



**THE UNIVERSITY OF  
NORTH CAROLINA SYSTEM**

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**MATH PATHWAYS TASK FORCE**

**UNC System Math Pathways Task Force Recommendations**

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University of North Carolina System  
Chapel Hill, North Carolina

## Introduction

The charge statement of the University of North Carolina System Math Pathways Task Force, adopted in April 2018, was to develop recommendations and processes that support the efforts of each UNC System institution to implement and scale mathematics pathways<sup>1</sup> that yield increased student success and learning in gateway mathematics and statistics courses. In addition to the charge elements, a concerted effort was made by the Task Force to identify successful curricular and pedagogical strategies and models across the UNC System institutions and to disseminate those strategies and models to enhance student success and learning throughout the System.

The University of North Carolina System-level strategic plan, *Higher Expectations*, calls on UNC System institutions to make significant gains on empirical measures of access and student success. The System is committed to increasing enrollment and graduation rates for its low-income students and closing equity gaps for underrepresented populations. To reach these goals, it is important that students have a strong start in mathematics. First-year math is a “gatekeeper” because it can be a powerful controller of access and may well be a barrier to forward movement. A large body of evidence identifies traditional post-secondary mathematics courses as primary barriers to degree completion and equitable outcomes for students (US Department of Education, 2017). Even more notable is the fact that traditional mathematics courses have been found to be the most significant barriers to degree completion in *all* fields of study (Saxe & Brady, 2015). The correct placement of incoming and transfer college students into their first college-level mathematics course is therefore both critical and pivotal. When students have opportunities to enroll in mathematics courses that are relevant to their programs of study, they are more motivated and more likely to succeed in reaching these goals (Rutschow & Diamond, 2015).

### System-wide data informs our work

The UNC System Office collected baseline data on mathematics and statistics courses between fall 2015 and spring 2018.<sup>2</sup> System-wide, 26% of the 219,087 students analyzed earned a D, F or W in the courses reported (8% D, 11% F, 7% W). Further, non-underrepresented minorities had a DFW rate of 22% (7% D, 9% F, 6% W), while underrepresented minorities<sup>3</sup> had a DFW rate of 33% (10% D, 15% F, 8% W). Further, Pell Grant recipients accounted for almost half (45%) of the total number of DFWs, while representing only 33% of the total population included in the baseline data. DFW rates varied from course to course, but generally, quantitative reasoning courses (where available) had lower DFW rates, while calculus courses tended to have higher DFW rates.

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<sup>1</sup> We define **math pathways** as a mathematics or statistics course or a sequence of courses that students take to meet the requirements of their programs of study. The concept of math pathways applies to college-ready and underprepared students.

<sup>2</sup> When possible, these were mapped to the categories of quantitative reasoning, college algebra, pre-calculus, calculus, introductory statistics, and math for educators, and most institutions focused on introductory and/or gateway courses.

<sup>3</sup> Underrepresented minorities include American Indian, African American and Hispanic students.

In spring 2018, the UNC System Math Pathways Task Force partnered with the Charles A. Dana Center at the University of Texas at Austin, with generous support from the John M. Belk Endowment, to plan, implement, and scale multiple mathematics pathways. The UNC System joins other states, regions, and systems in attempting to dramatically increase student success and modernize entry-level mathematics programs across two- and four-year public institutions of higher education.<sup>4</sup> By partnering with the Dana Center, the UNC System Task Force operates under the four principles of the Dana Center Mathematics Pathways Model (DCMP).<sup>5</sup> The first two principles focus on the pathways themselves and posit that mathematics pathways should be structured so that:

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

The DCMP Model also ensures that “students engage in a high-quality learning experience” and the following principles influence the design of math pathways (University of Texas at Austin, Dana Center):

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

The essential components leading toward the fulfillment of this charge are included here. These components are addressed in the recommendations contained herein:

- Develop strategies to engage institutions in the goals of the UNC System Math Pathways project.
- Develop strategies to communicate the recommendations of the UNC System Math Pathways Task Force to appropriate professional associations and organizations, state decision-makers, university leaders, and other relevant stakeholders.
- Champion newly developed mathematics pathways and provide professional development, cross-campus communication, and opportunities for connection to support faculty in teaching these courses.

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<sup>4</sup> The NCCCS partnered with the Dana Center in 2012. For more information about the states, regions and systems supported by the Charles A. Dana Center, visit <http://dcmathpathways.org/where-we-work>.

<sup>5</sup> While the Task Force is using the guiding principles of the Dana Center Mathematics Pathways Model, we are a separate body and have not held an official vote to adopt them.

- Partner with faculty across academic disciplines to identify, develop, and align rigorous and relevant mathematics courses to support student success across diverse disciplinary programs and majors.
- Consistently collect student and course-level data across all UNC System institutions (via Student DataMart) to support the ongoing implementation and scale of mathematics pathways programs at the institution-level and identify appropriate avenues for dissemination of system-wide progress to key audiences (i.e., dashboards). Subtopics of this essential component include:
  - Assess and develop mechanisms for collecting and analyzing data to measure effectiveness of existing and new gateway math courses.
  - Support the data collection efforts towards evaluation of specific programs or interventions.
  - Identify outcomes, areas of measure, and development of research questions.
- Convene faculty leaders to ensure that gateway<sup>6</sup> mathematics courses are both rigorous and aligned with programs of study.
- Communicate with academic advisors and others who influence student class schedules about the newly proposed pathways.
- Examine and identify appropriate and effective mathematics placement criteria.
- Engage K-12 and North Carolina Community College System (NCCCS) partners in the UNC System Math Pathways project.
- Review policies and mathematics courses to improve effective transfer and applicability of credits for students moving among institutions of higher education.

The UNC System Math Pathways Task Force proposes that the following recommendations, including supporting background and ideas, may be considered by a UNC System institution seeking to implement a mathematics pathways program. The recommendations on the following pages were developed through an intense System-wide Task Force process between spring 2018 and summer 2019, including an iterative review process between Task Force subcommittees, which included faculty and staff from UNC System institutions, representatives from the NCCCS and the North Carolina Department of Public Instruction (NCDPI) for K-12 education, and the Task Force Leadership Team. The work contained in these recommendations took place between April 2018 and July 2019. The full Task Force met together for multiple day-long working sessions during that time, as well as several additional web meetings. A System-wide summit of campus teams was held in fall 2018. The Task Force Leadership Team met

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<sup>6</sup> For purposes of the project, mathematics/statistics **gateway courses** are defined as those that are credit-bearing entry level courses that satisfy degree program requirements or serve as a prerequisite or corequisite course to a required degree program mathematics course. **Degree clusters** are the collections of degree programs with similar courses of study and supported by similar math pathways.

virtually at least every other week during this time frame, often multiple times during a given week. The final report (summer 2019) includes appendices documenting the progress of the work.

The iterative, collaborative process undertaken by the 17 UNC System institutions, NCDPI, and representatives from NCCCS resulted in the following recommendations. The recommendations represent the areas and activities that the committee has recognized as key to helping students successfully satisfy math requirements for graduation. Each recommendation is the result of several discussions between a lead subcommittee and the larger Task Force body and was based on data derived from the UNC and NCCS systems.

Due to the nature of the UNC System, the different institutions will have various starting points for implementation. Based on the differences, it is not expected that every institution will engage in making changes to each item, at one time. The recommendations are intended to act as a guide for institutions who have agreed to collaboratively work to improve student success. Due to the variety of needs for students at each institution, it is expected that the coalition of universities operating under these recommendations will need to customize their activities to implement them. The UNC System Math Pathways Task Force Leadership will work together with university chief academic officers, math department chairs, faculty, advisors, and other interested parties to help enact the recommendations in an order most impactful for each institution.

**Recommendation #1 (Design of Mathematics Pathways): The Task Force recommends that each institution develop campus-specific groups of disciplinary majors (i.e., degree clusters) and create visual representations highlighting each of the following:**

- available majors and degree options that can be obtained via each pathway
- the math pathway required for each of those groups of disciplinary majors<sup>7</sup>

**What is the background behind this recommendation?**

Deliberately designing and creating mathematics pathways with rigorous course material aligned to programs of study relevant to a student's major positively impacts student success (Rutschow & Diamond, 2015). National peer-reviewed research shows that traditional post-secondary mathematics courses serve as significant obstacles to student success and equity (Getz, Ortiz, Hartzler, & Leahy, 2016). According to Gordon (2008), "Each year in colleges and universities across the United States, approximately 1,000,000 students enroll in college algebra; and each year approximately 50% of these

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<sup>7</sup> We want to ensure that students have the information they need to make informed decisions about their degree programs and pathways they choose. We recognize, however, that students who begin along a specific pathway and subsequently switch majors may have their progress toward graduation delayed when they switch.

students fail to pass this course with a grade of C or better" (as cited by Ganter & Haver, 2011, p. 49). Further, the completion rates of mathematics courses are identified as critical indicators of degree completion (Offenstein, Moore, & Shulock, 2010).<sup>8</sup> In a study by the John N. Gardner Institution for Excellence in Undergraduate Education, researchers examined DFW rates at 13 two-year and four-year institutions and found that 90 percent of students who were dismissed from the institution for academic reasons took College Algebra and received a D, F, withdrawal or incomplete in the course (Gardner, 2014). There is a need to impact student learning and success in mathematics across all disciplines, further supporting the need for pathways design.

**Strategies to enact the recommendation:**

1. The Task Force will identify effective models and disseminate those models to the institutions across the System. The Task Force suggests that each institution review the existing literature regarding identifying, designing, and implementing math pathways. Attention may be placed on visual aids and promising practices such as in the example in Figure 1.
2. The Task Force recommends that universities consider alternative ways for students to begin their math pathways. For example, statistics may be its own starting point rather than being necessarily preceded by college algebra or some other course.
3. The Task Force recommends that each institution develop a plan for designing and implementing math pathways based on the promising practices provided in literature and the institution's defined degree clusters. It is worth noting that new courses may need to be developed for math pathways, and the content of such courses should be rich, rigorous, and relevant to the established degree clusters.
4. The Task Force recommends that each institution should have at least one introductory statistics course, one course with a focus on quantitative literacy<sup>9</sup>, and one calculus sequence designed for

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<sup>8</sup> Local data has been gathered and will be analyzed during Phase 2 of this project. While local data often reflects national data, we recognize that we may find some issues unique to the UNC System institutions. Local data must be included in the work done in Phase 2 to modify, revise and extend our recommendations and inform their implementation.

<sup>9</sup> Individual institutions would design these courses based on the needs of their student population and what those institutions value. As a result, courses that focus on quantitative literacy may vary in their learning objectives and topics covered. For purposes of clarity of what such courses may focus on, it is noted here that the MAA describes a quantitatively literate college graduate as being able to: 1) Interpret mathematical models such as formulas, graphs, tables, and schematics, and draw inferences from them; 2) Represent mathematical information symbolically, visually, numerically, and verbally; 3) Use arithmetical, algebraic, geometric and statistical methods to solve problems; 4) Estimate and check answers to mathematical problems in order to determine reasonableness, identify alternatives, and select optimal results; and 5) Recognize that mathematical and statistical methods have limits. (MAA, 1994)

its unique student population. The learning objectives should be designed to allow for easy transitions within degree clusters.

