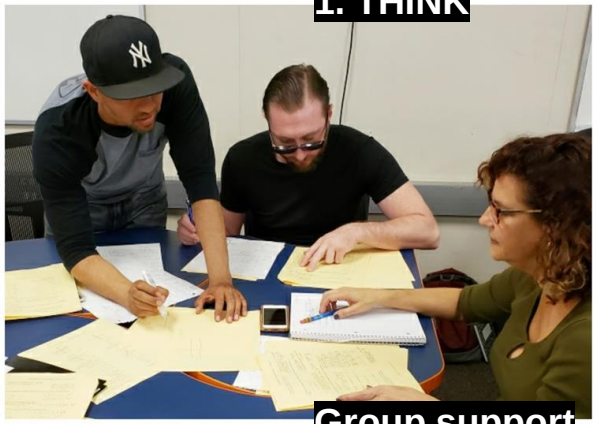
Project-Based Learning

- Used primarily in Statistics courses
- Students collect data, and perform descriptive and inferential statistical techniques using this data
  - Weekly project assignments
- Students own this learning

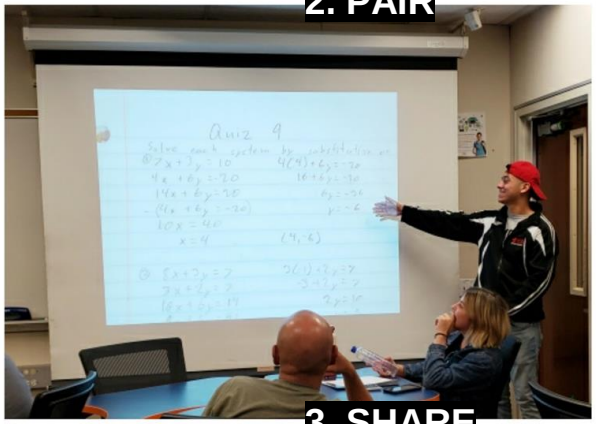
Think-Pair-Share

1. THINK

2. PAIR



Group support



3. SHARE

"When we don't understand something, the Professor will say "Why don't you visit other team members?"...we'll walk to other groups and see if the group gets it, and usually everybody is working together trying to get the answers."

- **Samantha**

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Affective Domain Support

Brainology Class Discussion Assignment with writing homework

- Completed by week 3, before the class has exam #1
- Do students have a “fixed mindset”?
- Remind students to have a “growth mindset” after exams and difficult concepts
- Students can complete this assignment during class as a gallery walk
  - Split the reading into paragraphs
  - Have each group answer questions on the board about their reading

Affective Domain Support

Growth Mindset: Carol Dweck, Ph. D. - Stanford University

- "...found that students' mindsets - how they perceive their abilities - played a key role in their motivation and achievement, and we found that if we changed students' mindsets, we could boost their achievement." (Dweck, 2006)
- "In a growth mindset, people believe that their most basic abilities can be developed through dedication and hard work—brains and talent are just the starting point. This view creates a love of learning and a resilience that is essential for great accomplishment" (Dweck, 2006)
- **Intelligent Practice = *Effort* + Good Strategies + Help from Others**

  (Apigo and Powers, 2015)

  - Students learn from mistakes
  - High standards/high expectations

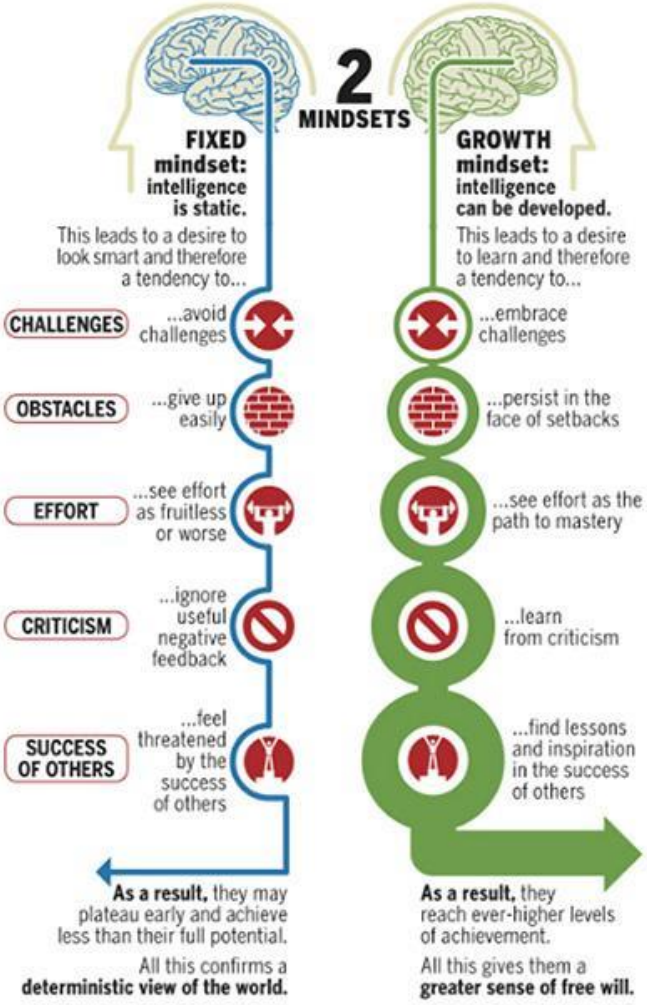
Dr. Carol Dweck
Mindset:The new Psychology of Success

https://www.youtube.com/watch?v=aQ0VQjKU8og

Growth Mindset

“This class has helped me not have a fixed mindset about doubting myself instead of actually trying to learn. That has really helped me.”

