Corequisite Education

Connie Richardson
The Charles A. Dana Center

January 13, 2022
The University of Texas at Austin

Equity — Access — Excellence
DCMP Norms for Equitable Conversations

1. Keep equity central.
2. Understand that those who work, learn.
3. Seek clarification in language and ideas to increase understanding.
   • “Can you tell me more about...,”
   • “How has your experience or upbringing informed your perspective on...”
4. Look for solutions, not blame.
5. Focus on systems, not people
6. Recognize that everyone has expertise.
7. Be honest.
8. Share talk time.
All Files > Dana Center - Connecticut ACME Implementation Work

Name | Updated
--- | ---
Backmapping Session | Oct 18, 2021 by Francisco...
CMAC Data Presentation Fall 2021 | Oct 18, 2021 by Francisco...
MATYCONN | Oct 18, 2021 by Francisco...
Optional Coreq Refresher Webinar January 2022 | Today by Connie Richards...
Statistics | Nov 16, 2021 by Francisco...
Structures and Case Studies Session | Oct 18, 2021 by Francisco...

https://utexas.box.com/s/g7djegb1i4ift7fmp0sea9k8mn287zmb
Student Outcomes – The “Why”

The most common student outcomes in U.S. across community colleges and universities:

• Accumulation of credit hours
• Accumulation of debt
• NO credential
A Thought Experiment

Assume we had 75% pass rates in all developmental and gateway courses.

What percentage of students would pass their gateway course?

Two levels below gateway: \((100\%)(75\%)(75\%)(75\%) = 42.2\%\)

What if 90% persisted at each transition point?

\((100\%)(90\%)(75\%)(90\%)(75\%)(90\%)(75\%) = 30.8\%\)
### CCC Guided Pathways Key Performance Indicator #12 by School and Region

<table>
<thead>
<tr>
<th>School Region</th>
<th>School</th>
<th>Fall 2013</th>
<th>Fall 2014</th>
<th>Fall 2015</th>
<th>Fall 2016</th>
<th>Fall 2017</th>
<th>Fall 2018</th>
<th>Fall 2019</th>
<th>Fall 2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital East</td>
<td>Capital</td>
<td>76%</td>
<td>78%</td>
<td>75%</td>
<td>75%</td>
<td>74%</td>
<td>72%</td>
<td>72%</td>
<td>66%</td>
</tr>
<tr>
<td></td>
<td>Manchester</td>
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<td></td>
<td>Middlesex</td>
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<td></td>
<td>Quinebaug Valley</td>
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<td></td>
<td>Three Rivers</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>North West</td>
<td>Asnuntuck</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td></td>
<td>Naugatuck Valley</td>
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<td></td>
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<tr>
<td></td>
<td>Northwestern CT</td>
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<td>Tunxis</td>
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<td></td>
<td></td>
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<tr>
<td>Shoreline West</td>
<td>Gateway</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Housatonic</td>
<td></td>
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<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Norwalk</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All CCC</td>
<td></td>
<td>76%</td>
<td>78%</td>
<td>75%</td>
<td>75%</td>
<td>74%</td>
<td>72%</td>
<td>72%</td>
<td>66%</td>
</tr>
</tbody>
</table>
### CCC Guided Pathways Key Performance Indicator #4 by School and Region

<table>
<thead>
<tr>
<th>Semester</th>
<th>Gender</th>
<th>Race/Ethnicity</th>
<th>Age Group</th>
<th>Zip Code (F19 Onward)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall 2020</td>
<td>(All)</td>
<td>(All)</td>
<td>(All)</td>
<td>(All)</td>
</tr>
</tbody>
</table>

**KPI:** Passed (C or better) college-level math in year one (fall, winter, spring, summer)

#### Capital East
- Capital: 27%
- Manchester: 30%
- Middlesex: 33%
- Quinebaug Valley: 28%
- Three Rivers: 31%

#### North West
- Asnuntuck: 23%
- Naugatuck Valley: 27%
- Northwestern CT: 36%
- Tunxis: 34%

#### Shoreline West
- Gateway: 34%
- Housatonic: 19%
- Norwalk: 25%

#### All CCC
- 29%

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**Years:**
- Fall 2013: 27%
- Fall 2014: 29%
- Fall 2015: 28%
- Fall 2016: 27%
- Fall 2017: 26%
- Fall 2018: 26%
- Fall 2019: 29%
- Fall 2020: 29%
Addressing the Problem: Innovation