**What resources are needed to enact the strategies?**

The Task Force suggests that each institution collect information on existing math pathways at their individual institutions in order to shed light on programs of study or majors that may be grouped to create degree clusters. Visual representation(s) can then be created to identify potential alignment of mathematics pathways/courses to defined degree clusters. Attention should be given to establishing the courses and sequences of courses that best fit each institution’s programs/majors. The Task Force also suggests that each institution designate an individual to serve as a liaison between the institution’s Math Pathways members and upper administration.

**Resources** to support institution-level action towards recommendation #1 and its proposed strategies include:

A. Emerging Texas Pathways

**Link:** <http://dcmathpathways.org/resources/emerging-texas-math-pathways>

Texas has identified five emerging math pathways based on six degree clusters. Their visual representation, displayed in Figure 1, aligns each degree cluster with the respective math pathway and indicates the entry level course for each pathway. The visual is organized in two chunks that separate the algebraically intensive math pathways from those that are non-mathematically intensive.

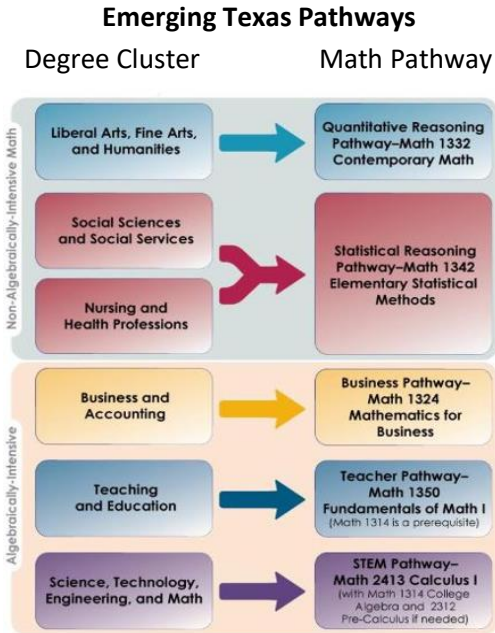


Figure 1. Emerging Texas Math Pathways. Reprinted from *Dana Center Math Pathways*, Retrieved, November 2, 2018, from <http://dcmathpathways.org/resources/emerging-texas-math-pathways>.

**Considerations for Effective Practices for Designing and Implementing Math Pathways:** This section provides resources for identifying, designing, and implementing mathematics pathways, so that they align with programs of study. This section also provides information on implementing math pathways.

B. Dana Center Math Pathways Institutional Implementation Guide

**Link:** <http://dcmathpathways.org/implementation-guide>

This website provides guidance for institutions implementing and scaling mathematics pathways organized around four stages: Stage 1-Getting Started, Stage 2-Planning, Stage 3-Implementing, and Stage 4-Continuous Improvement. A variety of resources are provided within the guide, including resources to support institution-level activity to align mathematics pathways to programs of study.

C. Guide to Aligning Mathematics Pathways to Programs of Study

**Link:** <http://dcmathpathways.org/resources/guide-aligning-mathematics-pathways-programs-study>

This tool is designed to aid institutions in working to align mathematics pathways to programs of study. It guides teams to identify mathematics course requirements for each program at their institutions, compare mathematics course requirements at primary transfer institutions, and provide clear and consistent information for advisors and faculty.

D. Sample Math Pathways List

**Link:** <http://dcmathpathways.org/resources/sample-math-pathways-list>

This document provides a list showing how a range of institutions have aligned math pathways with programs of study. Programs of study are categorized within three math pathways: college algebra, quantitative reasoning, and statistics.

E. Program of Study Issue Briefs

**Links:** <http://dcmathpathways.org/resources/program-study-issue-brief-mathematics-communications>

<http://dcmathpathways.org/resources/program-study-issue-brief-mathematics-criminal-justice>

<http://dcmathpathways.org/resources/program-study-issue-brief-mathematics-social-work>

<http://dcmathpathways.org/resources/program-study-issue-brief-mathematics-pre-service-elementary-k-5-teacher-education>

<http://dcmathpathways.org/resources/program-study-issue-brief-mathematics-business>

<http://dcmathpathways.org/resources/program-study-issue-brief-mathematics-nursing>

These briefs provide institutions with recommendations from professional organizations on mathematics course requirements for programs of study related to those organizations. The links above include briefs for the following programs of study: communications; criminal justice, social work, elementary education, business, and nursing.



**Recommendation #2 (Student Support):**

The Task Force recommends that, using disaggregated mathematics course data, individual institutions regularly review their student support programs and adjust as needed.

**What is the background behind this recommendation?**

Student support programs have a myriad of guises. The most traditional and most common is in the form of a tutoring/help center, where students engage with trained tutors for additional practice with course material and advice on how to execute a successful transition into college level mathematics. These may be implemented in both face-to-face and virtual models. Another approach to student support which is starting to be utilized more frequently comes in the form of fallback, transition, or corequisite courses. The goal of such courses is to help identify at-risk students and help them succeed in the primary gateway course. Fall-back courses allow students who realize they lack the prerequisite knowledge for the gateway course to drop back to a lower level course part way through the semester. The students will gain the prerequisite skills without having to wait until the start of the next semester, thereby allowing them to complete the gateway course in the following semester. Corequisite courses provide just-in-time support to students, targeted conceptual and mechanical skill formation in foundational mathematics, and much-needed additional time with faculty to foster student success. Such courses have been designed and implemented in several states with great success (e.g., Tennessee, Arkansas)<sup>10</sup>.

**Strategies to enact the recommendation:**

1. Each institution should identify promising practices in development and implementation of student support programs available to all students. Institutions should also develop methods to regularly evaluate and assess these efforts, making changes iteratively based on what is learned.
2. Each institution should examine its current support programs for students in mathematics and alternative options that have been proven successful at other UNC System institutions, and thoughtfully measure the effectiveness of their initiatives ongoing.
3. Institutions should meet regularly to share and discuss successes and challenges. This collaboration will also help institutions make appropriate changes to improve outcomes. Data on DFW rates for general education math courses should be gathered and analyzed across the system and for each institution.

<sup>10</sup> See the following for full reports: <http://dcmathpathways.org/sites/default/files/2016-08/Corequisite%20Remediation%20Study%20%28TBR%20report%29.pdf> (Tennessee); [http://dcmathpathways.org/sites/default/files/resources/2018-05/1\\_Notes%20from%20the%20field\\_number%204\\_FINAL%5B1%5D.pdf](http://dcmathpathways.org/sites/default/files/resources/2018-05/1_Notes%20from%20the%20field_number%204_FINAL%5B1%5D.pdf) (Arkansas).

**What resources are needed to enact the strategies?**

Resources for course development and delivery need to be provided by each institution. Funds should also be provided for training at all levels (tutors, faculty, advisors, etc.), and supporting faculty visits to other institutions where successful support models have been implemented. Funding should also be available for institutions to implement mechanisms to disseminate and present analyzed data within and across institutions and to other stakeholders.

**Recommendation #3a (Curriculum, Pedagogy and Faculty Engagement).** As institutions develop or refine their mathematics pathways and student support models, the Task Force recommends that each institution critically examine student learning outcomes, mathematics course content, and sequencing of courses to ensure that students' mathematical experience is relevant and appropriate for their individual programs of study.

**Recommendation #3b.** The Task Force recommends designing and implementing System-wide mechanisms for identifying and disseminating impactful, promising practices on the teaching, content, and delivery of lower-level undergraduate mathematics courses, including strategies for reducing disparities in student learning for diverse student groups, and on the training of faculty and graduate students to teach those courses.

**What is the background behind this recommendation?**

The UNC System has faculty across the institutions who have developed and are developing important strategies for enhancing student learning and success in all undergraduate mathematics courses and in the gateway mathematics courses in particular. By providing faculty with the opportunity to meet and discuss proven and promising strategies, learning in mathematics courses will be further enhanced. This will have the additional benefit of developing a cadre of faculty scholars within the System. Further, some institutions have developed programs and offered resources to support faculty development that have proven successful, such as Centers for Excellence in Teaching and Learning. Giving institutions the opportunity to share models of effective programs (and ideas for funding sources) will help strengthen existing programs and promote the development of similar programs where they don't currently exist.

**Strategies to enact the recommendation:**

1. The Task Force recommends that each institution identify a team of individuals to critically examine student learning outcomes, mathematics course content, and sequencing of courses.

This should be done in close collaboration with programs and stakeholders across institutions. Mathematics departments should develop open lines of communication with other departments about intended outcomes of required math courses, and institutions should revise and develop new courses as needed.

2. The Task Force suggests that the UNC System Office hold annual conferences for mathematics faculty across the UNC and the NC Community College Systems. These conferences will provide forums to share and discuss curriculum and pedagogy that enhance the learning of students in mathematics pathways courses, in particular those from traditionally underrepresented groups. Tenure track and non-tenure track faculty who frequently teach gateway mathematics courses, as well as those who are involved in student success and academic support, are especially encouraged to participate and contribute. Such conferences should also include sessions on course content in traditional courses and other alignment opportunities.
3. The Task Force requests that funding be made available to enable UNC System “ambassadors”, selected by individual institutions, to share curricular and pedagogical initiatives and dialogue with faculty, graduate students, and staff within their own institution and across institutions. These dialogues will help brainstorm ways to define and ensure student success in math pathways courses. These ambassadors may include mathematics faculty, faculty in other disciplines, and representatives from faculty development programs.

#### **What resources are needed to enact the strategies?**

Resources need to be identified to support faculty efforts to pilot promising strategies (such as the development of co-requisite courses), to attend conferences, to host guest speakers and workshops, and to organize faculty/administrative visits to pursue faculty development at institutional centers (e.g., Centers for Excellence in Teaching and Learning; Colleges of Education).

**Recommendation #4 (Advising):** The Task Force recommends that each institution critically reviews and appropriately updates advising programs (e.g., structure, policies, and processes) to ensure effective advising of students into the appropriate mathematics pathway based on students' academic and career goals. Advising programs that have proven effective can serve as models to other institutions.

**What is the background behind this recommendation?**

Students entering colleges and universities have varying math experiences in high school, as well as at community colleges, other colleges and universities, or during military service. These experiences can shape one's predisposition toward math, which will vary from student to student. In addition, it may be challenging to advise students with undecided majors, since these students will not have a predetermined starting point for their math pathway. Institutions in the System may also have varying advising structures for incoming freshmen. Expanding the advising efforts will make the implementation of math pathways more successful.

