# NINERways: The Path to Math Success

## University of North Carolina at Charlotte

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## Introduction

Established in 1946, the University of North Carolina at Charlotte is located in the largest city in the state. As North Carolina's urban research university, UNC Charlotte is a diverse and inclusive institution with local-to-global impact that transforms lives, communities, and industries through access and affordability, exemplary undergraduate, graduate, and professional programs, scholarship, creative work, innovation, and service

In Fall 2022, the total enrollment at the University of North Carolina at Charlotte was 29,551 students. The total undergraduate enrollment was 23,461 students, of which 4,157 were new freshmen. Underrepresented minority students including American Indian or Alaska Native, Black or African American, Native Hawaiian/Other Pacific Islander, Hispanic and Two or more Races accounted for 35.4 % (8,308) and non-underrepresented minority students including Asian, Non-Resident Alien, Unknown, and White accounted for 64.6% (15,153). Within the new freshmen class in Fall 2022, underrepresented minority students accounted for 36.5% (1,516) and non-underrepresented minority students accounted for 63.5% (2,641) which is similar to the percentage in the total undergraduate population.

## Executive Summary

The purpose of the Quality Enhancement Plan (QEP), also known as NINERways, at the University of North Carolina at Charlotte (UNC Charlotte) is to improve upon student success in the quantitative reasoning requirement of the institution's general education program. This will be achieved by designing math courses that successfully transition and prepare students for their major and enhancing the mathematics classroom learning environment, work also known as math pathways. Such efforts should lead to a decrease in annual DFW (students earning D's, F's and withdrawing from courses) rates for all students, a reduction on the variation of DFW rates between sections of the same courses, a reduction of equity gaps in DFW rates between student populations, and an increase in the four-year graduation rate.

This QEP topic was identified through UNC Charlotte's institution-wide planning and evaluation process. In 2014, the institution began its Graduation Initiative which focused on reducing the various barriers undergraduate students encounter that prevent them from being successful and graduating. While the initiative has increased the graduation rates to their highest levels in the past 15 years, there is a strong commitment by the University to achieve an even higher rate. The commitment is reflected in the University's 2021-2031 strategic plan, Shaping What's Next, where an area of focus is to increase student equity in on-time graduation by identifying and addressing gaps and barriers to success.

NINERways is built on three pillars: Pillar 1 - Math Pathways Structure and Alignment; Pillar 2 - Course Curricula Coordination; and Pillar 3 – Evidence-based Pedagogies and Classroom Practices. Each of the pillars is based on best practices identified in mathematics education research literature. The first pillar identifies gateway mathematics courses that reflect students' programs of study, are necessary for students to progress to their major, and contain content students need to be successful in other courses. The second pillar uses faculty teaching teams to provide consistency in multi-section courses taught by multiple faculty members for the students. Finally, the third pillar provides professional development for faculty members to identify and implement various evidenced-based pedagogies and classroom practices.

Implementation of NINERways will begin in Fall 2023 with the rollout of the three math pathways - A2C (Algebra to Calculus), STATways, and QUANTways. In the math and statistics courses, faculty will utilize common calendars and grading policies for courses and regular meetings of the instructional teams to improve course coordination. In the classroom, faculty will utilize the evidence-based pedagogies and classroom practices identified. Data will be collected during each semester for instructional teams to analyze and use to make decisions on how the changes are impacting student learning.

The implementation of the QEP will be assessed using student success metrics. This process includes (a) collecting and analyzing DFW rates for all gateway mathematics and statistics courses, (b) collecting and analyzing DFW rates for all sections of gateway courses, (c) collecting, disaggregating, and analyzing DFW rates for gateway mathematics and statistics courses by ethnicity/race, enrollment status, and socio-economic status, and (d) analyzing 4-year graduation rates.

The logic model below provides an overview of the NINERways design and expected outcomes.

**Logic Model for NINERways: The Path to Math Success**

UNC Charlotte is a diverse and inclusive institution that transforms lives through exemplary bachelor's programs. Successful completion of mathematics and statistics courses has been identified as a challenge for students further pursuing or extending time to a degree. The NINERways project will provide students with an intentionally designed set of courses that align with a student's interests and career paths.

| Input or Resources | Activities | Outputs | Short-Term Outcomes | Long-Term Outcome |
|---|---|---|---|---|
| People<br>-QEP Director<br>-Faculty<br>-Instructional Designer<br>-Faculty Course Coordinators<br>-Graduate Assistant<br>- Undergraduate Peer Mentors<br>- Advisors<br><br>Fiscal Resources<br><br>Time | Professional Development for faculty<br><br>Summer Course Development/Redesign<br><br>Advisor training and information sessions<br><br>Implementation of new or revised courses<br><br>Bi-weekly Instructional Team Meetings | Number of Trained Faculty<br><br>3 Math Pathways<br>- A2C Pathway<br>MATH 1101, College Algebra with Workshop<br>MATH 1103, Precalculus<br>Mathematics for Science and Engineering<br>MATH 1120, Calculus<br>MATH 1241, Calculus I<br>- STATways<br>STAT 1222, Introduction to Statistics<br>STAT 1322, Introduction to Statistics II<br>- QUANTways<br>MATH 1102, Introduction to Mathematical Thinking<br><br>Enrollment numbers<br><br>Math Pathways guide for advising<br><br>Course Implementation Guide<br><br>Adaptive learning courseware | Decrease DFW rates in courses<br><br>Decrease variation in grade distribution between course sections<br><br>Decrease equity gaps in courses' DFW rates | Increase graduation rate for FTIC students beginning with Fall 2023 Cohort. |