There is **not**:

- a lack of innovation.
- a lack of administration, faculty, and staff wanting students to succeed.
- a lack of initiative fatigue.
THE PATHWAYS MODEL

- An integrated, college-wide approach to student success
- Based on intentionally designed, clear, coherent, and structured educational experiences
- Informed by available evidence

<table>
<thead>
<tr>
<th>K-12 partners</th>
<th>CLARIFY PATHS</th>
<th>GET ON A PATH</th>
<th>STAY ON A PATH</th>
<th>ENSURE LEARNING</th>
<th>4-year, Grad School &amp; Workforce</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Clarify paths to students’ end goals</td>
<td>Help students choose and enter a pathway</td>
<td>Structured Programs of Study to help students stay on a path</td>
<td>Certificates, Degrees</td>
<td>Prepared for: Efficient Transfer, Graduate School, Meaningful Jobs</td>
</tr>
<tr>
<td></td>
<td>HS Graduates</td>
<td>Placement</td>
<td>Gateway Courses</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Adults</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Optional Webinar
Thursday, January 13th 2:00-3:30
Zoom Link: https://utexas.zoom.us/j/99821288641

Preparatory Work:
Set aside 30 minutes to review Key Performance Indicators, as follows:
1. Visit https://www.ct.edu/gp/kpi
2. Open the 2021 Report (2020 data)
3. Review pages 2-5
4. Find and review your campus page, especially focusing on KPI’s 4, 5, and 6
5. Return to the KPI website, choose the Equity tab, your campus, and KPI 4 (see sample screenshot below). Review the data; repeat for KPI’s 5 and 6.

• What did you notice?
• What did you wonder?
Comprehensive Redesign

Core elements:
• Bring an equity focus to all work
• First year enrollment in college-level mathematics and English
• Aligned math pathways with default or recommended math requirements
  • Meta-majors with default or recommended math requirements
• Multiple measures placement
• Enhanced advising for those students still deemed underprepared
• Corequisite supports for those students
City University of New York (CUNY)  
Randomized Control Trial  
Statistics Corequisites at Community Colleges
City University of New York Randomized Control Trial

Logue, Watanabe-Rose, & Douglas, randomized control trial conducted Fall 2013
City University of New York Randomized Control Trial

Enrollment Status After 3 Years

<table>
<thead>
<tr>
<th>Percentage of Students</th>
<th>Not Enrolled</th>
<th>Enrolled</th>
<th>Graduated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elem Alg N=297</td>
<td>17.1%</td>
<td>30.0%</td>
<td>52.9%</td>
</tr>
<tr>
<td>Elem Alg w/WS N=313</td>
<td>19.4%</td>
<td>25.0%</td>
<td>55.6%</td>
</tr>
<tr>
<td>Stat w/ WS N=297</td>
<td>25.2%</td>
<td>26.7%</td>
<td>48.1%</td>
</tr>
</tbody>
</table>

Logue, Watanabe-Rose, & Douglas, randomized control trial conducted Fall 2013
City University of New York Randomized Control Trial

Figure 1. Degrees completed by term, and wages earned by calendar year, for Elementary Algebra (EA) and Statistics with Workshop (Stat-WS) students (297 students per group).
Research on the Intersection of Mathematics Pathways and Corequisites
Analysis of Tennessee Corequisites

• ACT “college-ready” in math and reading is 19; writing is 18
• For example, the math analysis is of students:
  • scoring 17-18 (placed into remediation)
  • scoring 19-20 (placed directly into college math)
• This sample represents more than 1/3 of all students
• Analysis predicated on the well-documented lack of precision of placement exams: students near any particular score are relatively similar
Conclusion: it’s not all about coreqs

Enrolling students in corequisite courses resulted in large positive effects, and attributes these effects to state-wide efforts to enroll students in math courses aligned with the requirements of their program, i.e. enrolling more students in Statistics rather than placing them into algebra by default. …

[Math] students placed into corequisite courses were 8 percentage points more likely to enroll in and pass an additional college-level math course compared with students placed into college-level directly.