**Strategies to enact the recommendation:**

1. The Task Force recommends that math departments, as the driving force of the math pathways initiative, clearly communicate their expectations regarding the various pathways at their institutions with colleagues, advisors from other departments, and/or advising offices/centers. This line of communication should remain open in perpetuity. Possible means of communication include websites, university catalogs, or advisor training sessions.
2. The Task Force recommends that academic/career advisors discuss potential majors for incoming undecided majors. These discussions should begin as early as the orientation advising sessions for incoming students. Institutions may consider the implementation of a system of pre-majors or meta-majors for undecided majors.
3. The Task Force recommends that organized training and guidance specific to math pathways be made available to advisors. Among other things, the training should help to inform advisors of any institutional and System-wide policy changes, so that they are aware of how students' various math experiences and goals will be impacted, as well as how to take changes into account together with math placement criteria, during advising sessions. Such training will be crucial as more targeted math pathways are developed.

4. The Task Force suggests that institutions acquire advising technologies that allow advisors to record summaries of advising appointments and include course selection recommendations and other pertinent information to improve record keeping.
5. The Task Force recommends that math departments work with faculty advisors and advising centers to develop appropriate Baccalaureate Degree Plans (BDPs) for majors and degree clusters.

**What resources are needed to enact the strategies?**

Resources need to be identified to support advisors' professional development to ensure their participation in the implementation of math pathways is successful. In addition, institutions will require resources if they are to acquire or remain current with the recent versions of advising technologies.

**Recommendation #5 (Placement): The Task Force recommends that each institution evaluate its current placement practices to determine effectiveness in initial math course placement. Each institution may consider different, and perhaps multiple, measures for each of its college-level mathematics courses, based on those measures deemed appropriate.**

**What is the background behind this recommendation?**

Many faculty members across UNC System institutions feel that their placement mechanisms do not consistently place students into the most appropriate first math course. In addition to factors such as misalignment of mathematics courses to programs of study and insufficient academic support to fill "gaps" for prerequisite math skills for students, poor course placement is a significant factor contributing to students leaving a course with a D, F, or W. High DFW rates are a challenge to institutions and result in impeded student movement through their mathematics courses of study. Further, early research supports the use of multiple measures in mathematics placement with promising results (e.g., Barnett, Bergman, Kopko, Reddy, Belfield, & Roy, 2018; RFA Multiple Measures, n.d.)

A student's high school grade point average (GPA) is a robust reflection of a student's performance over time, across subject areas, and in varying instructional settings (Hodura & Cox, 2016).<sup>11</sup>

In its study of nationwide mathematics placement policies at colleges and universities, the North Carolina Community College System found that a high school GPA is the most accurate predictor of student success in college. Based on several years of collection of data from the fifty-eight community colleges, the Multiple Measures Policy for North Carolina Community Colleges now determines that an unweighted high school GPA of 2.8 or higher indicates that students are ready to begin in a gateway math course tailored to their intended major. Students with a GPA below 2.8 will be placed into gateway courses with a corequisite course requirement (2.2-2.799) or in a transition course (<2.2) unless one of the other data points places them higher.

The Task Force recognizes the autonomy of colleges and institutions to determine their own individual mathematics placement procedure. There is great variation in procedures that can be studied and learned from. The breadth of these procedures across NC community colleges and UNC System institutions is included in the summary of current procedures provided annually by the NC Early Mathematics Placement Testing (NC EMPT) Program to high schools and post-secondary institutions statewide.<sup>12</sup>

#### **Strategies to enact the recommendation:**

1. The Task Force recommends the development or adoption of math placement tests for each institution as one of multiple placement procedures. The test(s) should measure preparedness for a math pathway focused on areas such as algebra, statistics, and/or quantitative reasoning. The accuracy and effectiveness of the placement test should be based on data and adjusted as needed on a regular basis. The validity of the mathematics placement test score should also be considered. Any mathematics placement test should be carefully reexamined annually to ensure that it continues to implement best practices.

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<sup>11</sup> For example, the NC Community College System of fifty-eight colleges recently restructured its math placement procedure for all of its colleges. A variety of measures of mathematics preparedness were considered for each incoming student. These data points included scores from the ACT and/or SAT, assessments completed statewide by high school juniors and seniors. Also reviewed were GED or HiSET scores. A math score from a placement test (NC DAP) administered just before enrollment in a student's first semester of college courses was also considered for some students. (As of fall 2019, the NC DAP will no longer be a measure for placement, and most students will no longer be tested when they are admitted – only those who are beyond 10 years from graduation or who do not have a valid GPA available.) In addition, a student's unweighted high school grade point average (GPA) was used. A variety of mathematics data points for each student gave a broader picture of a student's mathematics readiness and ability to move forward at the college level.

<sup>12</sup> The brochure, "Mathematics Placement Procedures at NC Community Colleges and UNC Institutions," is uploaded to the NC EMPT website [www.ncempt.org](http://www.ncempt.org), and included in the Appendix to these Recommendations. Placement procedures are often based on the population of students on the campus, the majors offered, and institutional settings and logistics.

2. The UNC System Office might consider creating a math placement test or tests that can be used across the System, with each institution having the option to use these tests or not. When created, the assessment(s) should test for readiness in more than one area of mathematics and be aligned with a student's intended major. For example, one version of the assessment may test for readiness for statistics or quantitative reasoning. Another version may test for preparedness for college algebra, and yet another for calculus readiness. Scores should be transferable among institutions with protections in place for individual student's data. Each institution should decide on cut-off scores for placement into their own beginning math courses.
  
3. The Task Force recommends that the placement procedure generate an advising tool to inform students and advisors as to appropriate placement. Research indicates that the use of a single test score for math placement does not fairly measure a student's current mathematics abilities or his/her ability to succeed in a college-level math course. This includes the use of only a math placement test score, or a student's score from the ACT or SAT. Instead, to maximize access, equity, and completion of a gateway math course, colleges and universities should assess readiness through multiple measures that gauge likelihood of success in the student's chosen pathway (Hodura & Cox, 2016). Consider the matrix below for more accurate math placement that includes ranges of scores for several data points and the corresponding first college mathematics course. **Note:** A similar matrix can be created by the institution to include placement into math courses for non-STEM majors, such as statistics and quantitative reasoning. The criteria for scoring, as well as the math courses that fill the matrix, could vary from institution to institution, and from program to program within one institution.

For example, if an institution were to decide that ACT/SAT scores and unweighted GPA were the most important factors for determining course placement, they may use a tool as illustrated below:

|                            |                          |  |                              |                              |                          |
|----------------------------|--------------------------|--|------------------------------|------------------------------|--------------------------|
|                            |                          | ACT Math                                   |                              |                              |                          |
|                            |                          | Min: 0<br>Max: 19                          | Min: 20<br>Max: 21           | Min: 22<br>Max: 24           | Min: 25<br>Max: 36       |
|                            |                          | SAT Math Score (taken March 2016 or after) |                              |                              |                          |
|                            |                          | Min: 0<br>Max: 510                         | Min: 520<br>Max: 530         | Min: 540<br>Max: 580         | Min: 590<br>Max: 800     |
| High School Unweighted GPA | Min: 0.00<br>Max: 2.90   | Score: 5<br>College Algebra                | Score: 5<br>College Algebra  | Score: 5<br>College Algebra  | Score: 20<br>Precalculus |
|                            | Min: > 2.90<br>Max: 3.21 | Score: 5<br>College Algebra                | Score: 5<br>College Algebra  | Score: 10<br>College Algebra | Score: 20<br>Precalculus |
|                            | Min: > 3.21<br>Max: 3.52 | Score: 5<br>College Algebra                | Score: 10<br>College Algebra | Score: 10<br>College Algebra | Score: 20<br>Precalculus |
|                            | Min: > 3.52<br>Max: 4.00 | Score: 20<br>Precalculus                   | Score: 20<br>Precalculus     | Score: 30<br>Calculus I      | Score: 30<br>Calculus I  |

\*If students have a placement score of 5, they should be placed into College Algebra with caution; if College Algebra is not required for the program of study, consider Mathematical Concepts or Applied Statistics.

*Table Source:* Jeff Lawson, John Wagaman, and Johnny Lail (WCU) and Ben Kearns (ABTC)

- The Task Force recommends that additional support structures, such as co-requisite courses, faculty tutorial sessions, math laboratories, etc. should be considered when placement advice is given to students.<sup>13</sup>

<sup>13</sup> Please also see strategy #3 in the Advising recommendation (Recommendation #4).



### **What resources are needed to enact the strategies?**

A math placement test administered just prior to college enrollment can provide important and timely data about an incoming students' current math skills. This is particularly valuable for students who were not enrolled in a fourth math during their last block semester(s) of high school, resulting in a gap in their study of mathematics. A placement test score would also be helpful in evaluating transfer students and distance education students whose SAT/ACT/high school GPA may be dated. The Task Force recommends that if a mathematics placement test is employed, a review by the institution's math faculty of the current content of high school math courses, as well as the mathematics skills deemed necessary for success in various college majors, is essential. The content of the placement test(s) should align with the mathematics skills required for a student's intended major.

Each institution will need access to the necessary data (e.g., When, in their program, do most students take their first math course? What course do most students take?) to perform its analysis of current placement practices. This data should be housed in a central database at each institution to ensure ease of access. The analysis could include students' academic content backgrounds (i.e., courses completed) correlated to their initial placement in entry level mathematics courses. Coordination between the mathematics department, enrollment services, and institutional planning and research will be essential.

Funding may be required to enable those institutions with effective placement procedures to disseminate their placement findings with other institutions. Additional funding could be provided to institutions to assess the predictive ability of commercial placement products (e.g., ALEKS, Accuplacer, etc.)

**Recommendation #6 (K-14): The Task Force recommends strengthening partnerships among educational institutions in order to: analyze data that can affect seamless movement at each transition point (e.g., high school to college; community college to university), share best practices for teaching and learning, increase availability and diversity of academic supports, and increase opportunities for 9th-12th graders to engage with academic and professional communities.**

### **What is the background behind this recommendation?**

Preparation that takes place in high school for college varies as to the skills of students, preparation methods, and settings. The mathematics courses students take before beginning their associate or baccalaureate programs and the method for obtaining early college credits in mathematics also vary (e.g., AP, IB, honors, early college, community college, etc.). Cross-institutional sharing of best teaching practices and academic supports will help universities meet the academic needs of all

students, regardless of their preparation (Fitzpatrick & Sovde, 2017). Given the increased opportunities to earn college credits while in high school, the window of time that a student needs to decide about college or on a career path has been compressed. Students need to have access to information about linkages between academic choices and career paths, particularly at pivotal times when they are making decisions as to appropriate mathematics courses and sequencing. Cross-institutional sharing of best practices in outreach and for engaging 9-12 students with academic and professional communities' academic supports will better prepare students for choosing appropriate mathematics courses.

