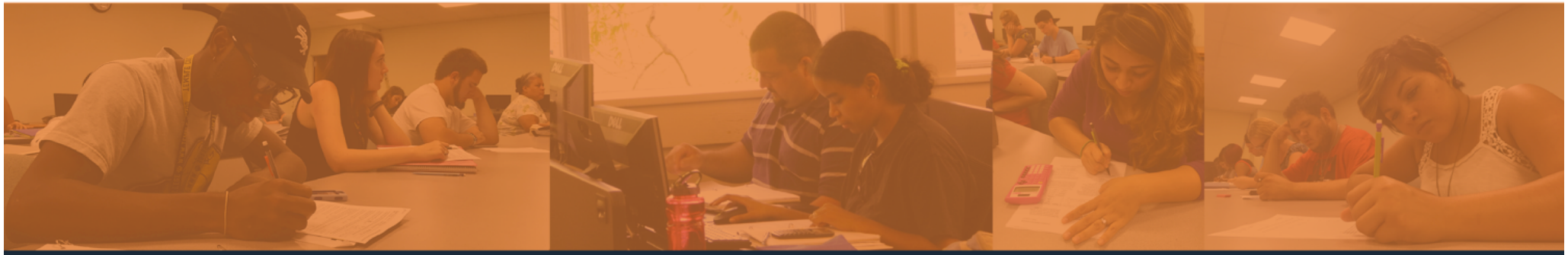
Dana Center
Mathematics
PATHWAYS

West Texas Regional Convening

Texas Tech University

April 6, 2018



Welcome and introduction

Lawrence Schovanec, *President, Texas Tech University*

Martha Ellis, *Director, Higher Education Strategy, Policy, and Services, The Charles A. Dana Center*

Jeremy Martin, *Senior Policy Analyst, Higher Education, The Charles A. Dana Center*

About the Dana Center

The **Charles A. Dana Center** at The University of Texas at Austin works with our nation's education systems to ensure that every student leaves school prepared for success in postsecondary education and the contemporary workplace.

Our work, based on research and three decades of experience, focuses on K–16 mathematics and science education with an emphasis on strategies for improving student engagement, motivation, persistence, and achievement.

We develop innovative curricula, tools, protocols, and instructional supports and deliver powerful instructional and leadership development.

2017

The University of Texas at Austin
Charles A. Dana Center

Who is in the room?

Four-Year Institutions

- Angelo State University
- Texas Tech University
- The University of Texas at El Paso
- The University of Texas of the Permian Basin
- West Texas A&M University

Two-Year Institutions

- Amarillo College
- El Paso Community College
- Frank Phillips College
- Howard College
- Midland College
- Odessa College
- South Plains College
- Western Texas College

Dana Center Staff

Presenters and Guests

A Regional Approach to Scale

Regional Coordinators

- Foster connections
- Synchronize mathematics pathways information and services

Who is in the room?

Four-Year Institutions	Number of Transfer Students in Fall 2015	% of Transfer Students from a West Texas College
• Angelo State University	236	53%
• Sul Ross University	71	42%
• Texas Tech University	1,555	38%
• University of Texas at El Paso	1,205	94%
• University of Texas of the Permian Basin	312	65%
• West Texas A&M University	551	74%

Source: THECB. Academic Performance of 2-Year College Transfer Students at Texas Public Universities
http://www.txhighereddata.org/reports/performance/ctctransfer/

Goals for the day

What will we accomplish together?

1. Develop a shared understanding of math pathways regionally.

2. Learn about models of regional alignment for transfer and applicability.

3. Explore data on math pathways and transfer student success.

Agenda: Regional Coordination

- **Session 1**: Understanding math pathways & requirements
- **Session 2**: Aligning math regionally
- **Session 3**: Exploring data on transfer and mathematics pathways

The Dana Center Mathematics Pathways

A **partnership** of:

- The Charles A. Dana Center at The University of Texas at Austin
- All 50 community college districts in Texas, represented by the Texas Association of Community Colleges and the Texas Success Center
- Collaborating with the university systems

A **systemic approach** to improving student success by reforming developmental and gateway mathematics

DCMP Vision

All students have equitable access to and the opportunity for success in rigorous mathematics pathways that are aligned and relevant to their future aspirations, propelling them to upward economic and social mobility.

The DCMP seeks to ensure that ALL students in higher education will be:

- **Prepared** to use mathematical and quantitative reasoning skills in their careers and personal lives,
- **Enabled** to make timely progress towards completion of a certificate or degree, and
- **Empowered** as mathematical learners.

DCMP Principles for Pathways

Quick structural change

Mathematics pathways are structured so that:

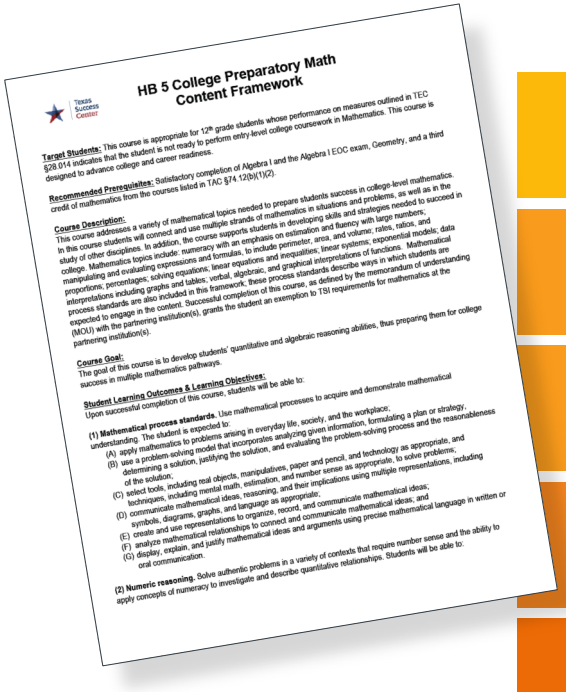
1) All students, regardless of college readiness, enter directly into mathematics pathways aligned to their programs of study.
2) Students complete their first college-level math requirement in their first year of college.

Continuous improvement

Students engage in a high-quality learning experience in math pathways designed so that:

3) Strategies to support students as learners are integrated into courses and are aligned across the institution.
4) Instruction incorporates evidence-based curriculum and pedagogy.

The Dana Center offers the following supports…



HB 5 College Preparatory Math
Content Framework

Target Students: This course is appropriate for 12th grade students whose performance on measures outlined in TEC §28.014 indicates that the student is not ready to perform entry-level college coursework in Mathematics. This course is designed to advance college and career readiness.

Recommended Prerequisites: Satisfactory completion of Algebra I and the Algebra I EOC exam, Geometry, and a third credit of mathematics from the courses listed in TAC §74.12(b)(1)(2).

Course Description:
This course addresses a variety of mathematical topics needed to prepare students success in college-level mathematics. In this course students will connect and use multiple strands of mathematics in situations and problems, as well as in the study of other disciplines. In addition, the course supports students in developing skills and strategies needed to succeed in college. Mathematics topics include: numeracy with an emphasis on estimation and fluency with large numbers; manipulating and evaluating expressions and formulas, to include perimeter, area, and volume; rates, ratios, and proportions; percentages; solving equations; linear equations and inequalities; linear systems; exponential models; data interpretations including graphs and tables; verbal, algebraic, and graphical interpretations of functions. Mathematical process standards are also included in this framework, these process standards describe ways in which students are expected to engage in the content. Successful completion of this course, as defined by the memorandum of understanding (MOU) with the partnering institution(s), grants the student an exemption to TSI requirements for mathematics at the partnering institution(s).

Course Goal:
The goal of this course is to develop students' quantitative and algebraic reasoning abilities, thus preparing them for college success in multiple mathematics pathways.

Student Learning Outcomes & Learning Objectives:
Upon successful completion of this course, students will be able to:

(1) Mathematical process standards. Use mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:
(A) apply mathematics to problems arising in everyday life, society, and the workplace;
(B) use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;
(C) select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems;
(D) communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;
(E) create and use representations to organize, record, and communicate mathematical ideas;
(F) analyze mathematical relationships to connect and communicate mathematical ideas; and
(G) display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

(2) Numeric reasoning. Solve authentic problems in a variety of contexts that require number sense and the ability to apply concepts of numeracy to investigate and describe quantitative relationships. Students will be able to:

INSTRUCTIONAL MATERIALS

PROFESSIONAL DEVELOPMENT

ASSESSMENT RESOURCES

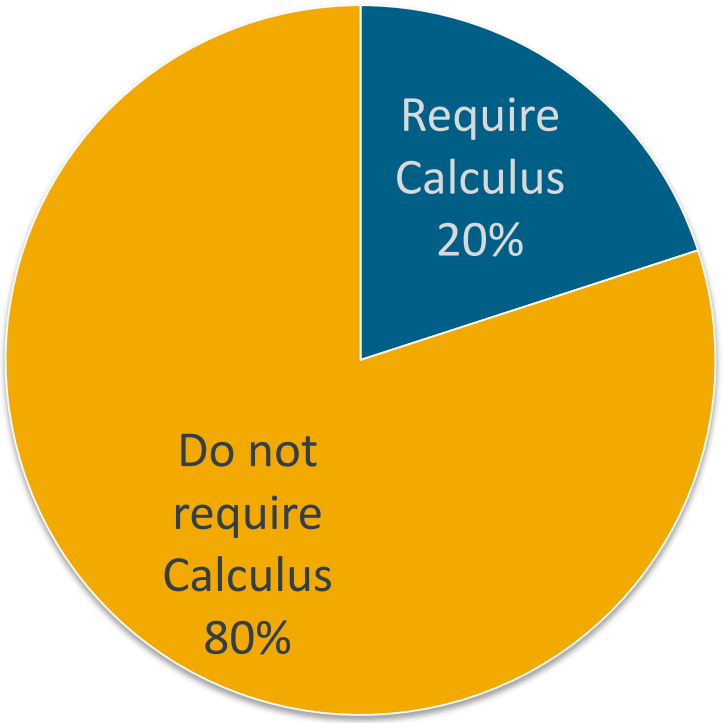
POLICY SUPPORT

EVALUATION

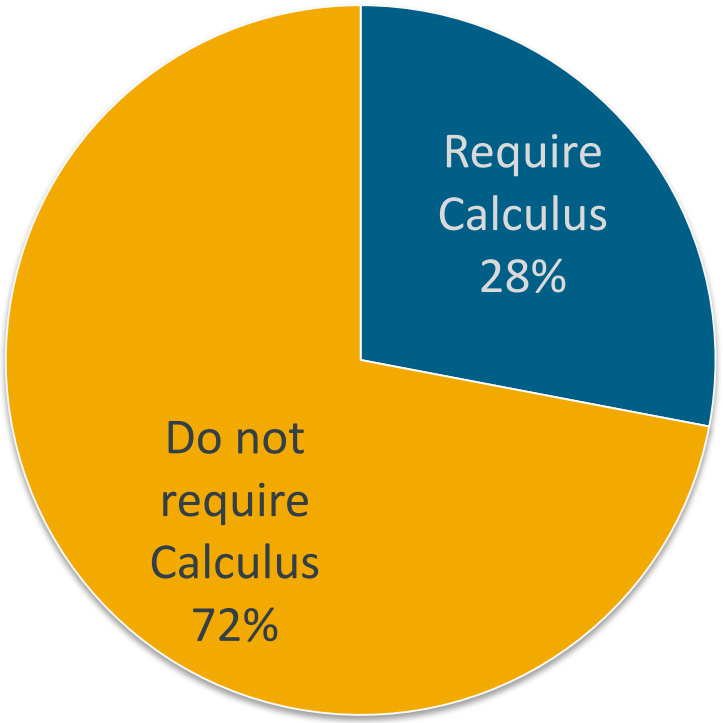
All students are prepared, enabled, and empowered.

What is the "Right Math?"

