Helping students get a **GRIP** in Math: Guided, Reasonable, Informed Pathways

Joe Gerda, Saburo Matsumoto, Kathy Kubo, Preeta Saxena, Daylene Meuschke
Objectives

How does Math placement fit into Guided Pathways?
• What are pathways in Math?
• What pathways are students taking?

Canyons’ Experience
• What should have happened?
• What happened?
• What we plan to do?
• Lessons learned and learning...
(IE)$^2$'s Canyons Completes initiative is designed to facilitate positive movement towards completion of degrees, certificates, and skills building courses for students through improved programs, processes and services.
### Intersecting Goals – CCCCCO Integrated Plan

<table>
<thead>
<tr>
<th>Goal</th>
<th>Activities in each program that serve the goal listed</th>
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<tr>
<td><strong>Accelerate student completion of college and transfer-level math and English.</strong></td>
<td><strong>SSSP</strong>&lt;br&gt;Program disjunctive placement model changes in Accuplacer and train program advisors on the implications of the new placement model.  &lt;br&gt;<strong>Student Equity</strong>&lt;br&gt;Provide analyses to support the implementation of a disjunctive placement model and evaluate the impact after first semester.  &lt;br&gt;Initial results of Math Disjunctive placement: Results show a significant increase in student placing directly into transfer-level statistics. Overall student success in that class has declined slightly, but far more students are completing transfer-level math than prior to disjunctive direct placement.</td>
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Background

Accelerated Pathways

- Created a statistics pathway
  - Pre-Statistics
    (2 LBT → 1 LBT)
- Removed Arithmetic

* LBT = Levels below transfer

Improved Placement

- Multiple Measures
- Two Placements
  - STEM
  - Statistics

2012 - 2015 Fall

2016 - Present
Current Math Sequence (2015-present)

- Moved to non-credit

- Arithmetic
- Pre-Algebra

- Elem. Algebra
- Int. Algebra

- Int. Algebra For Stats
- Statistics

STEM Transfer Courses

Accelerated Pathways
Two Placements through Multiple Measures

Students receive up to 2 placements

1. *STEM Placement*
   - *Floor* and/or
   - *Accuplacer score + weights*

2. *Direct Placement in Statistics*
   - *H.S. information*
Knowing the following, what *should* have happened?
Which pathway are students pursuing?

Fall 2017 Active Students (N=16,530)

- 21% are pursuing STEM

STEM includes: Biology, Computer Science, Geography, Geology, Physics, Engineering, Mathematics.
Note: Chemistry and Astronomy are considered STEM but are not program majors.

As of September 15, 2017
Which pathway are students completing degrees in?

- 11% of all Degrees awarded are in STEM

Degree Completers 2016-17 (N=1,759)
Students who placed into Transfer-level...

**FIRST PROGRAM**

- **NON-STEM**
  - 545 students
  - 424 (78%)
  - 95 (17%)

**SECOND PROGRAM**

- **NON-STEM**
  - 476 students
  - 45 (45%)

**STEM**

- 99 students
  - 52 (51%)
  - 45 (45%)

**DEGREE PROGRAM**

- **NON-STEM**
  - 476 students
  - 45 (45%)

- **STEM**
  - 140 students
Students who placed **Below Transfer** (Transfer with support...)

**FIRST PROGRAM**

- **NON-STEM**
  - 801 students

- **STEM**
  - 53 Students

**DEGREE PROGRAM***

- **NON-STEM**
  - 784 students

- **STEM**
  - 50 students

745 (93%)

39 (5%)

39 (74%)

11 (21%)
Takeaways

Super Majority are NON-STEM (completers and active)

Students who place below transfer...
• 90% NON-STEM starters end up in NON-STEM
• 75% STEM starters end up in NON-STEM

If you start in STEM but place below transfer level, likelihood of completing STEM degree is about 21%.

Statistics vs. STEM pathway is influenced by: Math Placement
What did happen?