**Strategies to enact the recommendation:**

1. Seconding the recommendation from the Curriculum, Pedagogy, and Faculty Engagement Subcommittee--an annual conference for mathematics faculty across the UNC and the NC Community College Systems and which also invites high school mathematics faculty and other campus leaders--would provide an opportunity for sharing best teaching practices, effective academic support design, and impactful 9-12 outreach.
2. Educational institutions should collaboratively analyze data that focus on curriculum offerings, course selection choices (sequencing and timing), and student performance, particularly at the transition stages (the last course taken before the transition and the first course attempted at the next level). Assessing the impact of gaps in mathematics enrollment on student performance will inform recommended timelines for mathematics pathway completion. For example, if a gap year from mathematics enrollment does not negatively impact college performance, then perhaps the UNC System may need to reconsider its recommendation that students take a mathematics course during their senior year of high school. If, however, poor performance occurs following a gap in enrollment, that information should inform advising recommendations and course scheduling priorities.
3. The Task Force recommends that the UNC System partner with the North Carolina Department of Public Instruction to examine student success in mathematics across grades 9 through 16. The partnership will engage in designing and implementing a study that determines a recommended timing for mathematics courses, from high school through college. The study will collect data on timing and success rate of college students' first and subsequent mathematics and statistics courses, as well as data on admitted students' mathematics courses and success rates prior to college enrollment. For example, are college students postponing their math requirements, thereby allowing for more time between math courses? If so, how does this impact success in those later courses? The study will attempt to identify trends related to gaps in between math courses (either in high school or college) and examine the impact on student success.

4. The Task Force also recognizes the need to connect the advising communities of high schools, community colleges, and four-year institutions. As the UNC System and the North Carolina Department of Public Instruction partner to examine student success, the results of that collaboration can be a driver for bringing together advisors at various venues. These collaborations around advising practices could occur at the System-sponsored annual conference defined in the first recommendation, at regional meetings hosted by the North Carolina Department of Public Instruction, or at the state and regional North Carolina Council of Teachers of Mathematics meetings.

#### **What resources are needed to enact the strategies?**

Each institution will need access to the necessary data to perform its analysis. The data should be housed in a central database at each institution to ensure ease of access.

Funding will be needed to enable the institutions to perform their analyses as well as to organize and implement the annual conference proposed.

**Recommendation #7: (Transfer): The Task Force recommends that deliberate collaboration and communication be established to ensure more seamless and effective student transfer and course applicability<sup>14</sup> between and among UNC System and NCCCS institutions.**

#### **What is the background behind this recommendation?**

As most internal and external processes work best when those involved are in constant communication and working together towards a common goal, so too are the themes of communication and collaboration integral to the successful transfer of credit between institutions of higher education. Articulation agreements work best when combined with close collaboration among those involved (Bueschel & Venezia, 2006; Knoell, 1996), and they can even foster the desired collaborative environment (O'Meara, Hall, & Carmichael, 2007). The *North Carolina Comprehensive Articulation Agreement (CAA)* was originally designed in 1996 to streamline the transfer process between the UNC System and the NCCCS. In 2014, almost 20 years later, the CAA underwent significant revision to further aid in the ease and efficiency of the transfer process. The revised agreement required publication of each university's Baccalaureate Degree Plans (BDPs) and cooperation in the articulation of credits from the NCCCS to the UNC System. Any additional policy or process changes at the local and statewide levels that can further the goals of seamless and effective

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<sup>14</sup> The Dana Center defines "mathematics course applicability" as a mathematics course that is in alignment with designated math pathways at an institution, and also counts towards a student's degree requirements as a required math course and not just transferring as an elective.

student transfer among institutions of higher education in North Carolina should be embraced and implemented wherever feasible.

**Strategies to enact the recommendation:**

1. The Task Force suggests that each university's BDPs, as mandated by the CAA, be regularly vetted and updated to ensure NCCCS students are aware of any changes to curricula. BDPs are designed to ensure that students are ready to succeed in their chosen major once they arrive at the university while also providing students with the opportunity to obtain credit for general education courses completed at the community college.
2. The Task Force suggests that the UNC System Office organize and support regular statewide and regional meetings between universities and their most significant "feeder" community colleges (and high schools, if they can be identified) to define and maintain clear pathways to degrees within degree clusters. These meetings will increase quality communication, promote successful transfer, assist with BDP management, and aid students in the process of efficient transfer.
3. The Task Force suggests that the UNC Online Course Equivalency Finder (<https://online.northcarolina.edu/courses/equivs.php>) be updated regularly and utilized frequently by community college partners and UNC System faculty and staff.<sup>15</sup>
4. The Task Force suggests that universities adopt a similar structure to each other for their introductory calculus sequences; i.e., three four-credit-hour courses. A similar structure would allow for streamlined transfer between any two public institutions of higher education in North Carolina.
5. The Task Force suggests that the UNC System Office support universities in developing interactive, digital course catalogs to assist students and advisors with the understanding of how credit would transfer in to each university and what courses would be required for their various degree programs.

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<sup>15</sup> The Equivalency Finder is a union of the equivalency tables stored at each UNC Institution in their Banner or Peoplesoft Student Information Systems (SIS). It refreshes at the same time each day by default, and it has the capability of refreshing instantly when new equivalencies are entered by an institution's registrar. **Note:** "The accreditation standards of the Southern Association of Colleges and Schools Commission on Colleges (SACSCOC) require member institutions to analyze credit accepted for transfer in terms of level, content, quality, comparability, and degree program relevance" (SACSCOC, 2003).

**What resources are needed to enact the strategies?**

Resources (people, funding, etc.) will need to be identified to engage in regular vetting and revising of university BDPs, examination of assignment of credit hours, and revision and expansion of the UNC Online Course Equivalency database. Funding and space are needed to hold meetings between universities and “feeder” institutions.

**Recommendation #8: (Data and Assessment): In support of data collection and all recommendations in this report, we recommend that the UNC System Office add mechanisms by which to identify all gateway and entry-level mathematics and statistics courses in Student Data Mart<sup>16</sup> and use it regularly to analyze and provide outcomes-based information to UNC System universities.**

**What is the background behind this recommendation?**

Data and assessment are areas of continuous improvement and engagement. In order to chart progress in a measurable and consistent way, data and student achievement must be recorded. Data is used to make evidence-based decisions, chart progress, and to suggest areas for continuous improvement.

For example, reports such as DFW and ABC rates are used to determine how students are matriculating towards graduation. Furthermore, baseline UNC System data collected between fall 2015 and spring 2018 show that almost half of the over 42,000 students who received a grade of D or F in their gateway mathematics course were also Pell-eligible (UNC System-level Summary of Baseline Data).

While UNC System rates provide a summary of the overall mathematics health, it is at the granular level that we gain the most value. Individual institutions can identify problem areas and develop strategies using the power of cross-institutional collaboration to fill challenging areas. While each institution has its own unique data and assessment process, the Task Force believes that an overall plan can help support the efforts of the individual institutions.

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<sup>16</sup> UNC Student Data Mart (SDM) presents student, course, instructor and related data for the UNC System. Data is supplied by constituent institutions. The data collected supports not only mandatory education reporting requirements but also planning, analysis, and assessment efforts at the central (System Office) and campus levels.

**Strategies to enact the recommendation:**

1. The Task Force recommends that the UNC System Office, in collaboration with the UNC System institutions, develop a data collection plan to which each institution contributes. The Task Force recommends that the UNC System Office, in collaboration with the UNC System institutions and UNC System Assessment Council, develop an assessment plan that each institution adopts. The plan should allow for consistency in overall analysis using common methodologies and data interpretations (e.g., ANOVA, regression analysis, etc.). The plan should provide standard operating procedures for data collection and analysis.
2. Outcomes data should be broken down by subgroups in order to monitor equity and access issues and to support UNC System strategic plan goals to address all student populations. Examples of subgroups include transfer students and Pell-eligible students.<sup>17</sup>
3. The UNC System institutions will work alongside the UNC System Office to develop a course completion indicator (“flag”) within the ERP<sup>18</sup> System for all gateway and entry-level mathematics and statistics courses, with an additional indicator for those courses that satisfy math pathways specific requirements. This will improve ERP data collection and the ability to track student progress.
4. The Task Force recommends that institutions should use the mechanisms to develop communication strategies to disseminate and present data within and across institutions and to other stakeholders.

**What resources are needed to enact the strategies?**

Institutional representatives will need to meet to develop an agreement on assessment methodology standards. As development of these plans begins, each institution should provide a list of individuals identified to participate in the process on behalf of their institution. Key data records that should be collected by each institution and how findings should be reported to the System office will need to be identified. Funding and space will also need to be made available to hold meetings for development, review, and implementation of the plan.

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<sup>17</sup> See System-level Summary of Math Pathways Baseline Data

<sup>18</sup> Enterprise resource planning (ERP) is the integrated management of main business processes, often in real-time and mediated by software and technology.

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## Appendix

### UNC System Math Pathways Task Force Member Biographies

#### Melinda Anderson

Melinda J. Anderson currently serves as interim Associate Vice Chancellor for Academic Affairs at Elizabeth City State University. Dr. Anderson has over 18 years of experience in academic advising and higher education administration at four-year and two-year institutions. Prior to this role she served as the Associate Dean for Undergraduate Studies and Director of the University College at the University of North Carolina Wilmington. She has been an active member of NACADA, the Global Community for Academic Advising since 2009, has held several leadership positions, and is an incoming Board Member. Dr. Anderson has held multiple roles in both student and academic affairs; her passion and commitment to student success has propelled her to operate in many different capacities with a focus on student transitions, persistence and retention. She earned an Ed.D. in Higher Education Administration from the College of William and Mary in Williamsburg, VA.

#### Tamar Avineri

Tamar Avineri has been teaching mathematics for 18 years, the last 15 of which have been at the North Carolina School of Science and Mathematics. She earned her bachelor's degree in Applied Mathematics from UC San Diego and her master's degree in Mathematics from UCLA. She also earned her National Board Certification in Mathematics: Adolescence and Young Adulthood in 2008. Dr. Avineri completed her Ph.D. in Mathematics Education in 2016 at North Carolina State University, focusing her research on online professional development for mathematics teachers. She has taught at the high school, community college, and university levels and has spoken at several practitioner and research conferences on both mathematical content and pedagogy.

#### Yufang Bao

Dr. Bao is currently a professor at Fayetteville State University. She graduated from the Fujian Normal University in China with a B.S. and M.S. in mathematics and later earned a Ph.D. in statistics and probability from Beijing Normal University, Beijing, China and a Ph.D. in electrical engineering from North Carolina State University.

#### Daniel Best

Daniel Best has always had a passion for mathematics but chose to pursue other majors for his undergraduate degree at Miami University. After thru hiking the Appalachian Trail in 1994 and working for a few years in the outdoor recreation industry, Best returned to school to study mathematics. He received his Master's in Mathematics at Miami University in 2000 and completed 8 years of mathematics education doctoral work at Portland State University. His interests in mathematics education include diversity and equity, student agency, standards-based assessment, statistics education, and innovative teaching practices.

Daniel Best is a faculty member in the Mathematics and Computer Science Department at Western Carolina University. He has taught mathematics and mathematics education courses for a total of 20 years, 10 of which have been at WCU.

One of his current responsibilities as a mathematics instructor in the Mathematics and Computer Science Department is serving as the gateway course director. In this position, Best serves as an advisor to the department head regarding the curricula of all 100-level mathematics courses. He is also the chair of the WCU STEM Math Pathways Task Force, which convened in January. This task force is exploring new mathematical pathways for the department, considering whether college algebra will continue to serve as an option for our students, and conceptualizing effective remediation for students who aren't ready for certain courses. Daniel is looking forward to serving on the UNC System Math Pathways Task Force.