Community College Student Enrollment into Programs of Study

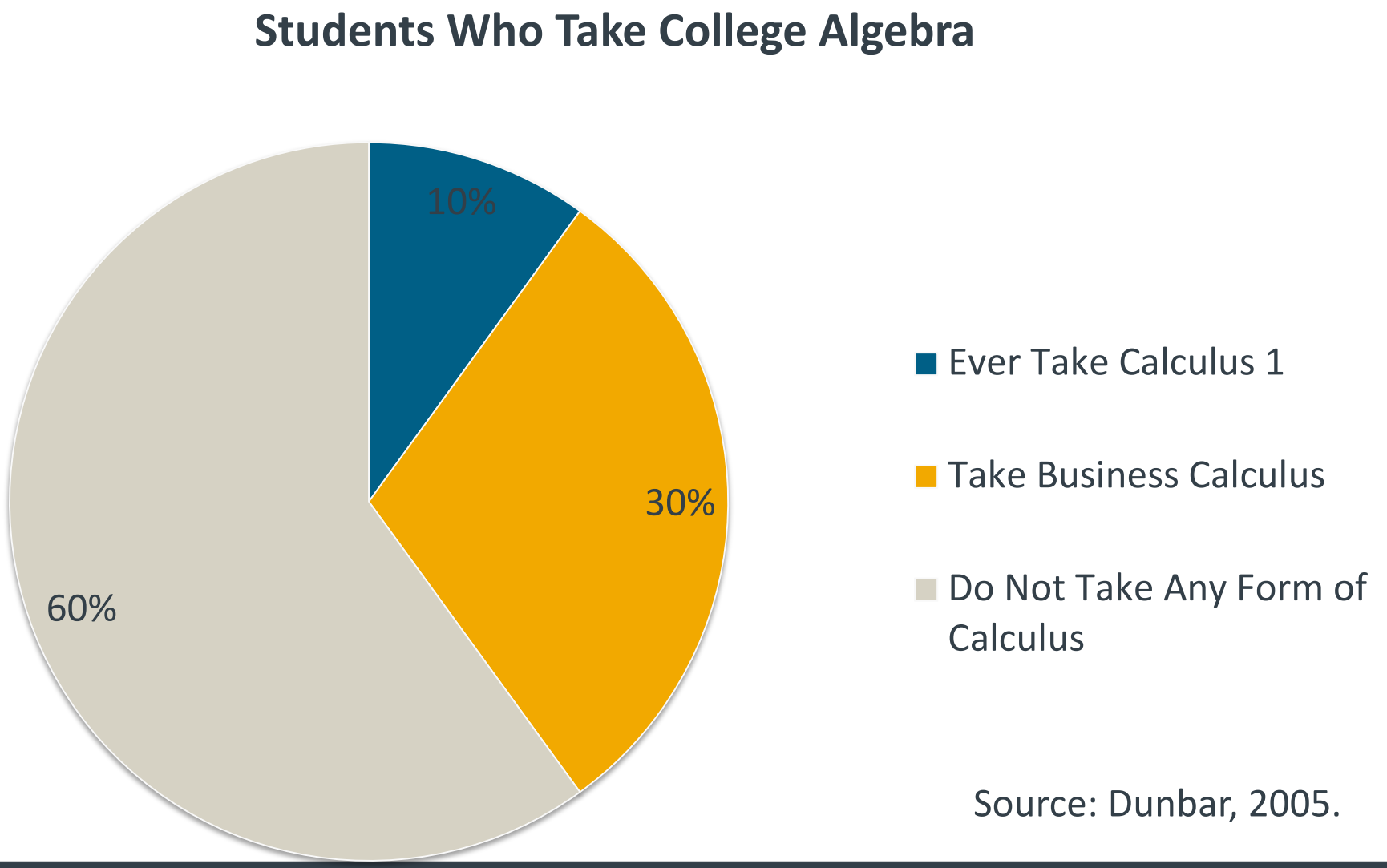


Four-Year Student Enrollment into Programs of Study



Burdman, P. (2015). *Degrees of freedom: Diversifying math requirements for college readiness and graduation.* Oakland CA: Learning Works and Policy Analysis for California Education.

Many students who begin on an algebra path never reach—or never intend to reach—calculus.



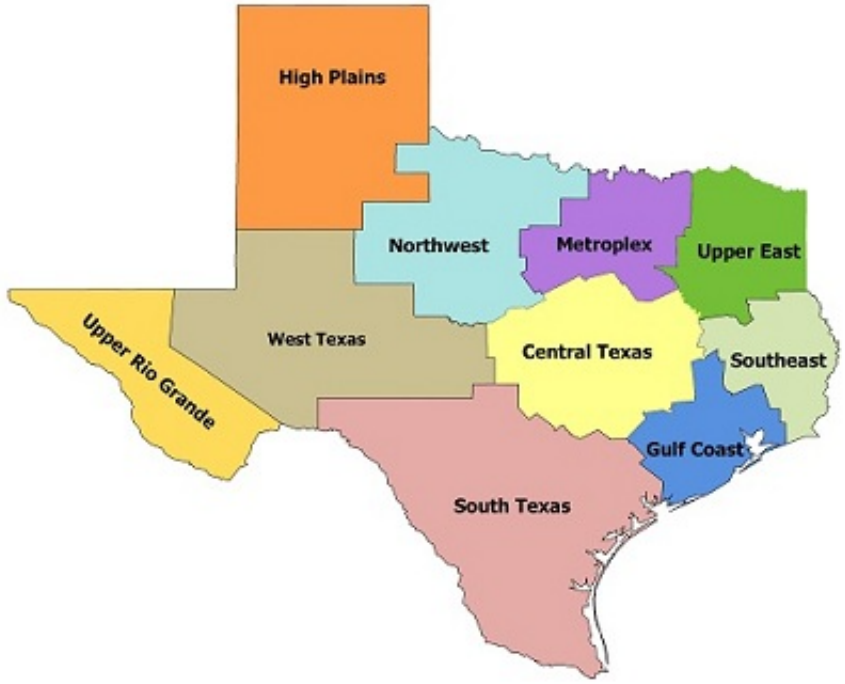
Source: Dunbar, 2005.

Transfer and Applicability

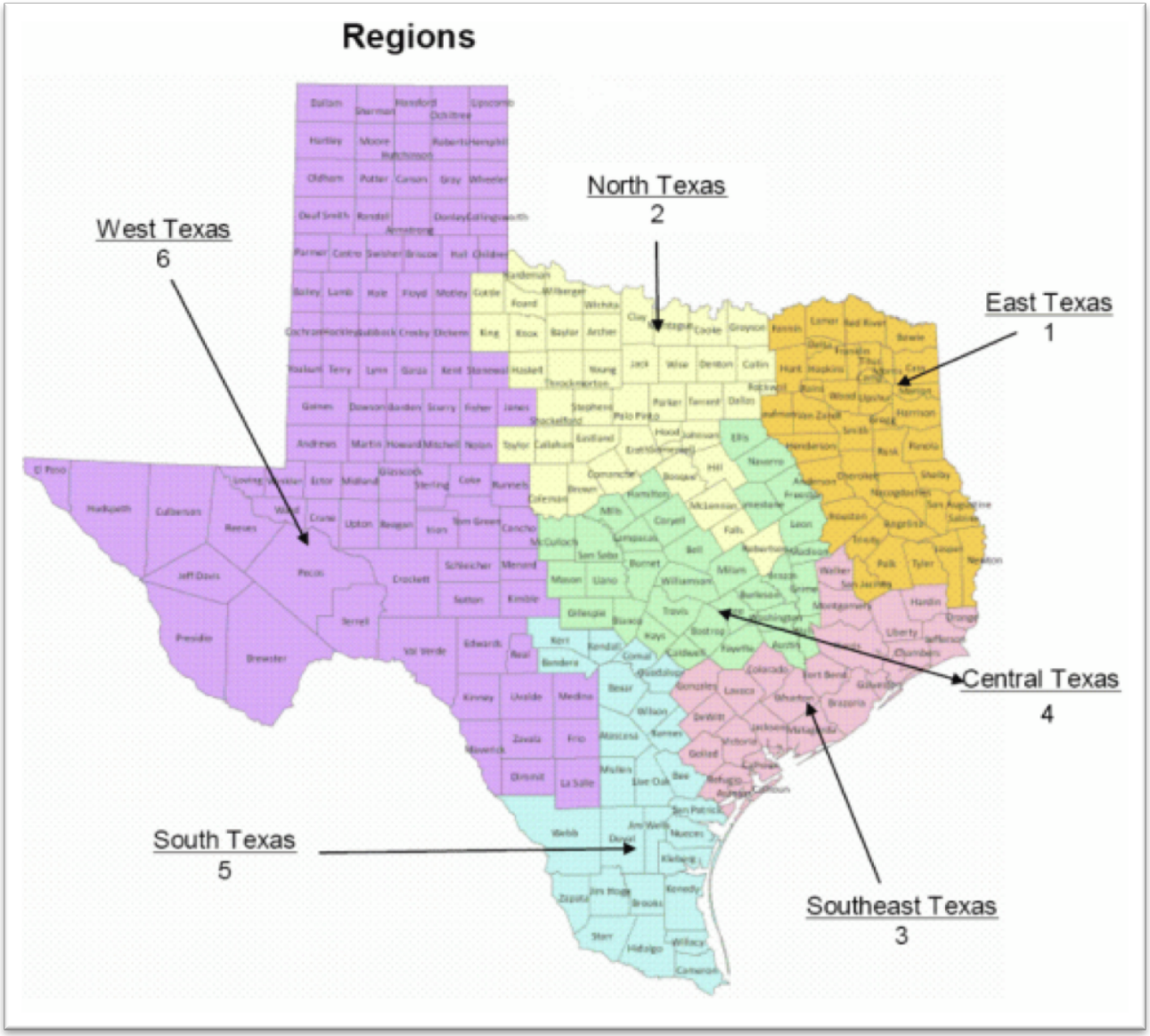
Texas Transfer Data Visualized

Why approach *60x30TX* regionally?

- Regions and institutions differ in many ways
- However, institutional actions and outcomes are embedded in regional context
  - High school feeder patterns
  - Transfer networks
  - Local labor market
- Institutional target-setting is improved by considering regional context
- Encourages tactical planning



Regional Transfer Convenings in Texas



What is west Texas?

Source: Robert Plocheck. Texas Almanac: Coleman County. *Texas State Historical Society.* http://texasalmanac.com/topics/government/coleman-county

Texas Transfer Context

78

138

Texas Transfer Context

78

…the percent of bachelor's completers that had community college credit on their transcripts. Almost 40% had 30+ SCH.

138

…the average number of credits accumulated by a bachelor's degree completers

National Student Clearinghouse Research Center. (2012). Transfer and mobility: A national view of pre-degree & student movement in postsecondary institutions. Retrieved from http://nscresearchcenter.org/signaturereport2/#more-1580

THECB. (2017). 2017 Higher Education Almanac. Institutional Comparison Sheets. *Author calculation*.

Texas Transfer Context

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Highest in U.S. according to National Student Clearinghouse

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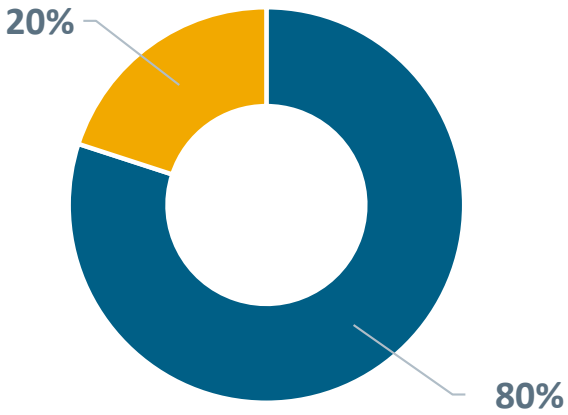
Highest in 36-state sample according to Complete College America

National Student Clearinghouse Research Center. (2012). Transfer and mobility: A national view of pre-degree & student movement in postsecondary institutions. Retrieved from http://nscresearchcenter.org/signaturereport2/#more-1580

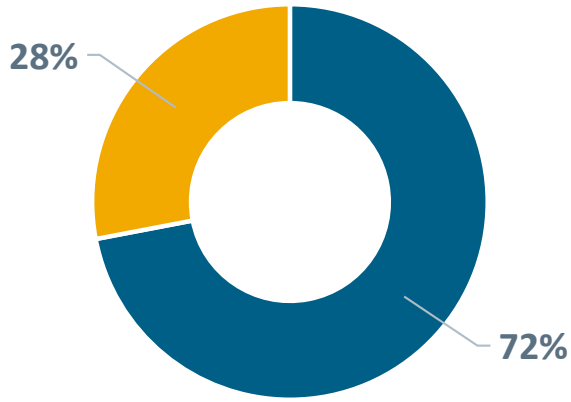
THECB. (2017). 2017 Higher Education Almanac. Institutional Comparison Sheets.