A significant takeaway from this study is that math pathways and corequisite courses should not be viewed as competing reform efforts, but rather, as complementary system-wide strategies that lead to student success in gateway level math courses. In fact, …, offering viable math pathways is essential to maximizing the benefits of corequisite remediation.

Summary approved by lead researcher Florence Xiaotao Ran
Personal communication April 27, 2020
What are other states doing?

100% Mandates:
- California
- Connecticut
- Georgia
- Ivy Tech (Indiana statewide)
- Tennessee
- Texas

Encourage/support:
- Arkansas
- Colorado Community Colleges
- Delaware Tech/CC (statewide)
- Louisiana
- Maine Community Colleges
- Massachusetts
- Michigan
- Missouri
- New York: SUNY and CUNY
- Ohio
- Washington
- West Virginia

Getting Started:
- Minnesota
- Pennsylvania
California Implementation Report
Key Takeaways

• Success rates are increasing
• STEM success rates are increasing
• Many students are still required to take prerequisite developmental courses; they are more likely to be students of color and/or from low-income communities.
Background: Returning adult student, away from math for 5 years; studied fashion design, worked as a historical costumer

Goal: Teach high school biology

Placement via Accuplacer: Intermediate Algebra

Probability of completing transfer-level math: 36%

Given access to transfer-level: Enrolled directly in Pre-Calculus with 2 units of concurrent support

Grade in Pre-Calculus: 89
University System of Georgia
USG System-wide Comparison of Success in Gateway Math Classes

https://completega.org/usg-corequisite-virtual-workshop-reviewing-progress
USG System-Wide Comparison of Success in Gateway English

https://completega.org/usg-corequisite-virtual-workshop-reviewing-progress
USG System-wide Comparison of Success in Gateway Math Classes

Disaggregated by Race

2013 Traditional DevEd  2015–17 Foundations  African American  Latinx  White  All Students
Full Corequisite Implementation AY2018
USG System-Wide Comparison of Success in Gateway English

Disaggregated by Race

https://completega.org/usg-corequisite-virtual-workshop-reviewing-progress
USG System-wide Comparison of Success in Gateway Math Classes

Disaggregated by Institution

Full Corequisite Implementation AY2018
USG System-Wide Comparison of Success in Gateway English

Disaggregated by Institution

ACT Math Sub-score

Full Corequisite Implementation AY2018
Distinguishing Factors of Success

- Regardless of race/ethnicity, gender, math pathway, preparation level, etc.:
- 2 or 3 hours of support are better than 1 hour
- Cohort model has better results, likely due to alignment issues in the co-mingled models
- Academic mindsets

https://completega.org/usg-corequisite-virtual-workshop-reviewing-progress
Tools and Resources for Design Teams

Corequisite Mathematics Toolkit
Tools and resources for the design and implementation of equitable and effective support courses
The Charles A. Dana Center at The University of Texas at Austin & Strong Start to Finish

https://strongstart.org/deepening-understanding/resource-library/corequisite-mathematics-toolkit
Questions?
What are institutions using to guide placement decisions?
### Purpose and Accuracy of Placement

<table>
<thead>
<tr>
<th>Problem</th>
<th>Solution Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Prerequisite developmental courses</td>
<td>1. Corequisite supports</td>
</tr>
<tr>
<td>2. Misaligned content</td>
<td>2. Multiple math pathways with aligned supports</td>
</tr>
<tr>
<td>3. Placement test validity</td>
<td>3. Multiple measures</td>
</tr>
</tbody>
</table>
## Developmental assessment and assignment theory

### Under-Placement and Over-Placement

<table>
<thead>
<tr>
<th>Student Ability</th>
<th>Placement According to Exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developmental</td>
<td>Developmental</td>
</tr>
<tr>
<td>College Level</td>
<td>Under-placed (English – 29%) (Math – 18%)</td>
</tr>
</tbody>
</table>

Why use multiple measures for placement?

“Given that institutions, students, and courses are so different, it is not possible to stipulate specific test cut scores for broad use across institutions.”

“Course placement scores appropriate for each program should be considered and [our organization] strongly recommends that multiple measures be used when placing students.”