### **Laura Bilbro-Berry**

Dr. Bilbro-Berry is Director of Community College Partnerships for the University of North Carolina System Office. Bilbro-Berry worked for 12 years at East Carolina University in a variety of roles to include being the Director of Partnerships and Enrollment Management that involved administration of a partnership between the university and community colleges. She was also instrumental in the launching of the ECU Community School. She has twice been the recipient of the *Order of the Long Leaf Pine*, the highest civilian honor in North Carolina, and was presented these awards by Governor Jim Hunt and Governor Mike Easley. President George W. Bush honored her at the White House for her achievements in North Carolina. In addition, Bilbro-Berry was recognized as the *University of North Carolina at Chapel Hill School of Education Outstanding Young Alumni* and was inducted into *East Carolina University's Educators Hall of Fame*. She has engaged in a variety of roles within the field of education to include being Beaufort County Schools' Curriculum Specialist and Director of Federal Programs. She is an honors graduate of the University of North Carolina at Chapel Hill where she was a *Teaching Fellow* (1992). She earned her master's degree in Adult Education from East Carolina University (2000) and completed her doctorate in educational leadership, also at ECU. In 2000, Bilbro-Berry was named the *North Carolina Teacher of the Year* and spent the year traveling the state visiting schools, training teachers, and serving on several education-related boards including the State Board of Education and the Public School Forum of North Carolina.

### **Banita Brown**

Dr. Banita Brown's entire academic career has been spent at the University of North Carolina at Charlotte. She was first appointed as a member of the faculty in the Department of Chemistry. While in the department, her area of teaching and research was in the sub-discipline of organic chemistry. Her research interests consist of the chemical syntheses of various heterocyclic derivatives. Numerous undergraduate and graduate students as well as high school students have participated in her laboratory's research projects. Dr. Brown was also recognized as a finalist for the UNC Charlotte Bank of America Award for Teaching Excellence. Her administrative roles at UNC Charlotte have included the chemistry masters' program coordinator, the UNC Charlotte Ronald E. McNair Post-Baccalaureate Achievement program director, the NanoSURE program director (a National Science Foundation Research Experiences for Undergraduates site), the UNC Charlotte principal investigator for the National Science Foundation North Carolina Louis Stokes Alliance for Minority Participation (an alliance consisting of eight UNC System institutions), and finally the associate dean for Academic and Student Success in the College of Liberal Arts & Sciences.

### **Beth Bumgardner**

Beth Bumgardner is a lecturer of mathematics and statistics at UNC Charlotte. She has eight years of experience teaching large lecture sections of introductory statistics, calculus for engineers, and a senior level mathematical modeling course for actuarial majors. Beth holds a master's in mathematics and is currently in the dissertation phase of her doctorate in curriculum and instruction with a focus on urban mathematics. She has worked to integrate her knowledge of mathematics with her love for helping students of different backgrounds to succeed in the courses she teaches and in those she has developed. She also has worked on the re-design team for pre-calculus, calculus I, and calculus II at UNC Charlotte to develop department-wide resources for students and instructors with the goal of improving DFW rates in lower level mathematics courses.

### **Phil Cauley**

Phil Cauley began working at WCU as an admissions counselor in 1984. A two-time graduate of WCU, he has spent most of his career promoting his alma mater (he also served a brief stint as dean of enrollment at Mississippi University for Women). During his 30-plus years of higher education, he has served in various capacities including associate director of admissions, director of alumni affairs, director of admissions, and interim associate dean of educational outreach. He currently serves as assistant vice chancellor for undergraduate enrollment, where he holds administrative responsibility for financial aid, new student orientation, undergraduate admissions, and university scholarship functions. Phil also serves on the Transfer Advisory Committee (TAC) and accompanied fellow TAC member, Jonathan Loss, in 2017 on visits to UNC System institutions to present and discuss math curricular changes within the NCCCS and related to the CAA.

### **Jo-Ann Cohen**

Jo-Ann Cohen is a professor of mathematics and professor of mathematics education at North Carolina State University. She was designated a member of the Academy of Outstanding Teachers in 1992, was named an Alumni Distinguished Undergraduate Professor in 1995, was the college-level nominee for the Board of Governors' Award for Excellence in Teaching in 2000 and was the recipient of the Equity for Women Award in 2011. She co-directed the mathematics graduate programs from 1993-1995, and, along with Virginia Knight of Meredith College, created and co-directed Math Week at Meredith, a residential mathematics summer camp for young women, from 1993 to 2008.

Jo-Ann was appointed as associate dean for academic affairs in the College of Physical and Mathematical Sciences at NC State in 2001 and served for 15 1/2 years in that position. During her tenure she worked with colleagues across campus to develop the Women in Science and Engineering (WISE) Village. She served on a wide variety of college-level and university-level committees and chaired or co-chaired a number of university committees including the Council of Associate Deans, the WISE Administrative Council, the Academic Affairs Assessment Planning Team, the Summer Sessions Task Force, the Undergraduate Student Success Task Force (one of nine strategic planning task forces), and two task forces charged with the development and implementation of a structure for the Division of Academic and Student Affairs. From 2012 to 2015, she worked with colleagues across campus to ensure a smooth transition for NC State's newest college, the College of Sciences.

### **Elizabeth Creath**

Elizabeth Creath is a lecturer and the college algebra coordinator in the Mathematics and Statistics Department at UNCW. She teaches lower division mathematics courses and mathematics education courses. Elizabeth prepares and mentors graduate students to teach college algebra. Most recently, Elizabeth has led an initiative to adopt adaptive learning and assessment technology in several lower division courses.

### **Till Dohse**

Lothar (Till) Dohse immigrated from Germany to the US as a child. He lived in New Orleans, where he went to school until he completed his BS in math from The University of New Orleans. In 1976, Dohse moved to NC to pursue graduate work in biomathematics at NCSU and completed his degree in 1982. For the next three years, Dr. Dohse worked as a post-doc Fellow at University of Laval, and later in industry at IBM.

Since 1985, Dr. Dohse has been employed as a professor at UNCA. At Asheville he has taught not only mathematics, but he has also taught in the arts, the humanities, and statistics programs. Dr. Dohse has had two "episodes" serving as department chair. In his spare time, he serves the city and does advocacy work to help keep traffic safe and pedestrian / bike friendly.

### **Alina Duca**

Alina Duca is a teaching associate professor of mathematics at North Carolina State University, Raleigh. A former public high school mathematics teacher from Romania, she earned her doctorate in mathematics from University of Manitoba, Canada and has been at NC State University since 2008. Her early research was in non-commutative algebra, but for the past 10+ years she has focused on the teaching and learning of mathematics. She collaborates with colleagues in the College of Engineering to improve the mathematical education of the engineering students and has also worked and is currently collaborating on projects focusing on the mathematical education of pre-service and in-service K-12 teachers. Alina Duca has been the director of the Undergraduate Programs in Mathematics at NC State University since 2013.

### **Peter Eley**

Dr. Peter Eley is professor and interim chair of the Health, Physical and Secondary Education Department at Fayetteville State University. He is responsible for a full range of leadership, research, coaching, training, and consulting activities. Dr. Eley holds a Bachelor of Science in Mathematics from Elizabeth City State University, a master's degree in Applied Mathematics, Mathematics Education and a Ph.D. in Mathematics Education from North Carolina State University. Dr. Eley has received multiple awards and accolades over the years including Middle Grades, Secondary, and Specialized Subjects Professor of the Year and Fayetteville State University's College of Education Professor of the Year. The Wynton H. Hadley Teaching Award honoree and was selected as a Senior Research Fellow at the Massachusetts Institute for College and Career Readiness (MICCR), MassInc's Gateway Cities Innovation Institute (GCII), and the Rennie Center for Education Research & Policy at Boston & Harvard University. He recently served as Faculty Administrative Fellow at Fayetteville State University and Academic Affairs Faculty Fellow for the University of North Carolina System Office.

### **Katie Floyd**

Katie Floyd, M.A., is an adjunct instructor in the Mathematics and Computer Science Department at UNC Pembroke specializing in developmental math. Prior to taking her current position at UNCP, Floyd worked as a secondary mathematics teacher for Robeson County, teaching grades 9-12.

### **Eric Fotheringham**

Eric Fotheringham serves as the Director of Strategic Academic Initiatives in Academic Affairs for the UNC System Office. In this role, he serves as the project director for a number of adult learning initiatives and grant-funded projects focused on expanding student success in innovative ways, including a recently-awarded grant from the Lumina Foundation that will, in partnership with the North Carolina Community College System, expand data analysis efforts around degree completion, develop a statewide platform for adult learners, and coordinate the development of prior learning assessment programs for both systems. Additionally, he works on research, evaluation, and assessment of strategic initiatives throughout the division and coordinating efforts with the system's 17 constituent institutions. Prior to this current role, his work in the System Office focused on policy analysis, survey research, and compliance reporting. Eric has extensive experience in the public and nonprofit sectors working with immigrant and refugee communities throughout the United States, particularly Latinos in the South. He received his PhD in Public Administration from NC State University, an MPA in Public Administration from the University of Georgia, and a BA in English from Brigham Young University.

### **Richard Gamble**

Richard Gamble is a senior academic advisor at Western Carolina University in the Advising Center. He previously worked on the Student Affairs side for 6.5 years specifically in Residence Life. Richard is a two-time WCU graduate and in his current role is also responsible for coordinating WCU's Finish Line program, managing academic standing policies and procedures, and works with academic learning communities. In addition to this, Richard advises Mathematics and Computer Science majors, seeing firsthand the need and importance for creating multiple Math Pathways for students.

### **Taylor Gibson**

Taylor has a BS in biomedical engineering from the Georgia Institute of Technology and a M.Ed. in mathematics education from the University of Georgia. He has worked in several public and independent schools in Atlanta, Dallas, and now calls Durham home. This past year Taylor earned his National Board certification. His professional interests include standards-based grading and student-centered instruction. Taylor also serves as an editor for the Technology Tips articles in the National Council of Teachers of Mathematics Journal, *Mathematics Teacher*.

Taylor has taught in the NCSSM Mathematics Department since 2013, where he's taught pre-calculus and calculus courses. He has developed and taught a summer course in cryptography, which will be taught next year in the NCSSM Residential program as an interdisciplinary course in mathematics and computer science. His work with the Summer Bridge program has helped incoming juniors prepare for their transition to NCSSM.

### **Mark Ginn**

Dr. Mark Ginn has been vice provost for undergraduate education since July of 2017. He is responsible for providing the vision and leadership that develops and implements undergraduate programming. In addition to overseeing the undergraduate curriculum and General Education, he also is responsible for many areas of student support in Academic Affairs including Advising, Orientation, the Student Learning Center, and the Office of Student Success.

Dr. Ginn received his bachelor's and master's degrees in mathematics from Wake Forest University and his doctorate in mathematics from Emory University.