Community College Students Aspiring to Earn a Bachelor's

National Surveys of Community College Students



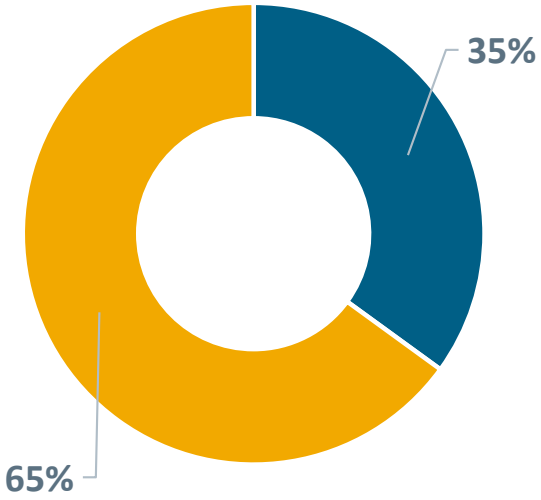
Texas Community College Students Enrolled in a Transfer Program



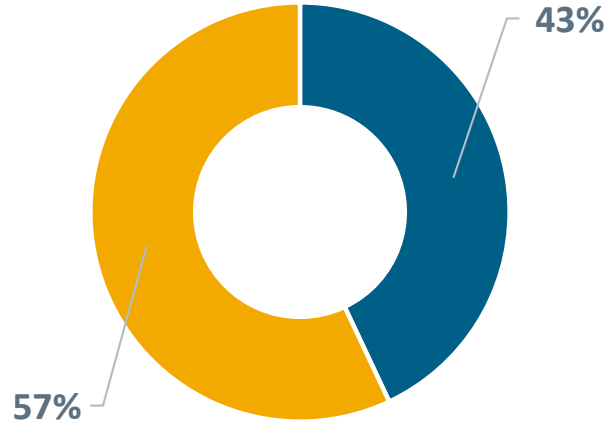
Source: Community College Research Center. (2017). Policy levers to strengthen community college transfer student success in Texas.

2-year to 4-year student transfer and success in Texas

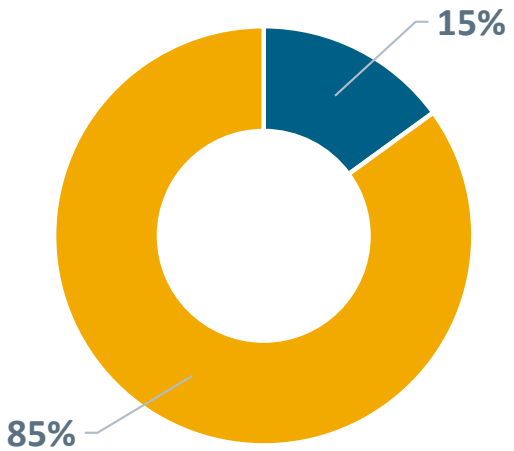
Community College Student Transfer Rates in Texas



Bachelor's Completion Rate for Community College Transfer Students in Texas (6 years)



Bachelor's Completion Rate for Community College Transfer *Aspiring* Students in Texas



Source: Community College Research Center. (2017). Policy levers to strengthen community college transfer student success in Texas.

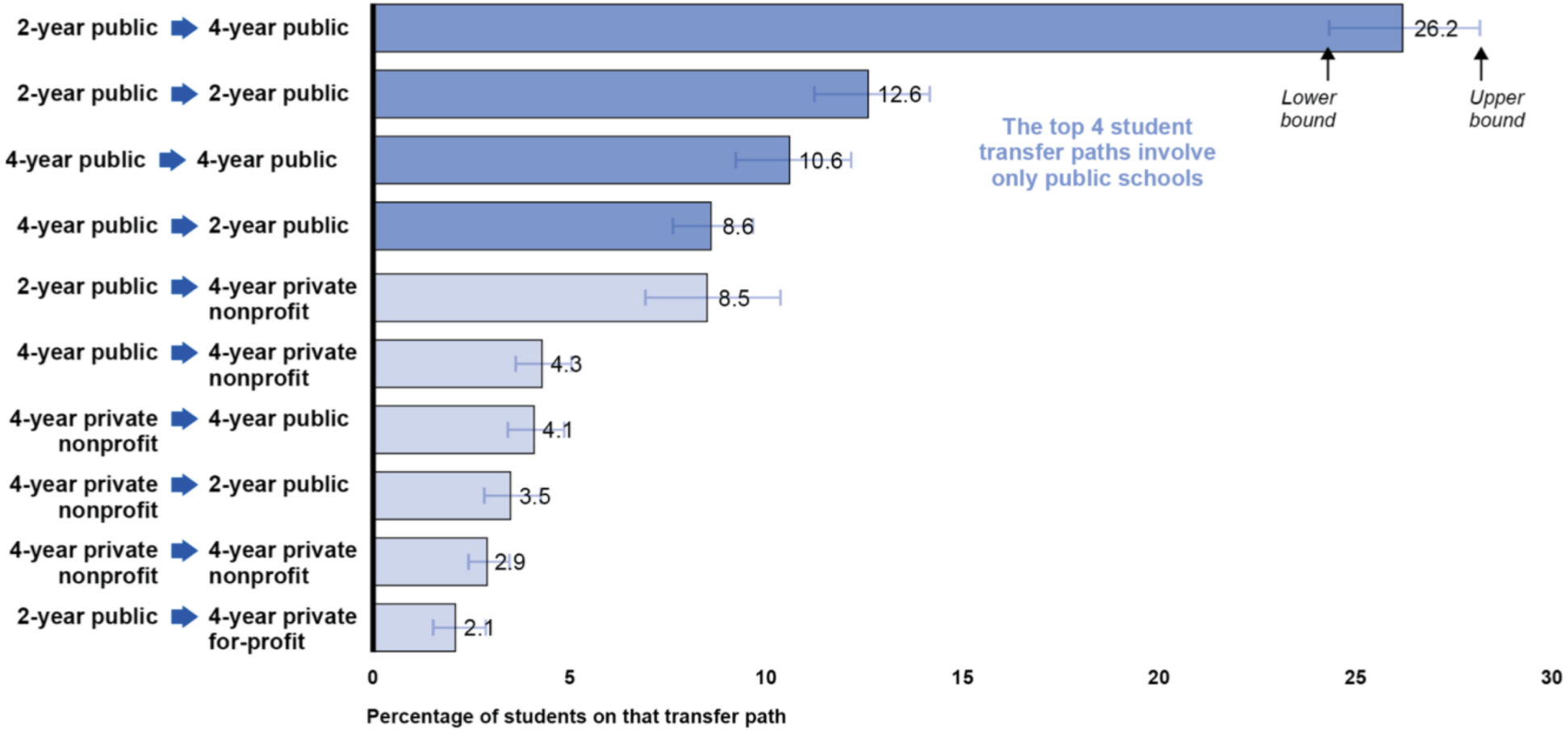
Implications for Students

- **Excess SCH accumulation**
  - Equity considerations
  - Excluding flagships from the sample increases to 145 SCH
  - Matched comparison of native and community college transfer students increases to 150 SCH
- **Most students do not complete a certificate or associate's prior to transfer**
  - 18% of Texas transfer students earn credential, national average is 29%
  - Accumulate debt, opportunity cost of work, and lost time without a credential

Source: Community College Research Center. (2017). Policy levers to strengthen community college transfer student success in Texas.

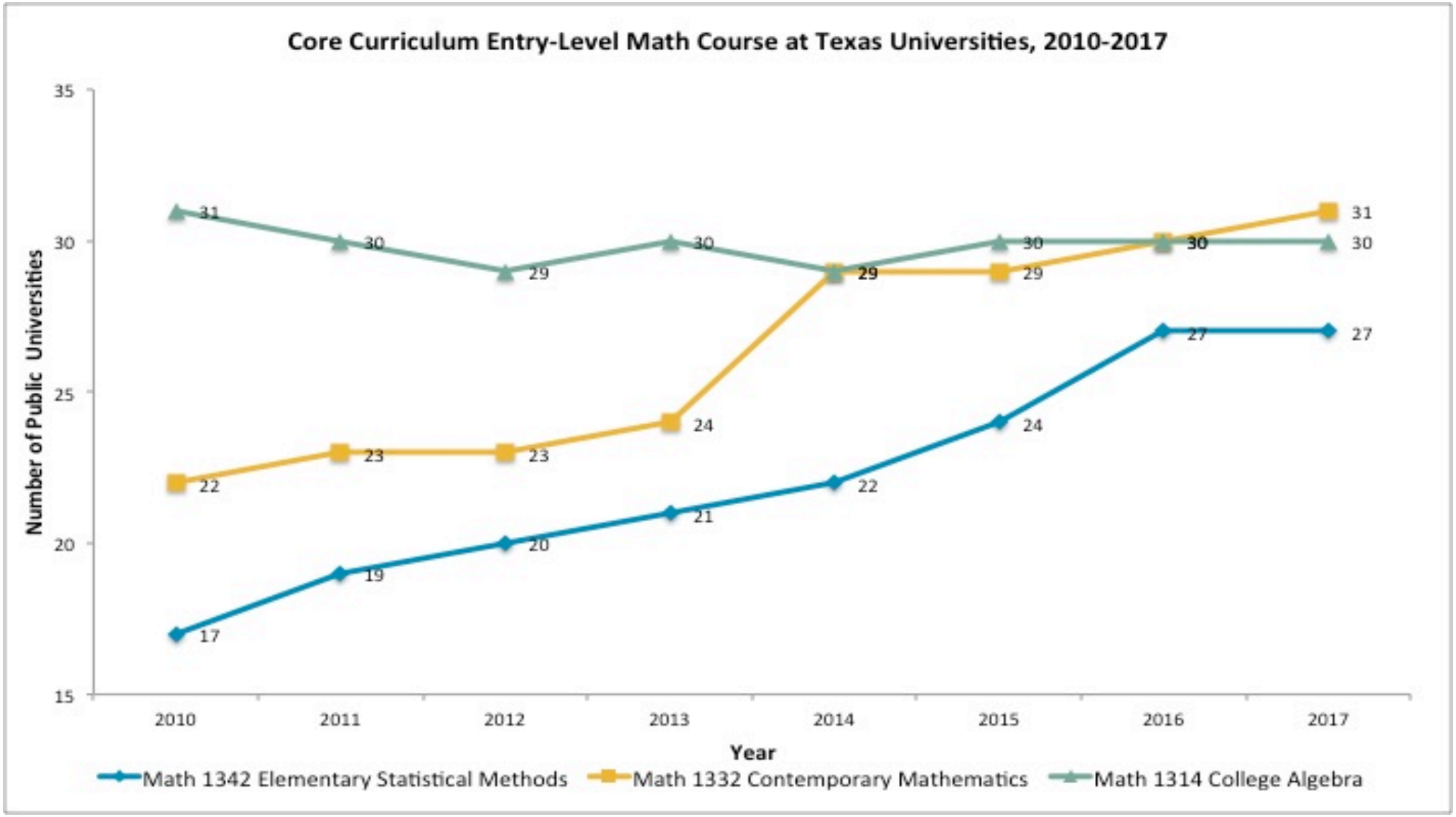
Almost all transfer happens between public institutions

Figure 1: Estimated Percentage of Transfer Students by Transfer Path, Academic Years 2003-04 to 2008-09