“Cut scores alone are simply one piece of information useful in determining course placement, but research has shown that test scores in combination with elements such as High School GPA, or years since last math course, can often lead to more targeted placements.”

Variance in college-level grades explained by exams, HSGPA

Conclusions based on prior research

- Too many students are placed in developmental education who could thrive at college level.
- Better assessment systems are needed.
- HS GPA is the best single predictor of success in college math and English.
- Other measures may be needed to best place diverse student groups.
Shifting the conversation from “evidence for sorting” to "evidence for support"
Example of Students’ Higher Ed Journey to and through Math Pathways

*Students have “momentum” towards degree completion when completing their first-year college mathematics in their 1st year of attending college.

Adapted from Complete College America. (2016).
Potential use of self-reported high school information

- UC admissions uses self-report but verifies after admission. 


- ACT research often uses self-reported GPA, generally find it to be a highly powerful predictor and highly correlated with students actual GPA: ACT, 2013: r(1978)=0.84 [http://bit.ly/ACTSRGPA](http://bit.ly/ACTSRGPA)

Cal-PASS Plus, A System of Data; the RP group (the Research & Planning Group for California Community Colleges)
Accuracy of self-reported high school information

<table>
<thead>
<tr>
<th>Actual HSGPA Level</th>
<th>N</th>
<th>Mean HSGPA</th>
<th>Accuracy</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Actual</td>
<td>Student-reported</td>
<td>Mean difference</td>
<td>% within 0.25</td>
</tr>
<tr>
<td>0.00-1.49</td>
<td>85</td>
<td>1.03</td>
<td>1.85</td>
<td>0.82</td>
<td>14%</td>
</tr>
<tr>
<td>1.50-1.99</td>
<td>172</td>
<td>1.77</td>
<td>2.04</td>
<td>0.27</td>
<td>30%</td>
</tr>
<tr>
<td>2.00-2.49</td>
<td>265</td>
<td>2.24</td>
<td>2.35</td>
<td>0.11</td>
<td>40%</td>
</tr>
<tr>
<td>2.50-2.99</td>
<td>408</td>
<td>2.81</td>
<td>2.76</td>
<td>0.05</td>
<td>47%</td>
</tr>
<tr>
<td>3.00-3.49</td>
<td>451</td>
<td>3.24</td>
<td>3.23</td>
<td>-0.01</td>
<td>60%</td>
</tr>
<tr>
<td>3.50-4.00</td>
<td>599</td>
<td>3.79</td>
<td>3.75</td>
<td>-0.04</td>
<td>87%</td>
</tr>
<tr>
<td>Total</td>
<td>1,980</td>
<td>2.95</td>
<td>3.02</td>
<td>0.07</td>
<td>58%</td>
</tr>
</tbody>
</table>
Cuyamaca College - Placement

Uses HSGPA and course-taking only; no testing. HSGPA is self-reported.

<table>
<thead>
<tr>
<th>Path</th>
<th>Measures</th>
<th>Placement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Algebraic</strong> (Business &amp; STEM)</td>
<td>Grade of C in High School Algebra II and GPA ≥ 3.3</td>
<td>Transfer-level</td>
</tr>
<tr>
<td></td>
<td>A or B in Algebra II and GPA ≥ 3.0</td>
<td>Transfer-level</td>
</tr>
<tr>
<td></td>
<td>A or B in PreCalculus and GPA ≥ 3.0</td>
<td>Calculus I</td>
</tr>
<tr>
<td></td>
<td>C in PreCalculus and GPA ≥ 3.0</td>
<td>Calculus I</td>
</tr>
<tr>
<td></td>
<td>All others*</td>
<td>Transfer-level with support</td>
</tr>
<tr>
<td><strong>Stats &amp; QR</strong></td>
<td>GPA ≥ 2.8</td>
<td>Transfer-level</td>
</tr>
<tr>
<td></td>
<td>GPA &lt; 2.8</td>
<td>Transfer-level with support</td>
</tr>
</tbody>
</table>

*Approximately 2% of STEM-intending students each semester enter with no Algebra 2 grade and are placed into Intermediate Algebra.
Redesigned Placement Process

Question 7: Guided Pathways/Math Pathways Placement

Step Two - Guided Pathways/Math Pathways Placement

Please answer the following questions, and you will not be permitted to continue if you do not answer all required questions.