**PATHWAY CHALLENGE**

*What percent of the students who were given the option, chose:*

- STEM Pre-Algebra
- OR
- Statistics Into. Statistics
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<tr>
<td>Transfer (College Algebra, PreCalc, Calc)</td>
<td>1,482</td>
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<td></td>
<td>75%</td>
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<tr>
<td>1 Level Below Transfer Interm. Alg./* for stats/Geometry</td>
<td>1,264</td>
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<td>51%</td>
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<td>2 Levels below Transfer Elem Alg./Alg. for Stats</td>
<td>790</td>
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<td></td>
<td>52%</td>
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<td>3 Levels Below Transfer Algebra Prep.</td>
<td>212</td>
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<td>47%</td>
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2016-17 & 2017-18 Placements: All received Direct Placement
Students shy away from Statistics BECAUSE it’s transfer-level, thinking “How can I succeed at transfer level when I am placed 2 or 3 levels below transfer?” “I’m not ready”

• Some students want to go STEM because they are afraid that non-STEM does not get them a job.

• Students do not know what Statistics is.
  • “Algebra” is familiar; “Statistics” is not.
What we plan to do?...

Develop a liberal Arts Math course

Eliminate Basic skills/Developmental courses

Offer dramatically more Statistics sections
  Needs Professional Development

Prioritize GRIP
Affective Pedagogy: Providing Support for Increased Number of Statistics/Transfer-Level Sections

![Graph showing the increase in number of sections offered from 2011 to 2017. The number of sections offered has increased from 15 in 2011 to 41 in 2017.]
Providing support for our students
Intentional Support for Students’ Affective Needs

Pedagogical practices are employed to

- reduce students’ fear
- create a sense of belonging
- make them less likely to sabotage their own classroom success
- increase their willingness to engage with challenging tasks
From Day 1: Build the community
Recent randomized experiments have found that seemingly “small” social-psychological interventions in education—that is, brief exercises that target students’ thoughts, feelings, and beliefs in and about school—can lead to large gains in student achievement and sharply reduce achievement gaps even months and years later.

_Social-Psychological Interventions in Education: They’re Not Magic_
David S. Yeager and Gregory M. Walton
Sample interventions
Mentors are pre-statistics/statistics coordinators.
Both mentors and mentees receive a stipend.

**Participant requirements**

- *Include description in syllabus*
- *Assign at least 5 affective domain activities*
- *Meet with a mentor for a total of 2 hours*
• The majority of faculty who teach introductory statistics have degrees in mathematics, not statistics

• How to encourage faculty to incorporate GAISE (Guidelines for Assessment and Instruction in Statistics Education) recommendations
Activity based/Collaborative learning
Use of technology
Metascore is better at predicting Rotten Tomato ratings than IMBD. The explanatory variables are Metascore & IMBD; the response variable is Rotten Tomatoes. There are over 70 cases for both analysis. The scatterplots for both explanatory variables show a linear form, moderately strong positive relationship. In comparing the different measures, Metascore has a higher correlation (0.87 vs 0.79), higher $r^2$ (0.73 vs 0.64) & a smaller standard error (0.18 vs 0.13), therefore Metascore is the better predictor for Rotten tomato rating.

The equation is:

$\text{Rotten Tomatoes} = -7.5 + (1.2) (\text{Metascore})$

In the context of this problem the slope of 1.2 means for every increase in 1 of Metascore, Rotten tomatoes rating increases by 1.2%. The $r^2$ indicates that 75% of the variation of Rotten tomatoes rating is explained by Metascore. The $\text{Se}$ lets us know that we expect an error of + 10.8% in our prediction of Rotten tomato rating.

Our prediction for a Metascore value of 80 is $88.5(-7.5 + 1.2 (80))$ the typical range of values would be 77.7 - 94.3.

-Alyssa
Presentations

UFO Sightings
by Morgan McChesney, Judith Plascencia, Cody Wells

LSD AND MATH SCORES
Jeric Fule ~ Maria Vargas ~ Diana Arellano
Students helping students
Workshops on the teaching of statistics
Upcoming Statistics Pedagogy workshops 2018-19

• October 13: Pasadena City College
• February 2: Pasadena City College
• March 30: College of the Canyons
• Additional dates TBA (Northern/Central California)
• Summer 3-day institute (TBA)
Closing Remarks

Having pathways is not enough!

Nudging
Messaging
Supporting the Statistics Pathway
Questions/Comments?

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G.P. is not enough, GRIP is essential

• G: “Guided”: meta-majors, counseling, support teams, messaging, nudging and assessment staff
• R: “Reasonable”: completion in 2-3 years? Realistic? (No aRithmetic!)
• I: “Informed”: choice based on success data including NUDGING
• P: “Pathway”: Get on narrower path, stay on, and reach the goal.