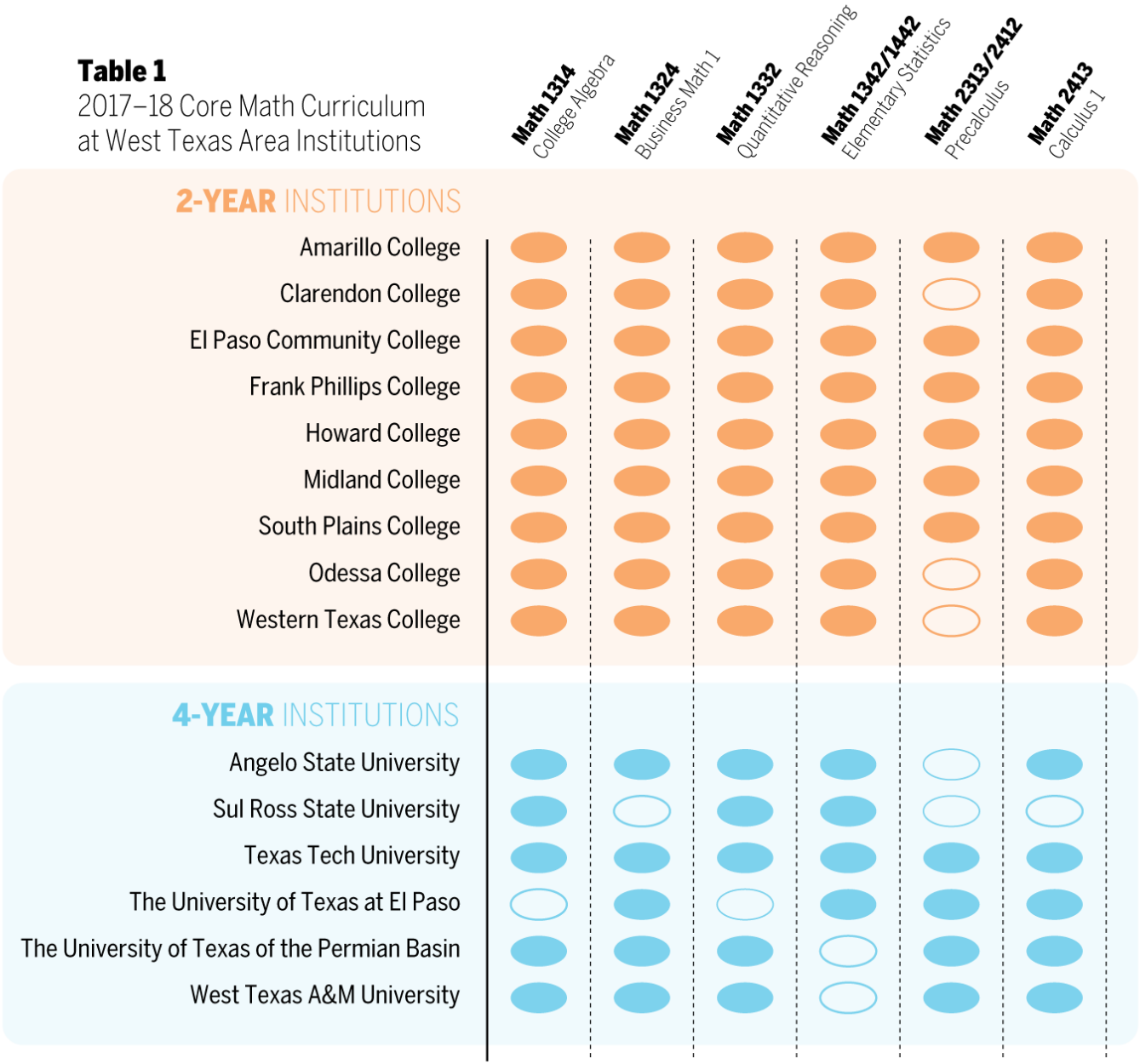
Source: GAO analysis of 2004-2009 Beginning Postsecondary Students Longitudinal Study. | GAO-17-574

Trends in core curriculum mathematics at Texas universities

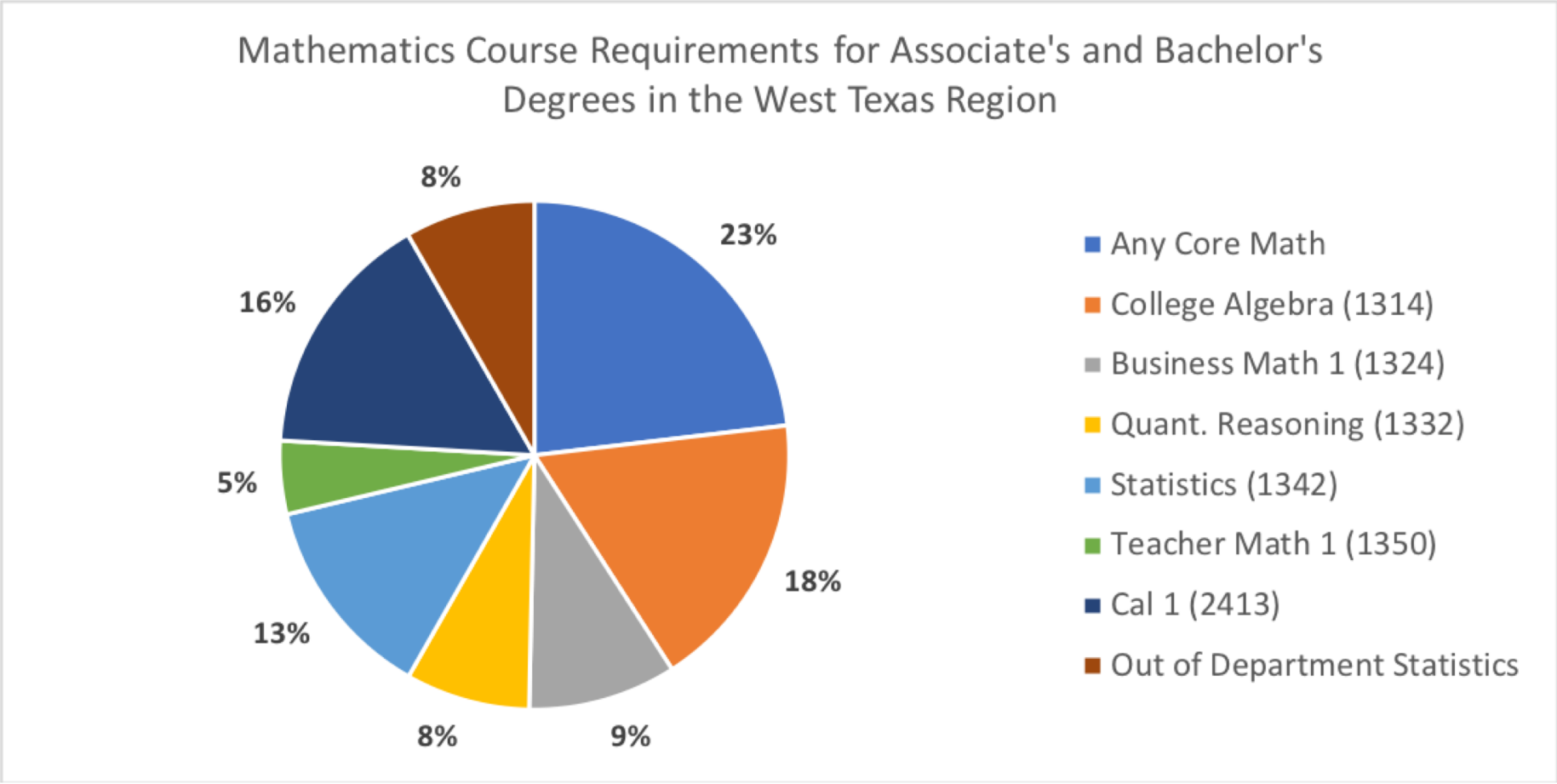


Core curriculum options for mathematics in West Texas

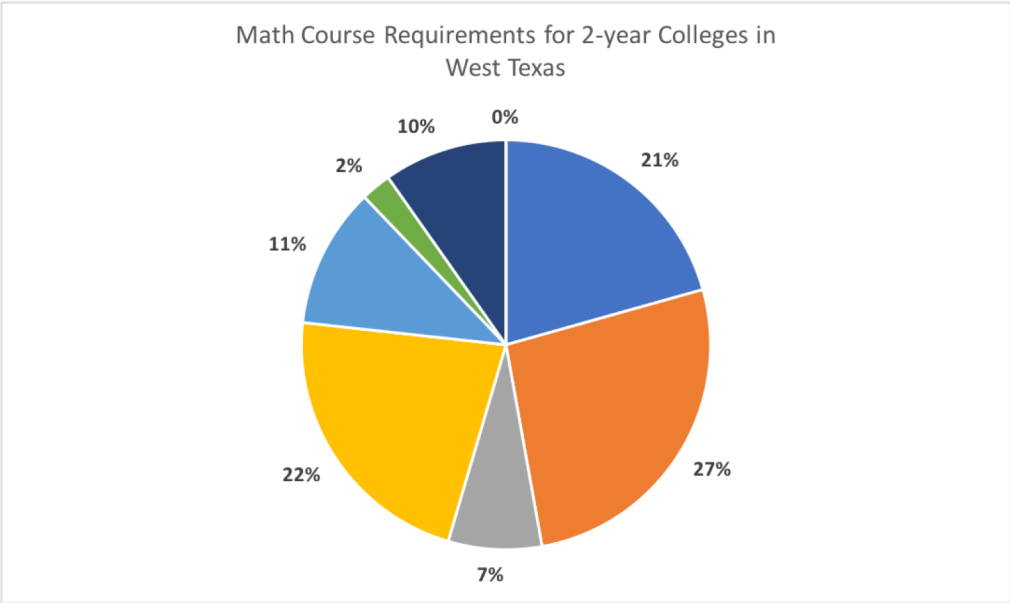
Table 1
2017–18 Core Math Curriculum
at West Texas Area Institutions