- **Crystal**



Let Learners Struggle - Classroom Activity

- Productive Struggle/Productive Failure

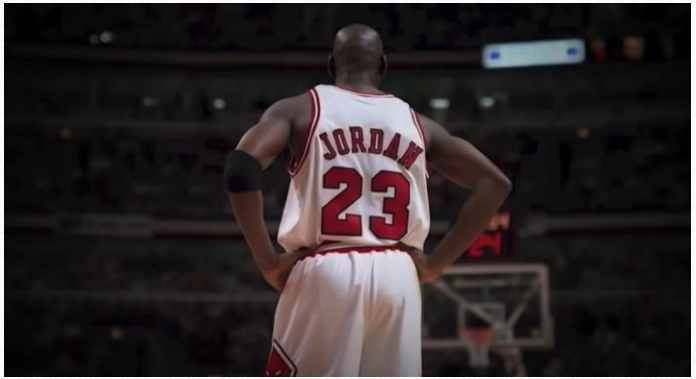
- Week 2 Activity given to us by Cuyamaca College
  - Prepares students for the difficulty, but encourages them to stick with it
  - Struggle with new material supports Growth Mindset
  - Board work allows for student struggle in the comfort of the classroom, so students are not alone

“I feel like the main thing that makes us succeed in the class is each other. Because we’re always helping each other out in group work and obviously the Professor helps a lot in understanding [the material] because we do Productive Struggle where we try to do the problem first and then it’s easier from there on.”

- **Jacob**

Affective Domain Support (continued)

Michael Jordan Videos: Failure



Michael Jordan "Failure" Nike Commercial

Maybe It's My Fault

Nike's Michael Jordan *Maybe It's My Fault Commercial*

Affective Domain Support (continued)

Broken Escalator

Stuck On An Escalator - Wake Up and Go After Your Dreams! (youtube.com)

Student work for Michael Jordan Videos

1) Watch Nike's Michael Jordan *Failure Commercial* and then respond to the question.

https://www.youtube.com/watch?v=45mMioJ5szc (30 sec)

In this video, what is the main point of Mr. Jordan's message? You should be able to answer this question with one short sentence!

2) Now watch Nike's Michael Jordan *Maybe It's My Fault Commercial* and then respond to the question.

https://www.youtube.com/watch?v=9zSVu76AX3I (1 min 2 sec)

In this video, what is the main point of Mr. Jordan's message? You should be able to answer this question with one short sentence as well!

Affective Domain Support (continued)

Metacognition Reflections:

- One-minute papers at the end of teaching difficult concepts (1x/month)
  - What was the “muddiest point” from the lecture, OR
  - Use as a check-in: “How is the class going for you”

Affective Domain Support (continued)

Exam Reflection and ReDo

- Use alone or in conjunction with a 10-point exam ReDo
  - Students complete a ½ page sheet with questions: did they study the right information, did they feel prepared for the exam, how will their preparation change for the next exam.

  - 10-point ReDo (for a 100-point exam): students have 1 week to correct every problem they missed on the exam and turn it in with their corrections. Students who participate will have a complete and correct study guide for the final exam.

Outreach to struggling students

- Classroom embedded tutor
- Focused study groups at campus tutoring center
- Encourage student interaction through Canvas Discussion Boards
- Use REMIND to quickly contact students who are not attending class or consistently leaving early

https://www.remind. com/

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Community of Practice

- Weekly faculty meeting for instructors teaching a specific corequisite course
- Identify issues
- Support each other
- Brainstorm ideas and solutions
- Mentor adjuncts and new instructors

Embedded Tutors

- Adjunct faculty embedded in corequisite classrooms
  - Excellent aid for the main instructor
  - Instructor collaboration for new activities
  - Often teach their own section of the same course later in the day
    - Embedded tutor knows the curriculum well

Institutional Research Office

At the end of each term:

- Student satisfaction surveys for each corequisite class
- Student group interviews

During the next term:

- Discuss the results with the entire math department

Student Quotes from various sections of Introductory Statistics with Corequisite Support

"In this class I've actually done a lot more math than I've ever have before in my entire life. I like that we have an extra instructor in the class because it gives me the ability to be helped quicker. And I like how we switch seats a lot because it gives me the confidence to talk to other people and ask them for help".

- **Jonathon**

"This class has given me the chance I never thought I would get. There is a light at the end of the tunnel, and I'll see it in June".

- **Reina (transferring to Pitzer College)**

"Before the start of class, Mr. B already sets the tone. He is very positive, he greets everyone. A common thing that he says is *I believe in you*. So you get to class and it just like alright, I can't fail, I'm already in a positive environment".

- **Phillip**

"Everybody has different learning styles and I think that all the interaction in the class is really helpful with that because people learn differently. I put something on the board today and one girl asked me "Oh, how did you do it like that?".

- **Samantha**

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Thank you! Questions?

Contact me with questions anytime:

Victoria Dominguez
Victoria.Dominguez1@gmail.com

References

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