Ginn came to Appalachian in 1998 as an assistant professor of mathematical sciences. He was tenured and promoted to associate professor in 2004, became assistant chair of the department of mathematical sciences in 2005, served as chair from 2006 until 2017 and was promoted to professor in 2008. He has served on numerous university committees and task forces over the years including three years (08-09, 09-10, 15-16) as chair of the Council of Chairs. He participated in the Appalachian State Leadership Development program in 2007.

### **Linda Green**

Linda Green graduated from the University of Chicago with a B.S. and M.S. in mathematics and from Princeton University with a Ph.D. in mathematics. After doing research in 3-dimensional topology, she worked in industry developing mathematical models of breast cancer. She joined the faculty of UNC Chapel Hill in 2013. Since then, she has taught every class in the Precalculus-Calculus sequence and recorded over 200 instructional videos. Dr. Green was a 2018 recipient of the UNC Math Department's Teaching Award.

### **Susan Hanby**

Susan Hanby, MA, is an instructor/lecturer in the Mathematics and Computer Science Department at UNC Pembroke. Hanby formerly worked as a 6-12 grade math curriculum facilitator for Scotland County and as a high school math teacher. Hanby has also taught developmental math as an adjunct mathematics instructor for Sandhills Community College.

### **Johannes Hattingh**

Dr. Johannes Hattingh is professor and chair at East Carolina University. His research area is in graph theory, and he has published in areas such as graph coloring, domination, and Ramsey Theory. As department chair, he has been very proactive in bringing innovation to math curriculum by leading efforts to redesign college algebra using an emporium model at ECU. He is also the director of the North Carolina Early Mathematics Placement Test, an initiative of the UNC System.

### **Ellen Hilgoe**

Ellen Hilgoe, a native of Long Island, New York, received her undergraduate degree in secondary mathematics education from Longwood University, VA, and her graduate degree in mathematics education from East Carolina University (ECU). She taught high school mathematics in Pitt County, NC,

and then mathematics and mathematics education courses at ECU for many years. Ellen is currently the associate director of the NC Early Mathematics Placement Testing Program and has been at the helm of this early intervention service for the past twenty-four years. A recent recipient of the prestigious NCCTM Innovator Award, Ellen and her staff provide high school students statewide with a reality check of their readiness for college-level mathematics and foster valuable communication among K-16 mathematics educators.

### **Tracey Howell**

Dr. Howell joined the Department of Mathematics and Statistics in 1998. She currently serves as the director of the Math Help Center and Math Emporium Lab and is also the coordinator for licensure in secondary mathematics. She teaches undergraduate mathematics courses at all introductory levels in a variety of formats and teaches undergraduate seminars for students working to become secondary mathematics teachers. Additionally, she serves as the academic advisor to all students in their first year in the Department of Mathematics and Statistics.

Dr. Howell's research focuses on instructional practices that support students' mathematical argumentation, instruction in highly impacted schools, and teacher learning of students' mathematical thinking. Also, she is interested in undergraduate mathematics learning and the use of technology in mathematics education. In particular, she is interested in exploring how the development of mathematical ways of thinking about doing mathematics and teaching mathematics supports the learning of mathematical concepts in undergraduate students.

### **Frank Ingram**

Ingram, a native of Ayden, North Carolina, graduated from North Carolina Agricultural & Technical State University with a degree in mathematics. He earned his master's and doctoral degrees in mathematics from North Carolina State University. Prior to his 2008 arrival at WSSU, Dr. Ingram was a member of the faculty at Youngstown State University where he was a fellow in Project NEXt, a program of the Mathematical Association of America for new Ph.D.'s dedicated to improving the teaching and learning of undergraduate mathematics. His primary research area is symmetric functions.

### **Kenneth L. Jones**

Dr. Jones is the chair, professor of mathematics, and graduate coordinator for the MS Program in Mathematics at Elizabeth City State University. He earned his BS in chemistry and mathematics, with a minor in physics, from Campbell University. Before pursuing a Ph.D., he earned several post-graduate degrees: an MA in science education (with a concentration in physics) from Campbell University; an MA in electrical and computer engineering from North Carolina State University; and an MBA in computer information systems from Strayer University. Dr. Jones earned his Ph.D. in mathematics (specializing in applied mathematics and statistics) from American University. His research interests include modeling and simulations, robotics, traveling wave solutions, digital communication, and the use of technology and the history of mathematics in the learning and teaching of mathematics.

### **Mohammad Kazemi**

Dr. Kazemi is a professor and associate chair of the Mathematics department at UNC Charlotte. His research interests are partial differential equations and mathematical physics. Dr. Kazemi served as a co-chair of the UNC System Math Pathways Task Force in 2018.

### **Jonathan Loss**

Jonathan Loss is the mathematics department head at Catawba Valley Community College, where he has been employed for over 13 years. He received his bachelor's degree in mathematics from Montreat College and his master's degree in mathematics from Appalachian State University. Additionally, he has just begun his pursuit of a doctoral degree in adult and community college education at North Carolina State University.

In 2012, Jonathan was appointed to the steering committee for the North Carolina Community College System (NCCCS) Mathematics Curriculum Improvement Project (MCIP). As a member of this committee, he helped redesign the mathematics curriculum taught in the NCCCS. Major outcomes from the MCIP included the reduction in NCCCS gateway math course offerings, the creation of a new quantitative literacy course, the formation of system-level student learning outcomes for each math course in the NCCCS Common Course Library, and the streamlining of the NCCCS curriculum to help students more effectively and efficiently transfer to the University of North Carolina System.

In 2014, Jonathan was appointed to serve on the joint NCCCS and UNC Transfer Advisory Committee (TAC), whose members are charged with oversight of the Comprehensive Articulation Agreement between the two systems. As part of this TAC service, during the Spring 2017 semester, Jonathan and fellow committee member Phil Cauley (Western Carolina University) visited each UNC constituent institution to detail the changes in the NCCCS mathematics curriculum and to answer any questions that the institutions might have concerning the process.

### **Katie Mawhinney**

Katie Mawhinney is a professor of mathematics at Appalachian State University. She is currently in her fifteenth year at Appalachian, teaching graduate and undergraduate students, as well as working in K-12 teacher professional development. Also, she is designing and implementing the first co-requisite, algebra support course for calculus students at Appalachian.

### **Rinav Mehta**

Rinav Mehta is the mathematics division director at Central Piedmont Community College where he has been employed for over 11 years. He received his bachelor's degree in civil engineering from Kansas State University, his master's degree in civil-environmental engineering from North Carolina State University, and has completed several graduate hours in mathematics from the University of North Carolina-Charlotte. Rinav has served on the steering committee for the North Carolina Community College System's Mathematics Curriculum Improvement Project which led to the redesign of several community college mathematics courses. He has also been involved in several state initiatives including the piloting co-requisite courses and the development of Reinforced Instruction of Student Excellence (RISE). Prior to entering the education profession, Rinav was a professional engineer for 7 years and served as a Peace Corps volunteer addressing sanitation and water issues for 2 years.



### **Valentin Milanov**

Dr. Milanov is an associate professor in the Department of Mathematics and Computer Science at Fayetteville State University. He joined the department in August 2005.

Dr. Milanov completed his Ph.D. from the Department of Mathematics at Michigan Technological University under the supervision of Renfang Jiang in 2005. He received his undergraduate degree in mathematics at Sofia University, Bulgaria, 2000.

### **Radoslav Nickolov**

Dr. Nickolov is a professor of mathematics and department chair in the Department of Mathematics & Computer Science at Fayetteville State University. He earned his Ph.D. in mathematical sciences from Michigan Technological University in 2004 and joined FSU as assistant professor. Dr. Nickolov's research interests are in the areas of applied and computational statistics, statistical genetics, bioinformatics, data science, and teaching undergraduate statistics.

### **Trina Palmer**

Dr. Katrina (Trina) Palmer is a professor in the Mathematical Science Department at Appalachian State University. Most recently her professional service has focused around transfer students. She contributed to the Transfer Task Force, which recommended opening the Transfer Service Office to help transfer students before, during, and after the transfer process. In addition to presenting at NCMATYC (North Carolina Mathematical Association of Two-Year Colleges) for the past 7 years, she has also organized four workshops for NC Community College faculty. She received her BS in Mathematics from Roanoke College, her MA from Appalachian State University, and her Ph.D. from Emory University.

### **Thomas Redd**

Dr. Thomas Redd is an Associate Professor in the Mathematics Department at North Carolina A&T State University. He currently serves as associate chair of the department of mathematics, and co-director for the university's Quality Enhancement Plan.

Dr. Redd received his BS in pure mathematics from Fort Valley State University and an MS in exploration geophysics from the University of Oklahoma. Dr. Redd went on to study at Brown University, where he earned an MS and a Ph.D. in applied mathematics. He completed his postdoctoral training at Louisiana State University in the Center for Computation and Technology. His research interests include geophysical fluid dynamics, ergodicity and mixing, dynamical systems, and morphology.

### **Shun Robertson**

Dr. Shun Robertson serves as a state policy expert for the Strategy and Policy Division at the UNC System Office, researching key higher education issues to advance the system's strategic goals.

Prior to joining UNC, Robertson was a program director at MDC and Jobs for the Future, providing senior-level policy and research support to education and community-based projects. She also served as a policy analyst for the South Carolina Technical College System (SCTCS). In her role with SCTCS, Robertson provided ongoing analysis of education and economic trends affecting community colleges. She also has several years of experience working in admissions offices at colleges in Georgia and South Carolina.

Dr. Robertson received her Bachelor of Science in business administration and doctorate in educational administration from the University of South Carolina; and her Master of Business Administration from Augusta State University. She earned a certificate in nonprofit administration from Duke University.

### **Viji Sathy**

Viji Sathy is an award-winning teaching professor in the Department of Psychology and Neuroscience at UNC Chapel Hill, teaching the very classes she credits for charting her own professional career in quantitative psychology: statistics and research methods. Sathy is also the program evaluator of the Chancellor's Science Scholars, an adaptation of the Meyerhoff Scholarship at the University of Maryland Baltimore County, which has successfully increased representation of underrepresented students in STEM PhDs. She is engaged in numerous activities on campus using data-driven techniques to promote student success. She speaks around the country about flipped classrooms and, along with Dr. Kelly Hogan, about inclusive classrooms. She was born in India but grew up in a small town in NC and is a proud recipient of public education (K-Ph.D.) in NC.

### **Dipendra Sengupta**

Dr. Dipendra C. Sengupta is a professor of mathematics & computer science at ECSU and has been teaching mathematics for more than 35 years. He has been a NASA Administrator Fellow and devoted his time in research on chaos in communication systems at NASA at Lewis Center and North Carolina State University. He had three funded research grants from NASA. He is a reviewer of the NSF Graduate Fellowship Program for last four years. He also received the University of North Carolina's Board of Governor's award for Excellence in Teaching in 2005. At ECSU, he has developed a Mathematics Laboratory to teach mathematics using technology through grants from the NSF and the US Department of Education. He has spent 2011, 2012, 2013, and 2015 summer as an ONR Faculty research fellow working on analyzing genome sequences using information entropy. He has directed 15 master theses and 33 undergraduate honors projects

### **John Smail**

John Smail provides university leadership to develop and implement the student success initiatives with a particular focus on first year programs and at-risk students at the University of North Carolina at Charlotte. He led the two-year planning process to develop the Prospect for Success quality enhancement plan and now oversees the program's implementation. He also teaches in the Prospect curriculum, offering a Prospect 'Big Questions' LBST course for students in the College of Liberal Arts and Sciences and University College. Dr. Smail is a professor of history, and he specializes in British and European history in the period from 1500-1800. He joined the UNCC in 1988 and went on to chair the Department of History for nine years before assuming his present position.