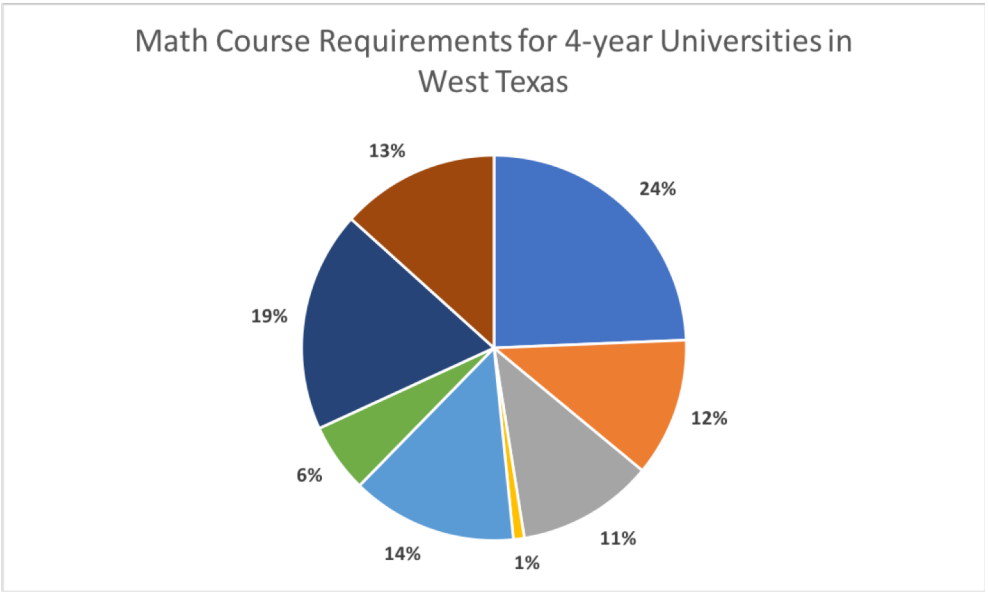


Math Requirements in West Texas



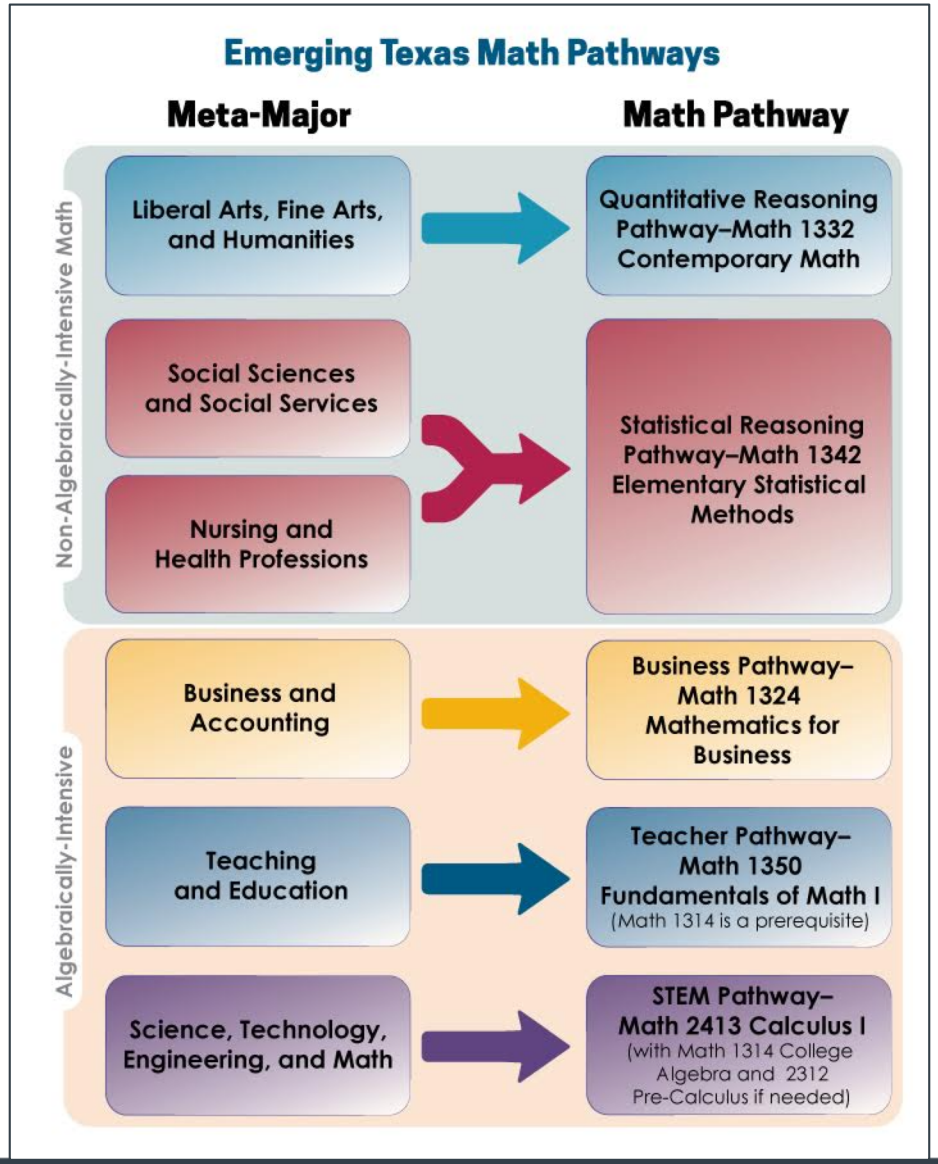
Math Requirements in West Texas



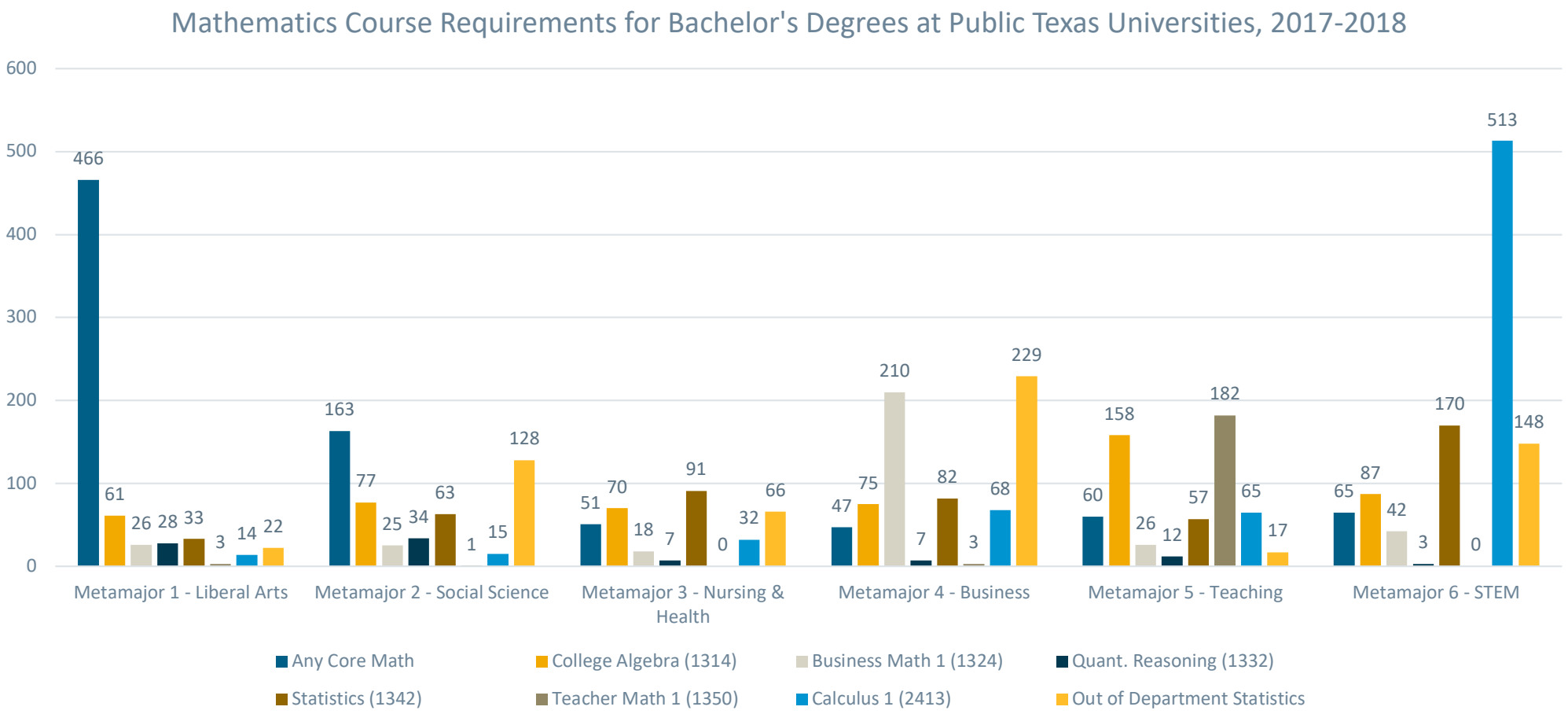


- Any Core Math
- College Algebra (1314)
- Business Math 1 (1324)
- Quant. Reasoning (1332)
- Statistics (1342)
- Teacher Math 1 (1350)
- Calculus 1 (2413)
- Out of Department Statistics

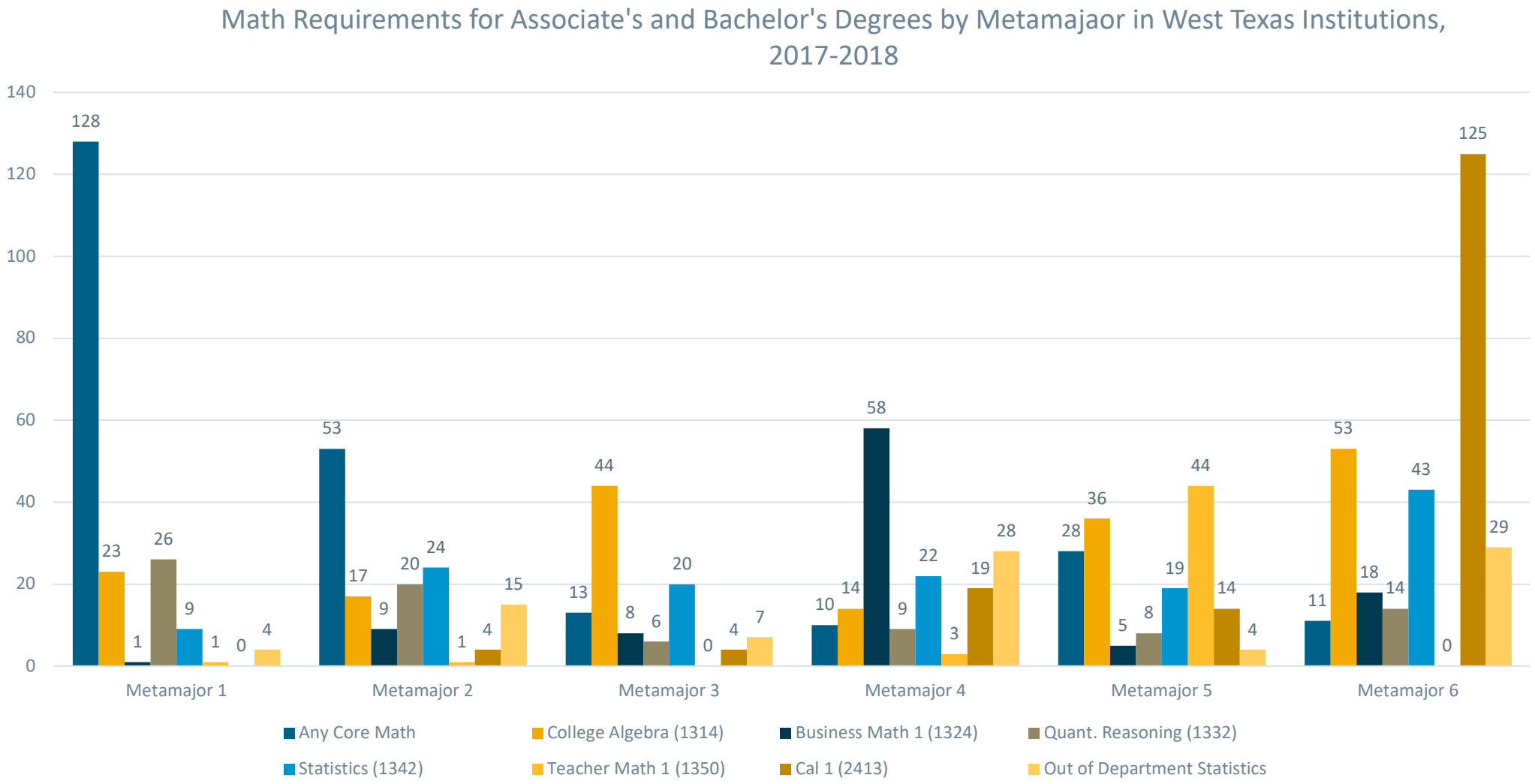
Results from statewide analysis of math requirements



Results from statewide analysis of math requirements for bachelor's degrees in Texas



Math Requirements in West Texas



Supporting a Coherent System

Regional approach to transfer success

- Engaging all universities through regional convenings
- Different approaches for different regions

Tools and resources

- Transfer Inventory
- Toolkit for partner discipline engagement
- Program of Study Research Briefs
- Policy analysis and implementation support

Lessons Learned

Regional coordination enables institutional change

- Common mathematics pathways framework
- Ensure transferability
- Map math pathways to programs of study for applicability