* Required

You have previously submitted the Assessment Center (Cuyamaca College) for the... (Assessment Center (Cuyamaca College) for the...)

1. Did you attend a U.S. high school?
   - Yes
   - No

2. Which of the following is your highest school grade point average?
   - 3.3 or higher
   - Lower than 3.3

3. Is English your native or primary language?
   - Yes
   - No

4. Do you sometimes have difficulty understanding English?
   - Yes
   - No

5. Of the courses in this section, which is your best calculator?
   - Calculus
   - Statistics
   - Other

6. What is your grade in... (course name)?
   - A
   - B
   - C

7. In which of the following areas are you thinking of majoring (studying)?
   - Engineering/Math/Computer Science/Science (Physics, Chemistry, Biology, Pre-Med, etc.)
   - Teaching (Elementary Education)
   - Social Science/Allied Health (Nursing, Social Work, Administration of Justice, Psychology, Sociology)
   - Business (Accounting, Economics, Finance, Management, Marketing, etc.)
   - Arts & Humanities (History, English, Literature, Languages, Philosophy, Communication, etc.)
   - I am thinking of something else

Assessment/Placement Results

Recommended courses:

- Submitted: 28 Feb 2019
- Recommended Math: Math 180
- Recommended English: Engl 120

Please see a counselor if you have any questions about your placement results, or if you change your major, which might change your Recommended Math.

I am thinking of something else
Southern Arkansas University - Placement

High school GPA and ACT scores

Stipulates Arkansas HS & graduation within 5 years

Begins placement by determining appropriate mathematics pathway

Mathematics - Mathematical Literacy

Initial Placement Using Math ACT & GPA

<table>
<thead>
<tr>
<th>Math ACT or Equivalent</th>
<th>Unweighted GPA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;2.51</td>
</tr>
<tr>
<td>22+</td>
<td>MATH 1053 Mathematical Literacy &amp; MATH 0051 Mathematical Literacy Lab</td>
</tr>
<tr>
<td>18-21</td>
<td>MATH 1053 Mathematical Literacy &amp; MATH 0051 Mathematical Literacy Lab</td>
</tr>
<tr>
<td>&lt;18</td>
<td>MATH 1053 Mathematical Literacy &amp; MATH 0051 Mathematical Literacy Lab</td>
</tr>
</tbody>
</table>
Equity Implications of Limited Corequisites

• Students are much more likely to stop out of a prerequisite sequence than they are to fail a college-level course plus corequisite.

• The impact is worse for students of color and low-income students.

For example, see Belfield, Jenkins, & Lahr (2016) and Denley (2021)
Caleb Rendon-Guerrero, Cuyamaca College

**Background**: High school dropout who’d been in and out of criminal justice system

**Goal**: To “be the solution not the problem” in his family, create a non-profit to help kids like him

**Placement via Standardized Test**: Elementary Algebra

**Probability of completing transfer-level math**: 36%

**Corequisite Remediation**: Enrolled directly in College Statistics with 2 units of concurrent support

**Grade in Statistics**: B

**Follow Up**: Second-year student, GPA of 3.6

*California Acceleration Project, February 22, 2019*
A Cautionary Tale from College of the Canyons

- In 2016, **71% of students were eligible to enroll directly** in college Statistics through multiple measures.
- The college gave students two placement options and let them choose between Statistics and a below-transfer algebra course.
- Students who chose statistics passed at a rate of 66%.
- But **80% of the eligible students placed themselves into remedial algebra**, even though the vast majority didn’t need it for their major.
- Just **13% of these students completed transfer-level math that year** – 188 out of 1,438 students.
- If you offer developmental courses, they will come, and “instead of a field of dreams, it’s a field of nightmares.”
  
  - Sab Matsumoto, long-time chair of mathematics and current AB 705 coordinator
Resources

Dana Center Math Pathways Implementation Guide
https://dcmathpathways.org/implementation-guide

Dana Center Corequisite Toolkit
https://strongstart.org/deepening-understanding/resource-library/corequisite-mathematics-toolkit

DCMP Curriculum Design Standards