### **Michelle Solér**

Michelle Solér is the research and development lead for competency-based education for the UNC System Office. Her work helps to clear the path for institutions across the University's 17 institutions as faculty and staff consider, design, and implement competency-based degree programs, certificates, and other credentials. Solér provides assessment strategies, business modeling assistance, communication and program development support, and curricular redesign strategies toward the successful launch and implementation of campus programs investigating student mastery of learning objectives at a

personalized pace. She assists staff and faculty across the system in support of online and alternative learning pedagogies. Solér earned a BA in Journalism from the University of North Carolina at Chapel Hill, an MBA from Wake Forest University School of Business, and a Ph.D. in education, cultural studies from the School of Education at the University of North Carolina at Greensboro. She is a past fellow in the Institute for Emerging Leadership in Online Learning co-sponsored by Penn State World Campus and the Online Learning Consortium, and also a past fellow from the Educational Policy Program, Institute for Educational Leadership in Raleigh, NC and Washington DC.

### **Guoqing Tang**

Dr. Guoqing Tang is a professor and chair of the Mathematics Department at North Carolina A&T State University. Dr. Tang received his BS from Anhui University and his MS from Nanjing University of Science and Technology. He completed his Ph.D. in mathematics at Rutgers University, and his research interests include differential geometric optimal control and mathematical modeling.

### **Dan Teague**

Daniel J. Teague is an instructor of mathematics at the North Carolina School of Science and Mathematics (NCSSM). He completed a Ph.D. in mathematics education at North Carolina State University under the direction of Lee Stiff. Dan has been at NCSSM since 1982.

Dan Teague has served as a member of the Mathematical Sciences Academic Advisory Committee at the College Board and was a member of the College Board's Study Group on Advanced Placement Statistics, a committee that developed the curriculum for the AP Statistics program. He served on the AP Statistics Test Development Committee during its first four years in existence. Additionally, Dan served on the NRC's Committee on Programs for Advanced Study of Math and Science in American High Schools and two terms on the US National Commission on Mathematics Education. He has served on the Board of Governors of the Mathematical Association of America as governor-at-large for high school teachers and as the 2nd vice-president of the MAA. He is currently a director-at-large on the NCTM Board of Directors.

In 2007, Dan Teague was selected as the first NCSSM faculty member to receive the Board of Governors Award for Excellence in Teaching. He was also presented with the 2013 W. W. Rankin Memorial Award for Excellence in Mathematics Education by the NC Council of Teachers of Mathematics. Dan's special interest is in mathematical modeling and he has served as the lead author of the high school section of the Guidelines and Assessment in Mathematical Modeling Education (GAIMME) report. In 2017 Dan was honored by the Consortium on Mathematics and Its Applications with the Doug Faires Lifetime Achievement Award.

### **Matthew TenHuisen**

Matthew TenHuisen is associate director of the Center for Teaching Excellence and Center for Faculty Leadership and associate professor of mathematics at the University of North Carolina Wilmington. A recipient of the General College Advisor of the Year and the Discere Aude Award for student mentoring, professor TenHuisen balances his work in faculty development with teaching undergraduate and graduate mathematics courses. In addition, Dr. TenHuisen served the university as chair of the Department of Mathematics and Statistics from 2007 through 2015. While department chair, Dr. TenHuisen guided the department's development of a statistics program and represented the

department's interests in major facility renovations. Dr. TenHuisen has published extensively in mathematical optimization and, more recently, has begun publishing in faculty development and leadership. Currently, Dr. TenHuisen is working with leaders at Cape Fear Community College to plan a summer 2018 Academic Chairs Summit so that department chairs from UNCW and CFCC can share approaches and strategies for general education.

### **Richard Townsend**

Dr. Townsend received both his BS and MS from the University of Tennessee. Townsend's BS is in health and physical education and his MS is in mathematics education with a concentration in remedial mathematics. He completed his Ed.D. in Higher Education and Administration from North Carolina State University. Dr. Townsend has been teaching gateway math courses at NC Central since 1983. He is also the chair of the NC Central General Education Council

### **Dong Wang**

Dr. Dong Wang earned his Ph.D. in applied mathematics at Wayne State University in 2005. Currently, he is an associate professor in the Department of Mathematics and Computer Science at Fayetteville State University. His research interests include optimal control, optimization, variational analysis, and nonsmooth analysis.

### **Coral Wayland**

Dr. Coral Wayland is an associate dean in the Office of Undergraduate Education at UNC Charlotte. She specializes in medical anthropology and the scholarship of teaching and learning. She has worked in Brazil and Charlotte. Her early research looked at the politics of medicinal plant use in the urban Amazon. It also explored contested understandings of primary health care in Brazil. Her more recent research explores team-based learning in large undergraduate classes. One research project examines the ways that gender and race shape the peer evaluation process. Another documents the effectiveness of team-based learning for different groups of students.

### **Tracy Foote White**

Tracy Foote White is a native of Winston Salem, NC. She is in her third year as an assistant professor of mathematics at Winston Salem State University. She is not new to WSSU as it is where she earned her Bachelor of Science in mathematics with secondary teacher certification. Further, it is where she received her first undergraduate teaching experience. Upon completing her Master of Education at Wake Forest University, she taught for eight years as an adjunct instructor in the mathematics department at WSSU. Tracy also taught high school for 11 years before beginning the mathematics education doctoral program at North Carolina State University. She earned her Ph.D. in May 2016. Tracy has a range of experience teaching both mathematics and mathematics education courses and has done so in both formal and informal learning environments. Her research interests include, but are not limited to, implementing student-centered approaches in undergraduate mathematics courses, the retention of STEM majors, and equity.

### **Cathy Whitlock**

Cathy Whitlock has been teaching introductory math and statistics at UNC Asheville since 1995. She has also teaches a First Year Seminar on Honeybees and leads a team of students who keep the campus hives.

### **Dan Yasaki**

Dr. Yasaki has an MA (2000) and Ph.D. (2005) from Duke University under the supervision of L. Saper. After a three-year post-doc at the University of Massachusetts working with P. Gunnells, he has been part of the UNCG faculty since 2008. He currently serves the department of mathematics and statistics as associate head. His research interests are in the area of modular forms, particularly the connection between explicit reduction theory of quadratic forms and the computation of Hecke data for automorphic forms. Recent work has focused on producing new examples of cusp forms over number fields of small degree.

### **Heather Ortiz**

Heather leads technical assistance initiatives that support state- and institutional-level work for Dana Center Mathematics Pathways, a transformative redesign to modernize entry-level college mathematics programs through working with states, systems, universities, and colleges. Through communication, tools, and resources, she builds collaborative partnerships to plan, implement, and scale mathematics pathways to normative practice.

As dean of academic affairs at Ranger College, Heather led diverse institutional initiatives related to academic and support programs, including developmental education, academic advising, the NMP, student retention through early alert reporting, learning frameworks, and college-preparation coursework with partner high schools. At the American Clearinghouse on Educational Facilities, she facilitated learning events on behalf of nationwide experts related to training K–12 educational leaders on topics pertaining to educational facilities (i.e., construction, renovation, maintenance, safety, sustainability).

### **Paula Talley**

Paula Talley provides leadership and oversight of the professional learning tools, products, and services for the Dana Center Mathematics Pathways, a transformative redesign to modernize entry-level college mathematics programs through working with states, systems, universities, and colleges. In this role, she develops tools and services that support local leaders and works with external organizations to coordinate and mobilize math pathways efforts. Paula also leads a team of experienced facilitators who serve as a field presence in the work of the Center to foster collaboration among various stakeholders at the state, system, region, and institution levels. Before joining the Dana Center Paula served Temple College (Texas) for 20 years, as a mathematics professor, lead of the developmental mathematics department, and division director of student success. In the latter role, she directed a college division that included developmental education, adult education and literacy, English as a second language, tutoring services, and the TRIO program. Paula led the redesign of developmental education using the DCMP principles that increased student success. As a mathematics professor, she taught various mathematics courses, including DCMP's Foundations of Mathematical Reasoning, Statistical Reasoning, and Frameworks for Mathematics and Collegiate Learning.

## **Carl Krueger**

Carl has an extensive background in education policy, with a focus on increasing postsecondary opportunities for all students. He currently serves as senior policy analyst for the Higher Education Services team, providing in-depth technical assistance, resource development, and policy analysis to states seeking to increase student success and social mobility through the creation and implementation of mathematics pathways aligned with career goals and workforce needs. Carl facilitates state policy efforts, writes policy briefs and summary reports, and creates project tools, all of which support aligned programs of study, enhanced student support services, and coordinated state and institutional policy change.

Prior to joining the Dana Center, Carl was a project coordinator and policy analyst for the Western Interstate Commission for Higher Education (WICHE). He worked closely with several Western states, helping them implement and manage efforts to increase the number of low-income students participating and succeeding in higher education. Additionally, Carl tracked legislation and prepared policy briefs through oversight and maintenance of WICHE's State Higher Education Policy Database. Before that, Carl was a policy analyst for the Education Commission of the States, working with select state policymakers across the country on their design and delivery of education. He published policy briefs on issues such as P-16, governance, teaching quality, and college access and completion. Carl also served as research director for Colorado Media Matters, a web-based information center that analyzed media coverage of political and public policy issues.



# THE UNIVERSITY OF NORTH CAROLINA SYSTEM

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## MATH PATHWAYS TASK FORCE

### Math Pathways Implementation Grants

Successful completion of gateway math courses is essential to student progress toward a degree since pass/fail rates in these courses can be predictors of retention. Nationally, more than one million students take College Algebra annually, and research shows that nearly half of students enrolled in College Algebra either withdraw or receive a grade of D or F. Further, minority and low-income students fail to complete this course at higher rates than their white and higher income peers. Students who succeed in entry-level English and math courses are much more likely to successfully complete a degree than those who do not.<sup>1</sup>

With funding from the John M. Belk Endowment, the UNC System Office has launched a Math Pathways Implementation project. The Math Pathways project will create clearer and more deliberate paths to graduation for students who encounter difficulty in general education math requirements. We define math pathways as a course or a sequence of courses that students take to meet the requirements of their programs of study. The concept of math pathways applies to college-ready and underprepared students.

The UNC System Office Divisions of Academic Affairs and Strategy and Policy will make competitive grants to UNC System institutions to implement and evaluate initiatives that are designed to improve math pathways. Like the Student Success Innovation Lab design, there will be a demonstrated commitment to rigorous, third-party evaluation that can produce high-quality evidence of the effectiveness and cost-effectiveness of the particular math pathways implementation plan. Responses can originate from a single campus or collaborations between multiple North Carolina institutions and community colleges.