Challenges

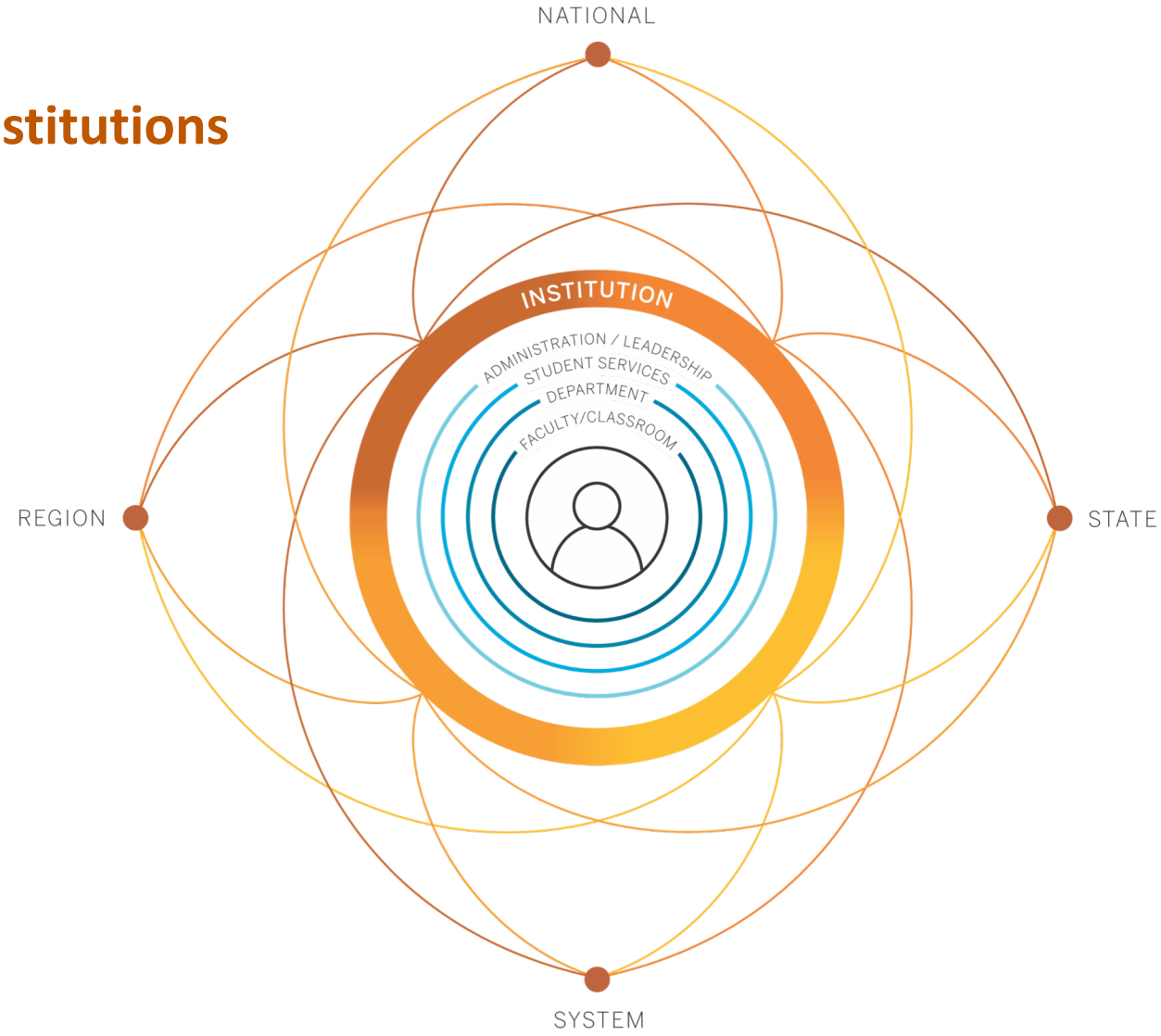
- Building ownership for change; creating new courses and requirements
- Offering new courses is no guarantee of uptake; small numbers of sections
- Mobility and transfer; advising and program alignment

Intra-Institutional Implementation

Math Pathways within an institution

Inter-Institutional Implementation

Math Pathways across institutions



Session 1: Understanding Math Pathways in the West Texas Region

Martha Ellis, *Director, Higher Education, The Charles A. Dana Center*

Session Details

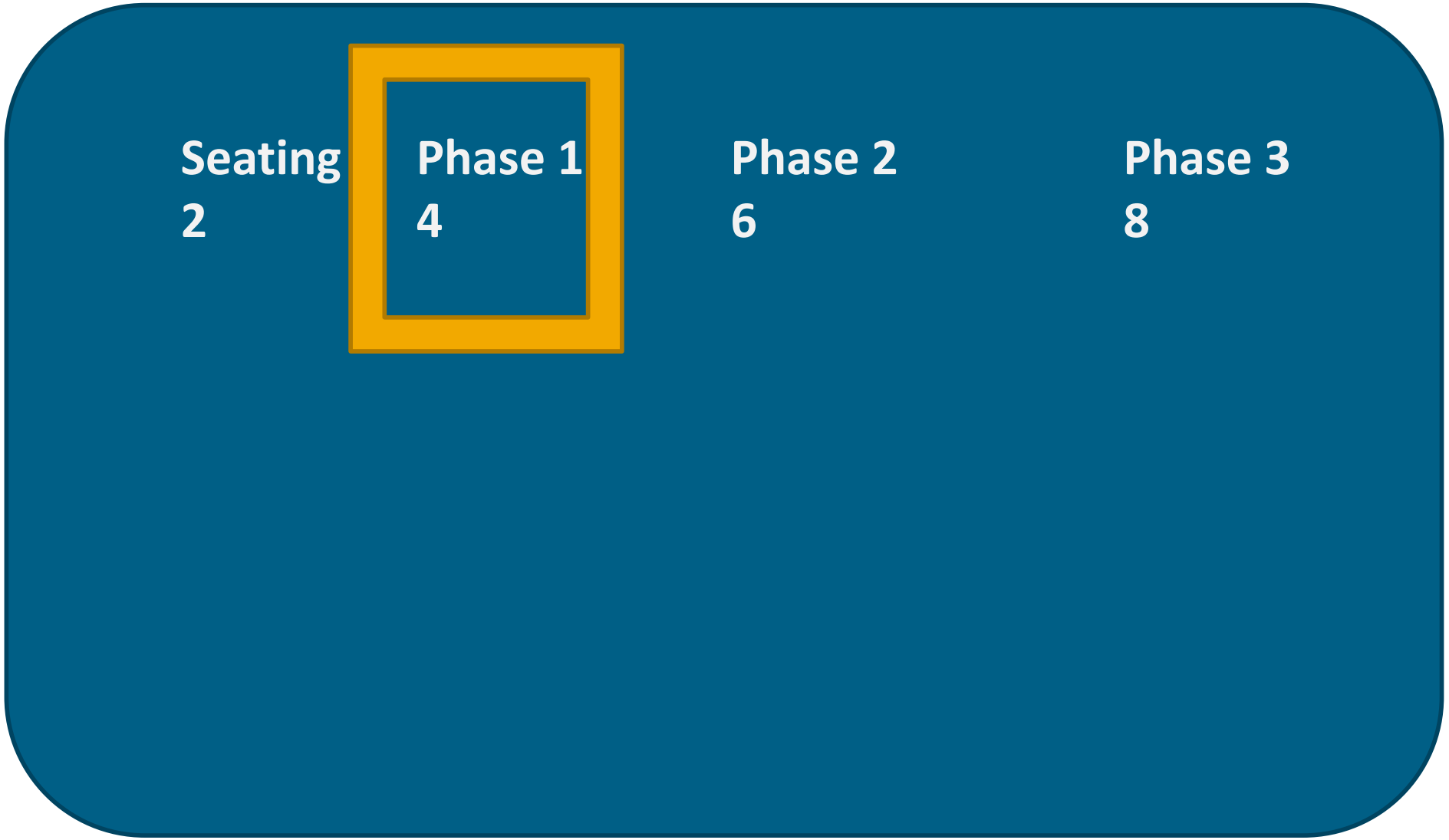
Progressive small group discussions

- Phase 1 - Your institution
- Phase 2 - Your sector
- Phase 3 - Across sectors

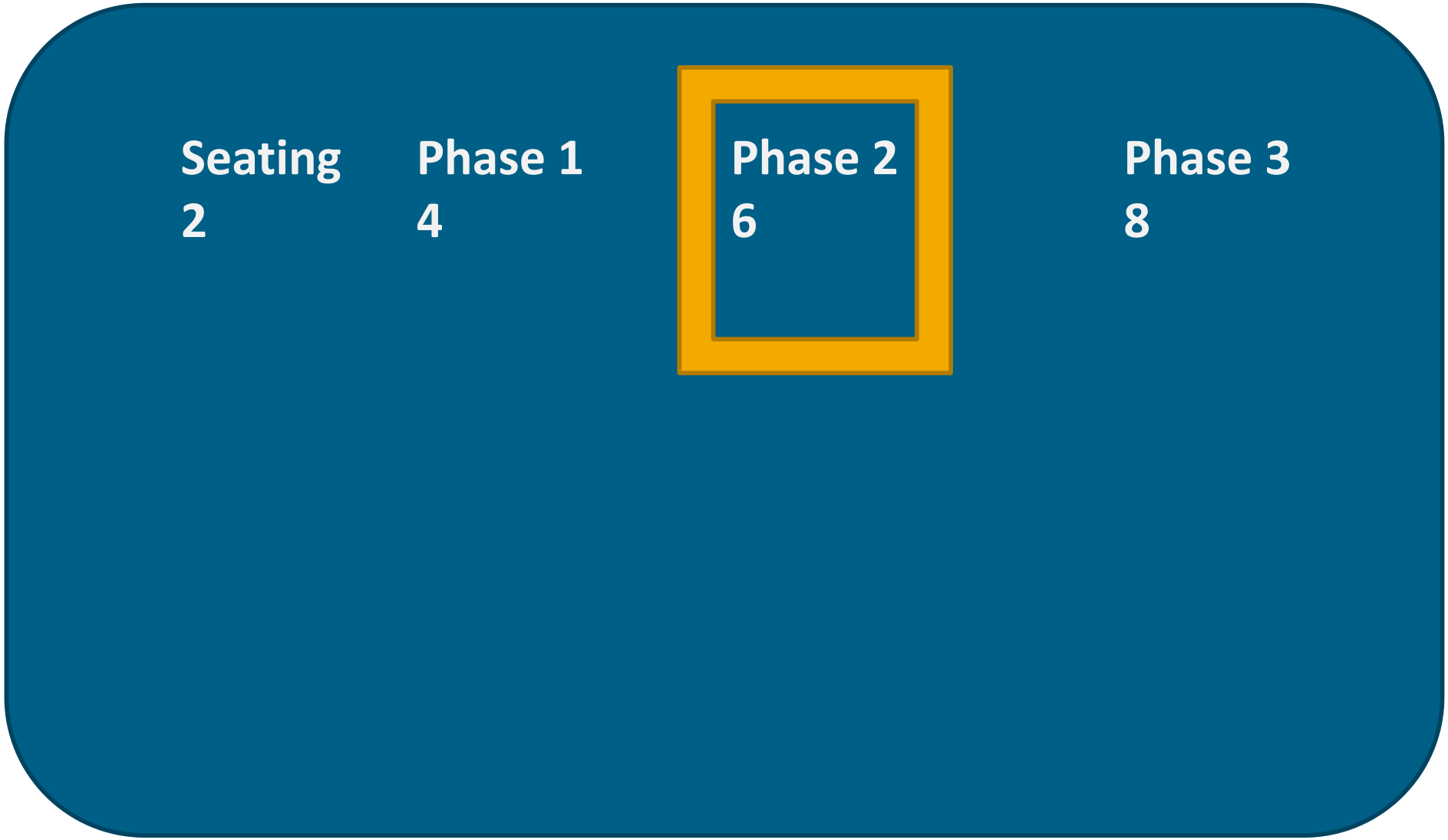
Resources

- **Session 1 Discussion Template**
- Regional Analysis Brief
- Transfer Inventory