# Topic Identification Process

## Institutional Alignment

The identification of the QEP topic for the University of North Carolina at Charlotte (UNC Charlotte) was directly related to the institutional planning and evaluation process. Starting in 2014, UNC Charlotte began its Graduation Initiative which is a multi-step effort designed to clarify degree requirements, reduce barriers to student progression, and aid in students' ability to successfully navigate their curriculum. The four purposes of the Graduation Initiative are to guide students into the right major, avoid late attrition from majors, monitor student progress toward timely degree completion, and mitigate barriers to student persistence and graduation. Over the past several years, these efforts have resulted in considerable increases in four-year graduation rates from 37.2% (2013 cohort of entering freshmen) to 49.8% (2017 cohort of entering freshmen) and a six-year graduation rate of 54.1% (2011 cohort of entering freshmen) to 65.6% (2015 cohort of entering freshmen). These are the highest graduation rates the University has achieved within the past 15 years. However, room for improvement remains.

Student success is a critical component of the University's role as an institution of higher education. The selection of its QEP topic coincided with the development and completion of the University's 2021-2031 strategic plan, Shaping What's Next. An area of focus in the 2021-2031 strategic plan is to increase student equity in on-time graduation by identifying and addressing gaps and barriers to success. It is reflected in the strategic theme of transforming students' lives through educational opportunity and excellence. Specifically, there are two actions related to this theme:

> **Action A1.1.1** - Embed strategies for student attainment of core competencies articulated as goals for UNC Charlotte graduates (critical thinking, communication, quantitative reasoning, data analysis, and intercultural understanding) into the undergraduate general education curriculum, all majors and co-curricular activities; measure the impact of realization of these competencies on educational attainment, engagement with complex issues and lifelong success.
>
> **Action A2.1.1** - Identify and address equity gaps and barriers in programs and courses, and employ continuous improvement strategies to rectify performance gaps.

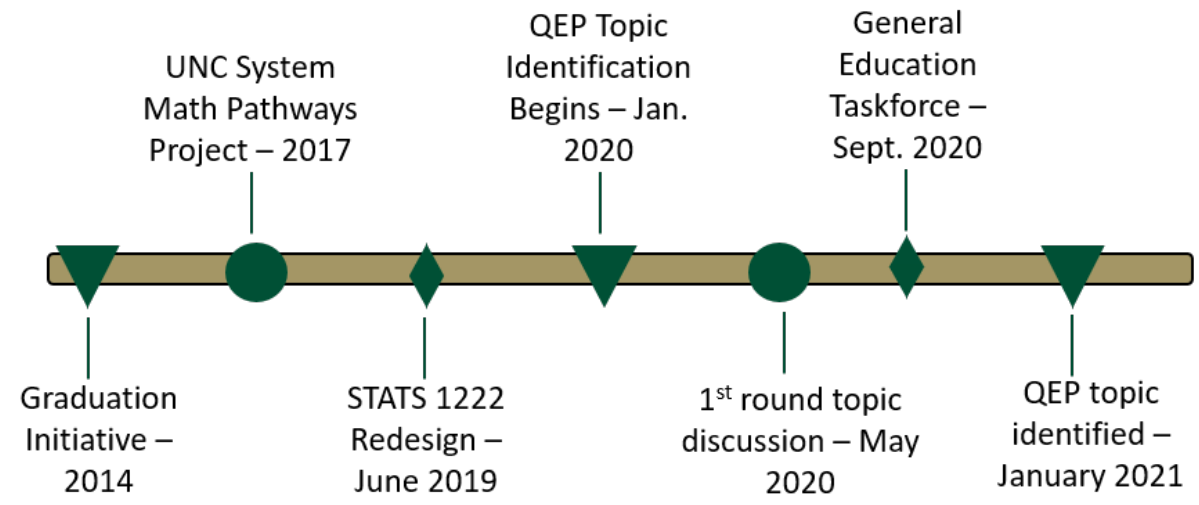
## Selection Methodology

Based on addressing gaps and barriers to success, a list of possible topics was generated within the Office of the Provost. Among the topics explored were removing financial barriers, incorporating high impact practices, developing math pathways, and redesigning the general education curriculum. Historical data were collected from a variety of sources including data gathered by institutional research, units with specific data connected to a topic, and student responses to national surveys. A description and rationale for each of the topics along with the accompanying data were developed to contribute to the discussion and selection of a topic. Narrowing of the topic was accomplished through analysis of the data collected, examination of the scope of each topic, and the projected level of support each topic could garner across the institution. Campus constituents involved in deliberating the topics included the Provost and Vice Chancellor for Academic Affairs, Senior Associate Provost, Associate Provost for