Over the past year, the UNC System Math Pathways Task Force developed recommendations and processes that support the efforts of each UNC System institution to implement and scale mathematics pathways that yield increased student success and learning in gateway mathematics and statistics courses. The recommendations are categorized into eight focus areas:

1. Design of math pathways to support various degree clusters
2. Student support for those enrolled in gateway math courses
3. Curriculum, pedagogy, and faculty engagement
4. Advising
5. Placement
6. Strengthening partnerships between educational institutions (K-14)
7. Transfer
8. Data and assessment

The main goals of this RFP are to enable UNC institutions to *implement new, or scale, existing math pathways programs related to these eight focus areas and evaluate the results*. These grants are also

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<sup>1</sup> <https://completecollege.org/wp-content/uploads/2017/12/Bruce-Vandal-Slides-1.pdf>

designed to inform institutional and System-level efforts to improve retention and graduation rates to achieve the goals outlined in the UNC System Strategic Plan (<http://northcarolina.edu/strategic-planning>).

Institutions that wish to receive math pathways funding to implement an initiative will be required to partner with a third-party evaluator to conduct a rigorous study of the intervention. Evaluators for math pathways projects will be drawn from a group of UNC System faculty and staff that have been selected on the basis of their expertise and experience in program evaluation. The System Office will facilitate a matching process that pairs evaluators with institutional implementation teams on the basis of common interests and compatibility. Note that evaluators will not be from the same institution as the math pathways initiative being implemented.

## GRANT TYPES AND PROCESS

The proposal will fund the implementation of the Math Pathways recommendations in the eight focus areas. The proposal should at a minimum address at least one of the recommendations and fall under one of the following categories:

- *Development and Efficacy*: Grants may fund development and implementation of a new math pathways program solution that address at least one recommendation and should rigorously test its effect on student outcomes.
- *Replication and Scale*: Grants may enable institutions to implement an existing intervention with promising evidence at greater scale, with a different group of students, and/or at a different site(s), and evaluate the results of that expansion.

The evaluation of each funded proposal will be directed from the UNC System Office. External evaluation will ensure consistency and quality of evaluation across all of the funded programs.

Applicants will be eligible to receive grants ranging from \$50,000 to \$100,000 to be distributed in April 2019, to be used during academic year 2019-2020. Grant amounts across funded projects may vary. Inter-institutional collaborations are encouraged but not required. Strong consideration will be given to proposals developed in collaboration with local community colleges.

## AREAS OF FOCUS

Math Pathways implementation grants will fund the Math Pathways recommendations identified in the “Math Pathways Recommendations January 2019” document. Please refer to this document as well as your campuses’ Math Pathways Task Force Member(s) for more information.

## SUBMITTING A PROPOSAL

- **Deadline for RFP submission: 7:00 PM on March 15, 2019.**
- **Length:** Proposal narrative not to exceed 7 double-spaced pages, excluding required budget spreadsheet, logic model, evaluation plan, and any references (references are optional). Narrative must be in 12-point font, with page numbers, and in PDF format.
- **Submission process:** Upload your full proposal to [https://northcarolina.co1.qualtrics.com/jfe/form/SV\\_af04WiS2VoUs4QZ](https://northcarolina.co1.qualtrics.com/jfe/form/SV_af04WiS2VoUs4QZ). Proposals should be submitted by an institution’s math department chair.
- **What to expect:** Proposals will be reviewed and scored according to the rubric provided below.



## GUIDELINES FOR THE PROPOSAL

Each institution may submit only **one proposal in response to this request**.

The proposal narrative should be no more than 7 double-spaced pages (12 point font and include page numbers), excluding required budget spreadsheet, logic model, evaluation plan, and any references (references are optional), **submitted online (see link above)**. The narrative should address the following:

- **Problem Statement:** Establish a clear and compelling problem statement that explains the recommendation the institution seeks to address and how the proposed project aligns with your institution's overall student success strategy and Performance Agreement goals.
- **Project Description:** Provide a clear description of the proposed recommendation(s) that will be implemented using this funding and the specific population(s) on which the project will focus. The project should address one of the Math Pathways recommendations. Projects may span more than one area.
- **Evidence Base:** Describe available evidence that shows this strategy can improve student success among target student populations and how this project will make a genuine contribution to student success research and literature.
- **Impact:** Identify the student outcomes that the project aspires to affect, and describe the proposed impact that the proposed initiative will have on those outcomes.
- **Budget:** Include a brief budget narrative relating the requested amount to the proposed project activities. Institutions are expected to demonstrate a 25% match, cash or in kind, in proposal budgets. Waived indirect costs cannot be counted as part of the match. Indirect costs are limited to 10% of allowable costs.
- **Sustainability:** Provide a clear description of how the proposed intervention will be sustained outside of the funding years.
- **Timeline:** Provide a timeline that is aligned with the proposed budget.
- **Principal Investigator & Key Personnel:** Include information on the faculty and staff members that will lead the effort.

*Additional Attachments (not included in the 7-page limit)*

- **Logic Model:** Complete the logic model template provided. **Submit in PDF format.**
- **Evaluation Plan:** Complete the evaluation plan template provided. **Submit in PDF format.**
- **Budget:** Complete the budget template provided. Be sure to read the instructions tab before completing the budget. **Submit in Excel format.**
- **Letters of Support:** Provide letters of support from the Provost Office and other collaborative partners, (i.e. Advising, Institutional Research, etc.). **Submit in PDF format.**
- **References:** Any additional references, including supporting tables or figures, can also be submitted but are optional. **Submit in PDF format.**

The attached rubric details how proposals will be evaluated.

\*\*\*Incomplete or late proposals will not be reviewed\*\*\*

## INQUIRIES

Questions regarding the Math Pathways implementation grants should be addressed to Dr. Michelle Solér, Director, Competency-Based Education and Assessment [mlsoler@northcarolina.edu](mailto:mlsoler@northcarolina.edu) or Dr. Shun Robertson, Assistant Vice President for Policy and Analysis, [srobertson@northcarolina.edu](mailto:srobertson@northcarolina.edu).

### Math Pathways Implementation Grants Rubric

| CATEGORY  | HIGH RATING<br>(2 points)   | AVERAGE RATING<br>(1 point)  | LOW RATING<br>(0 points)  | Weight |
|---|---|--|---|--------|
| <b>Project Description</b>                      | The proposal provides a clear and compelling description of the problem the initiative is trying to solve, how the project will improve student outcomes and for which groups of students, and the timeline for implementation. | The proposal provides a partial description of the problem the initiative is trying to solve, how the project will improve student outcomes and for which groups of students, and the timeline for implementation. | The project description lacks important details.  | 2.5    |
| <b>Budget</b>                                   | The budget is complete and contains all required information. Budget is cost effective and linked to activities and outcomes.   | The budget is complete but is not cost efficient and/or related to activities and outcomes.  | The budget lacks required information or includes unallowable expenditures.                         | 2.5    |
| <b>Evidence Base</b>                            | The proposed initiative incorporates a strategy that is promising and based on rigorous evidence.   | The proposed initiative incorporates a strategy that may be promising, but is backed by only limited rigorous evidence.  | The proposed initiative lacks rigorous evidence.  | 5      |
| <b>Potential Impact (Students)</b>              | The proposed initiative should have a positive impact on the outcomes of the target group(s) and a meaningful impact on the institution's overall student success rates.  | The proposed initiative should have a positive impact on the outcomes of the target group(s), but will have limited impact on overall rates of student success.  | It is not clear from the proposal what impact the initiative will have on student success outcomes. | 7.5    |
| <b>Potential Impact (Research Contribution)</b> | The proposed initiative represents a significant opportunity to contribute to student success research.   | The proposed initiative will contribute some new information to student success research.  | The proposed initiative's contribution to student success research will be limited.                 | 5      |
| <b>Collaboration</b>                            | The proposal includes a well-defined plan that identifies appropriate collaborative partners, each of which adds value to the initiative.   | The proposal shows some indication of appropriate collaborative partners.  | A critical partner is missing from the project plan.  | 2.5    |
| <b>Sustainability</b>                           | The proposal includes a well-defined plan for sustainability and identifies appropriate funding and/or partners to continue the initiative.   | The proposal shows some planning for sustainability but it is not well-defined or unclear.   | The proposal shows no planning for sustainability or the plan presented is not feasible.            | 5      |
| <b>Potential for Evaluation</b>                 | The proposed initiative will allow for a rigorous experimental or quasi-experimental study of effectiveness.  | The proposed initiative may allow for rigorous study of effectiveness, but the design included in the proposal lacks important details.  | Is it unclear whether the proposed initiative will allow for a rigorous study of effectiveness.     | 5      |



*Southern Association of Colleges and Schools  
Commission on Colleges  
1866 Southern Lane  
Decatur, Georgia 30033-4097*

## **TRANSFER OF ACADEMIC CREDIT**

### **A Position Statement**

The Southern Association of Colleges and Schools Commission on Colleges (SACSCOC), the regional accrediting body for the eleven southeastern states, recognizes that issues surrounding transfer of academic credit continue to generate debate nationally. The debate touches on questions of accountability, access, and equity in the higher education community. The Commission encourages its member institutions to review their transfer policies and procedures with a view toward making transfer of credit easier for students while continuing to honor their obligation to maintain academic quality and integrity. Institutions participating in self-regulatory, nongovernmental accreditation are responsible to the public for establishing transfer processes that address both views.

Transfer of academic credit is a public policy issue for several reasons: (1) an increase in student mobility, (2) the proliferation of distance learning programs and common acceptance of their legitimacy, (3) the economics of expending public money twice for the same course, and (4) consumer protection from expending private money twice for the same course.

SACSCOC supports institutional autonomy in determining its own standards for transfer of academic credit while also encouraging institutions not to impose artificial impediments or meaningless requirements on the transfer process. Many systems and institutions have taken positive action such as negotiating articulation agreements, common course listings, common core curricular, and automatic acceptance of credit arrangements to facilitate the transfer of academic credit. These kinds of proactive approaches, involving qualified faculty in the decisions, ease the way toward resolving transfer of credit problems while maintaining curricular coherence and academic and institutional integrity.

The accreditation standards of SACSCOC require member institutions to analyze credit accepted for transfer in terms of level, content, quality, comparability, and degree program relevance. The accreditation standards do not mandate that institutions accept transfer credit only from regionally accredited institutions. When an institution relies on another institution's regional accreditation as an indicator for acceptability of credit, it should not be the only criterion used for acceptability nor should it be represented as a requirement of this accreditation agency, which it is not.

Maintaining academic quality and integrity remains the primary responsibility of each institution accredited by SACSCOC. This position paper should not be interpreted as supporting any idea that would undermine that responsibility or as impinging on the institution's right to establish and enforce its own policies. At the same time, SACSCOC encourages member institutions to consider ways in which they might ease the acceptance of transfer of academic credit while maintaining an acceptable level of academic quality reflecting their unique missions.

*Approved: Commission on Colleges, June 2003  
Reformatted, September 2016*