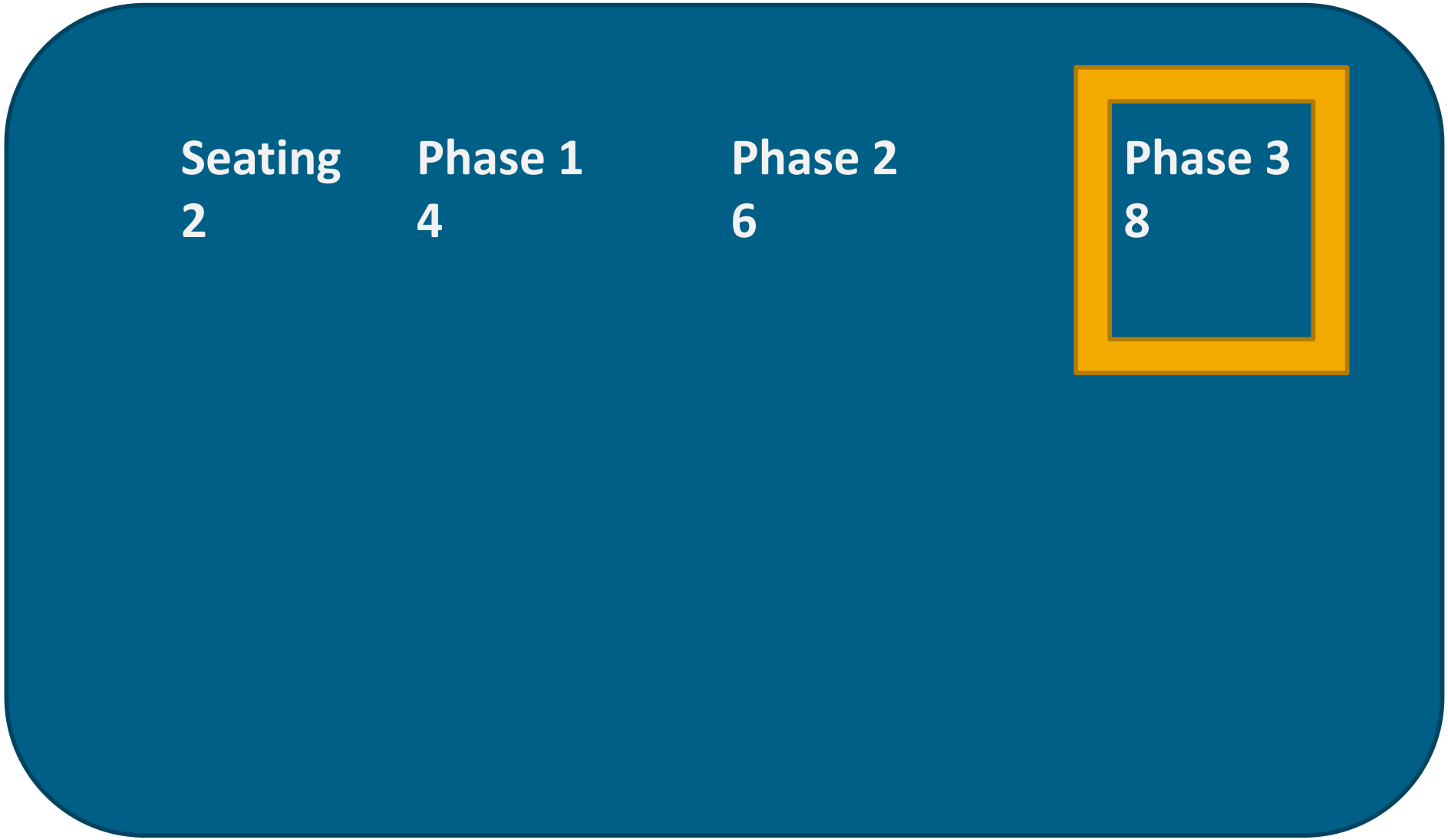
Phase 1 – Discussion with your institution



Phase 2 – Discussions with your sector



Phase 3 – Discussions across sectors



Session 2: Cross-Departmental and Cross-Institutional Mathematics Pathways Alignment

Frank Savina, *Course Program Specialist, Higher Education, The Charles A. Dana Center*
Mary Ann Barber, *Principal Lecturer and Assistant Chair, Department of Mathematics, University of North Texas*
Matt Lewis, Mathematics Faculty and Research Analyst, San Jacinto College

Session 3: Exploring Data on Transfer and Mathematics Pathways

Jeremy Martin, *Senior Policy Analyst, Higher Education, The Charles A. Dana Center*

UNT is one of the nation's largest public research universities, with nearly 38,000 students. We currently offer 103 bachelor's, 86 master's and 38 doctoral degree programs.

- Ranked a Tier One research university by the Carnegie classification;
- 15 programs ranked in the Top 100 in the nation by *U.S. News & World Report*; and
- "Best in the West," by *The Princeton Review* for nine consecutive years

Math Pathways Evolution

2008 Fall

- **MATH 1580 - Survey of Mathematics with Applications piloted;**

2010 Fall

- **MATH 1010 – Fundamentals of Algebra deleted from course offerings;**
- **MATH 1180 – College Math for Business, etc., piloted;**
- **MATH 1581 & MATH 1681 developed;**
  - The ##81 courses were initially MATH 1580/ 1680 and MATH 1010 content concurrently delivered;
  - The ## 81 courses – served as prerequisite for MATH 1100, MATH 1180;

2011 Fall

- **MATH 1100 – renamed "Algebra" and removed from the University Core;**

Math Pathways Evolution

2014 Fall

- **MATH 1581 & MATH 1681 deleted;**
- **MATH 1580 paired with UGMT 1300, co-requisite model***
- **MATH 1100 paired with UGMT 1300, co-requisite model***

2016 Fall

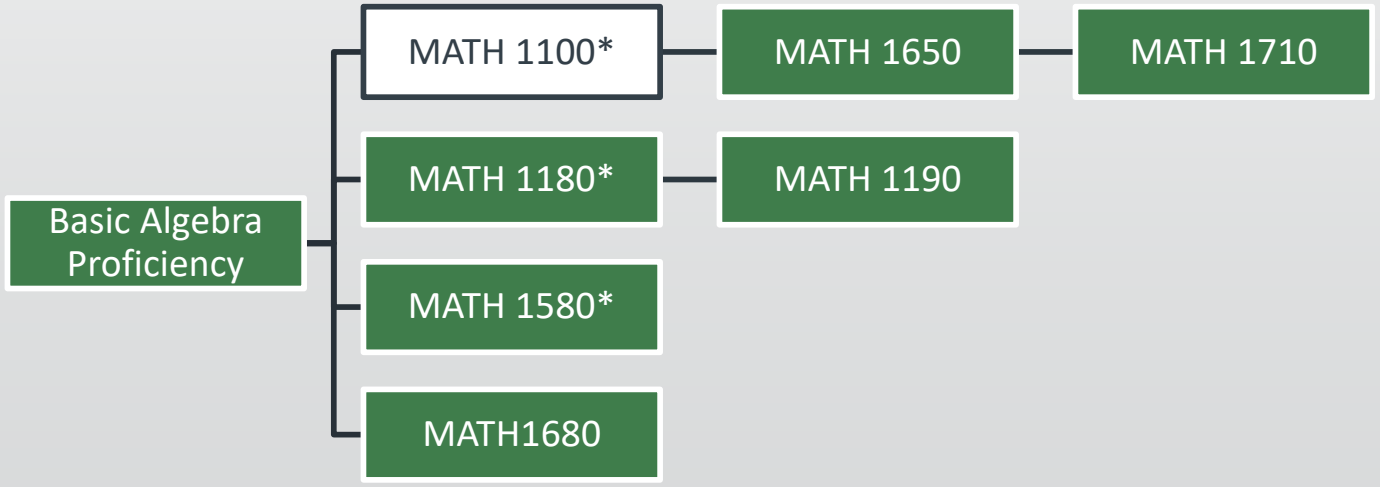
- **MATH 1180 paired with UGMT 1300, co-requisite model****

2018 Spring

- **MATH 1580 paired with UGMT 1300, co-requisite model****

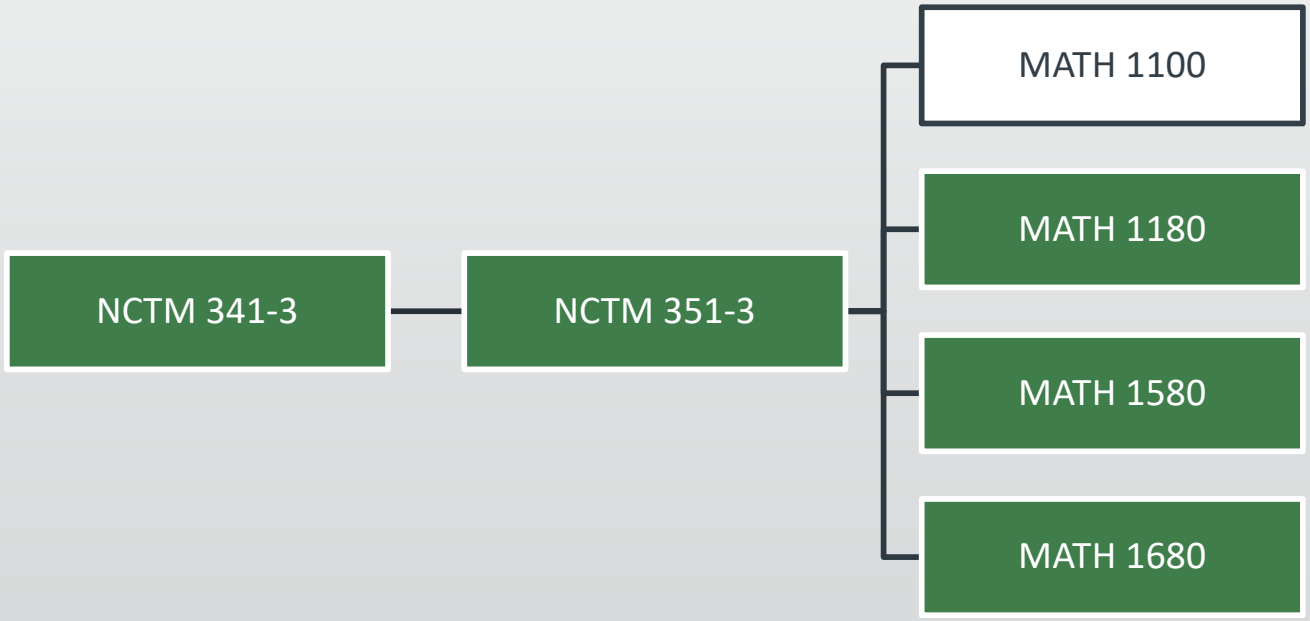
***The co-requisite models are for "high" TSI incomplete level;**
****The "medium" TSI incomplete level added.**

Math Pathway Based on Major



*These courses have a TSI Incomplete option which have co-requisites;
*TSI Incomplete students are main-streamed into Math 1680.

TSI Incomplete Options → College Level Math



We have a partnership with North Central Texas College. NCTC faculty teach the NCTM courses on the UNT campus.

Which UNT Math Class† is Right for Me? (Effective Summer/Fall 2018)

- Please consult your academic advisor to ensure you select a course which fulfills degree requirements for your intended major(s).
- Students who feel prepared to take a math course beyond their placement level are encouraged to take the math placement test.
- Math placement is valid for one school year

†This page only covers college-level courses. Students who are not TSI complete or who are unsure of their TSI status should consult the Learning Center, (940) 369-7006.

Entry Level Courses open to any student TSI complete in math

Journalism, Arts, Social Sciences, Humanities, Health and Public Service, Music, Merchandising and Digital Retailing, Hospitality, and Tourism, College of Information, College of Education (other than Interdisciplinary Studies)

These non-technical courses satisfy University core but do not meet prerequisites for higher-level math courses. Some majors & programs require or prefer Math 1680. Consult an advisor for help selecting between Math 1580 and Math 1680.

- Math 1580 Survey of Math
- or
- Math 1680 Elementary Probability & Statistics

Business, BA Economics and Interdisciplinary Studies EC—6th Grade

Math 1180 does not meet prerequisites for Pre-calculus or other science or engineering math.

- Math 1180 College Math for Business & Econ

C or better needed for 1190 and for 1350

Math, Science, Engineering and BS Economics

New students are encouraged to take the math placement test to see if they may begin in a higher level course.

- Math 1100 —Algebra

Math 1100 serves only as a prerequisite course and does not satisfy the University core.

C or better needed for level 2

Interdisciplinary Studies 4th—8th Grade (College of Education)

This chart does not apply to 4th—8th Grade Interdisciplinary Studies Majors. 4th—8th Grade Interdisciplinary Studies majors should always consult advisors before enrolling in any mathematics course.

Placement Level 2

Interdisciplinary Studies, EC—6th Grade (College of Education)

- Math 1350 Math for Elem Ed I
- Math 1351 Math for Elem Ed II

Business, and BA Economics

Math 1190 does not meet prerequisites for higher-level math classes. Business students planning advanced quantitative study are encouraged to follow the science/engineering track instead.

- Math 1190 Business Calculus

Math, Science, Engineering, and BS Economics

This track is also recommended for business students planning advanced quantitative study. Consult an advisor.

- Math 1650 Pre-calculus

C or better needed for level 3

Placement Level 3

Placement into Level 3 requires one of the following:

(1) Placement via the math placement exam;
(2) A "3" or higher on an AP Calculus exam; or
(3) Prior college credit for Pre-calculus or Calculus I

Math 1710 Cal I → Math 1720 Cal II → Higher-level Math

Questions? E-mail <MathAdvising@unt.edu>

03/18

How to Choose Between Math 1580 or 1680 at UNT

At UNT, Math 1580 and 1680 are non-technical math courses that satisfy the mathematics requirement for the university core and are designed to efficiently provide a college-level mathematics experience to UNT students who are in majors and programs that do not require a high degree of technical algebra proficiency. These courses help UNT students build the quantitative literacy, mathematical affinity, and critical thinking skills required to fully make use of and appreciate the quantitative aspects of a typical university course experience.

Math 1580
Survey of Math.
Topics include probability, statistics, algebra, logic and the mathematics of finance. Additional topics are selected from geometry, sets, cryptography, fair division, voting theory and graph theory. Emphasis is on applications. Historical aspects of selected topics are also included.

The topics are not tightly connected and some topics do not make heavy use of numbers and equations.

Math 1680
Elementary Probability and Statistics.
An introductory course to serve students of any field who want to apply statistical inference. Descriptive statistics, elementary probability, the normal curve, confidence intervals, and hypothesis testing.

A sequential treatment of probability and statistics, where topics later in the semester build upon earlier material and with a greater use of numbers and equations.

You should always **consult your advisor** before making your choice.

Math 1680 (Elementary Probability & Statistics) is REQUIRED by these programs	Geography, Kinesiology, Medical Laboratory Science (including Cytotechnology), Merchandising and Digital Retailing, Psychology, Audiology & Speech-Language Pathology, and all degree programs in the School of Journalism
Math 1680 (Elementary Probability & Statistics) is PREFERRED by these programs	Political Science, Sociology, and all degree programs in the College of Health and Public Service
Math 1580 (Survey of Mathematics) is often RECOMMENDED in these programs	Arts, Humanities, Music, Dance and Theatre

UNT Department of Mathematics

Session Details

Goal

Use data to create actionable steps for improving transfer and mathematics pathways implementation within and across institutions.

Resources

- **Session 3 Discussion Template**
- West Texas Transfer Metrics
- Math Pathways Data Sheets

Institutional Transfer Data Sheet

Statewide Average

In Fall 2015, 74.1% of all bachelor's completers in Texas carried credit from 2-year colleges on their transcripts. 35.3% of bachelor's completers had more than 30SCH and 38.8% of bachelor's completers had between 1-29SCH from 2-year colleges. (A)

Transfer Student Success Metrics

	Top transfer partners			Developmental education prior to transfer		Persistence		Graduation rates
	Top 3 transfer institutions	Total student transfers in Fall 2015 (B)	Percentage of university's total transfer population that come from sending college cohort, Fall 2015	Total transfer students who took developmental education prior to transfer, Fall 2015 (B)	Percentage of developmental students in transfer cohort, Fall 2015	Total number of transfer students still still enrolled in Fall 2016 (B)	Percentage of transfer students still enrolled in Fall 2016	4-year graduation rate for 2-year college transfer students from Fall 2012 cohort (C)
1	College A							
2	College B							
3	College C							
Total from all transfer institutions		36,690	N/A	16,872	46.0%	27,542	75.1%	60.50%

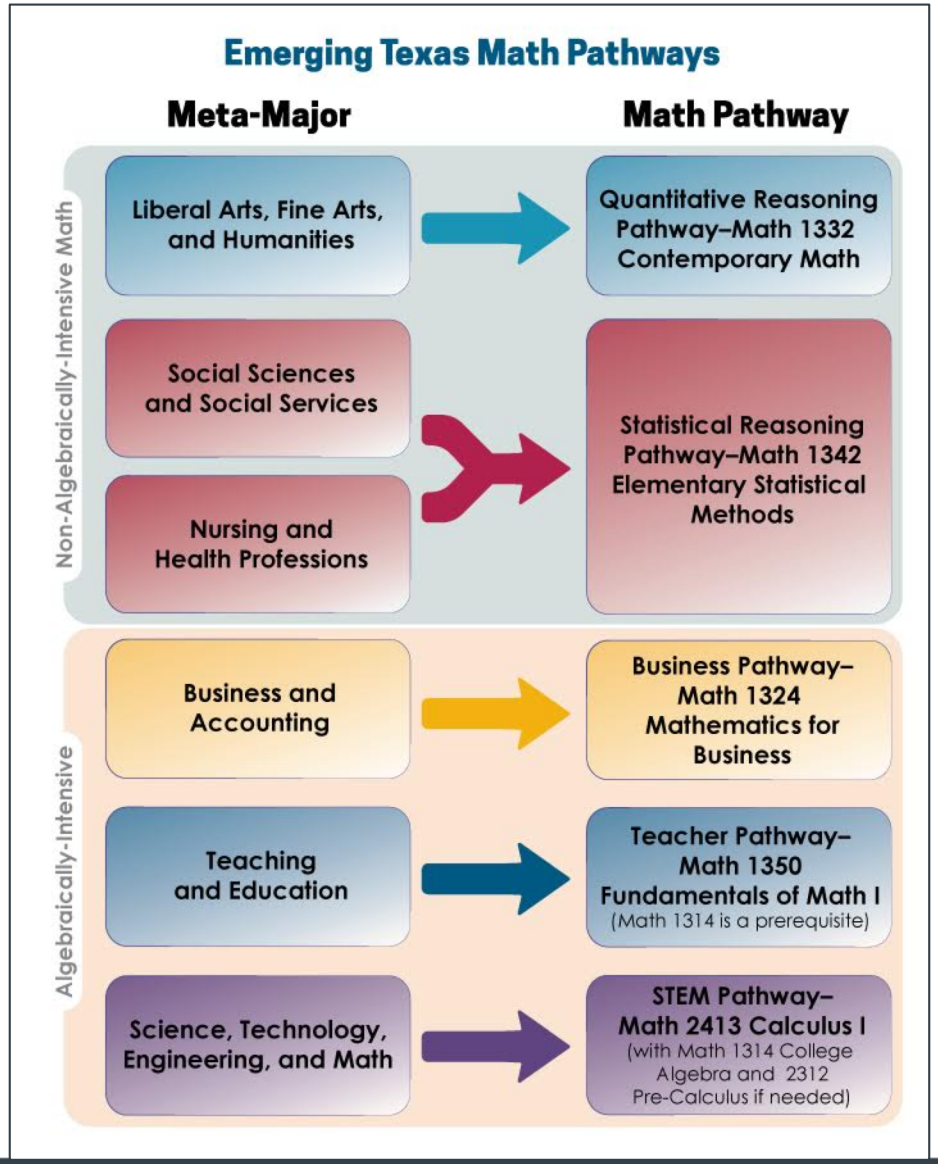
Top 5 declared majors, Fall 2015 (D)

Curriculum area	Student enrollment
1. Interdisciplinary Studies	24,783
2. Biology/Biological Sciences, General	24,708
3. Registered Nursing/Registered Nurse	22,806
4. Psychology, General	21,971
5. Kinesiology and Exercise Science	18,881

Native v. transfer student graduation rates (E)

	Percentage of transfer students with junior standing in Fall 2011 graduating in 4 years	Percentage of native students with junior standing in Fall 2011 graduating in 4 years
Institution Specific	N/A	N/A
Statewide average	65%	83%

Results from statewide analysis of math requirements



Closing

Goals for the Day

What have we accomplished together?

1. Develop a shared understanding of math requirements regionally
2. Work towards regional agreement for transfer and applicability
3. Explore data on transfer and math pathways

A Closer Look:
What's the real problem?

It's NOT

- Developmental math…
- College-level mathematics courses…
- Student supports…
- Programs of study…
- Transfer or policy…

A Closer Look:
What's the real problem?

It IS the { **DISCONNECT**
between all these things

Next Steps

Dana Center

- Follow up with institutions' point of contact
- Document institutional challenges and assets

Institutions

- Continue the dialogue with transfer partners
- Connect with regional coordinator

Meeting Evaluation

http://bit.ly/dcmpwesttxeval

Contact Information

- General information about the Dana Center
  www.utdanacenter.org

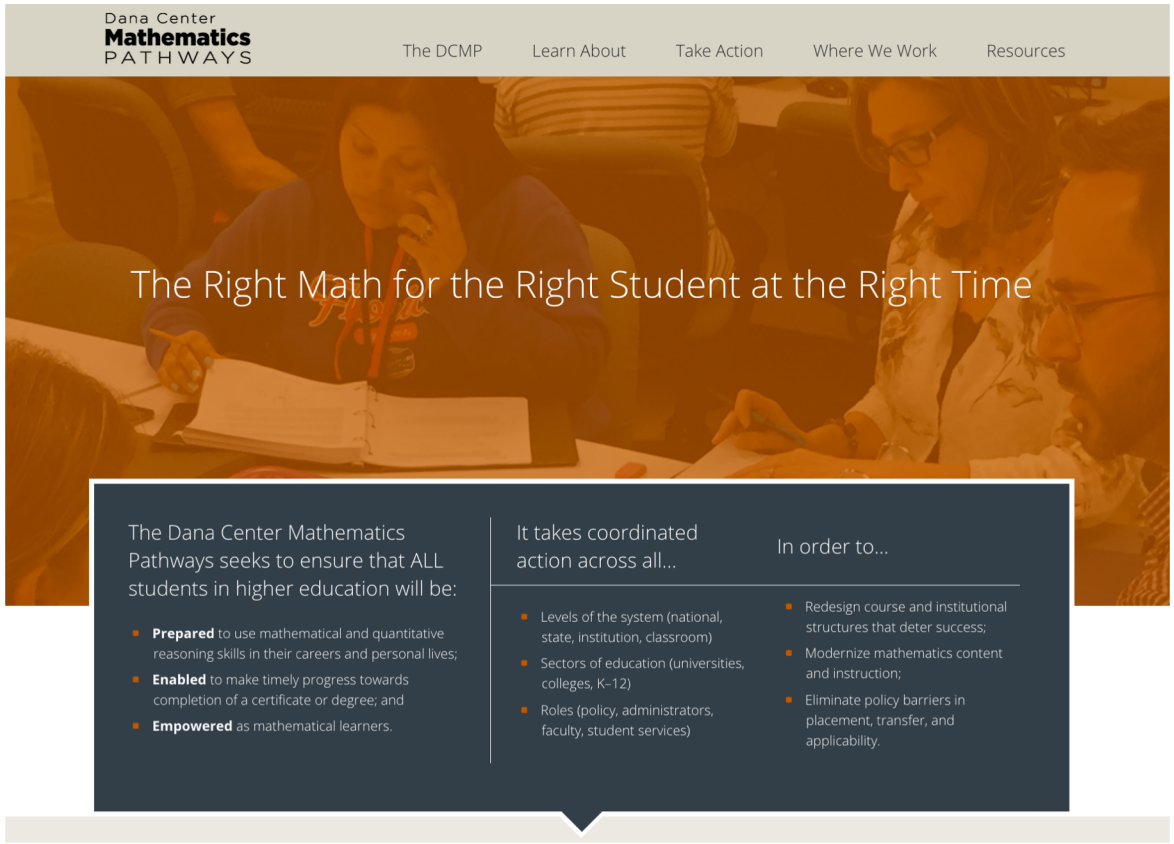
- Dana Center Mathematics Pathways Resource Site
  www.dcmathpathways.org

- To receive monthly updates about the DCMP, contact us at
  dcmathpathways@austin.utexas.edu

Support your Work

Dana Center Mathematics Pathways Resource Site:

http://www.dcmathpathways.org/



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