Undergraduate Education/Dean of University College, Assistant Provost of Institutional Effectiveness and Analytics, and the Director of Assessment. The topic was narrowed to math pathways and general education redesign and the Chair of the Department of Mathematics and Statistics and the Chair of the University College Faculty Council were consulted since they oversee each of the areas relevant to each of the respective topics.

**Figure 1**

*Timeline for the QEP topic selection.*




There were two related events that provided added support to the math pathways topic. As previously indicated, UNC Charlotte participated in the University of North Carolina System's Math Pathways Project. The project was a collaborative effort between the 17 University of North Carolina System (UNC System) member institutions and the Charles A. Dana Center at the University of Texas at Austin. The purpose of the project was to examine the various issues that may impede student success in mathematics courses and thus student success in obtaining a college degree. Utilizing the Dana Center Mathematics Pathways Model as a guide, the UNC System developed a set of recommendations based on the results of this collaborative project. The faculty at UNC Charlotte selected STAT 1222, Introduction to Statistics, for revision as a pilot project. The process of revising STAT 1222 merits discussion because it serves as a model for creating an aligned pathway.

In Summer 2019, the Office of Undergraduate Education and the Center for Teaching and Learning held a retreat for STAT faculty and social science faculty who taught major courses with a STAT 1222 pre-requisite (Appendix A). The discussion between the STAT and social science faculty brought to light a misalignment of content. The social science faculty explained that they needed students to understand what type of statistical analysis they could use to answer questions, what type of data they would need, how to interpret the results of analysis, and how to present these results to an outside audience. However, the STAT faculty communicated that students arrived in their classes without this knowledge, and faculty spent the first five weeks of class reteaching basic statistics. As a result of this conversation, STAT 1222 was completely redesigned to focus on applied and conceptual statistics rather than theoretical concepts and hand calculations. The STAT and social science faculty also agreed that instead of rushing through

content (which the social science faculty said students forgot), it would be better to remove the last two weeks of content which focused on regression so that the course could move at a slower pace.

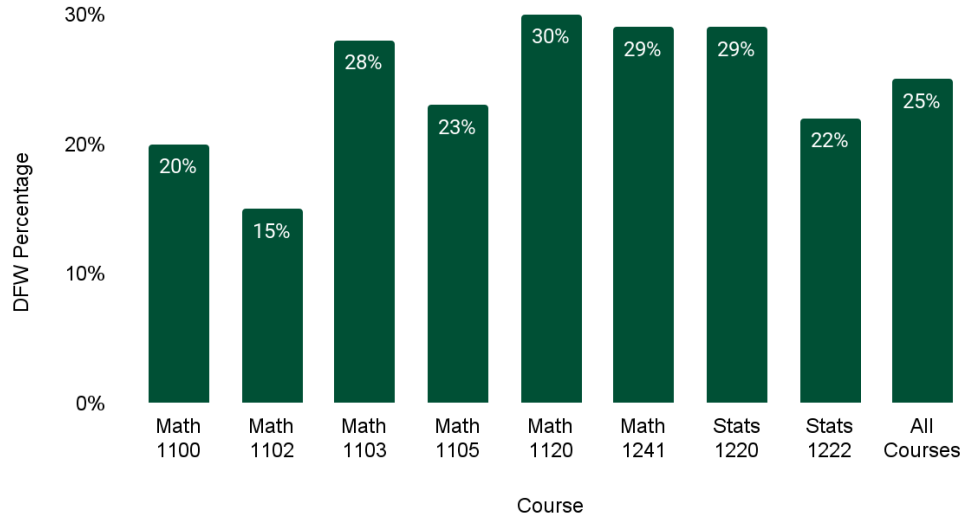
A team of STAT faculty spent the summer and fall of 2019 redesigning STAT 1222. They built adaptive courseware using the platform Realizeit. This adaptive courseware allowed the use of a flipped classroom model, where time in class is spent practicing statistics using active and collaborative learning, and non-class time is spent taking notes, watching videos, or reading passages. The adaptive courseware also provides individualized remediation which is specific to a student's need. A pilot of the redesigned course was initiated in Spring 2020; however, due to the COVID-19 pandemic, the course had to be modified for online delivery thus disrupting the designed implementation. In Fall 2021, the designed implementation was utilized resulting in a DFW rate of 18.2% (4 sections) compared to 22.4% in courses that used the previous curricular design (10 sections). In Summer 2022, the STAT faculty began work on STAT 1322, Introduction to Statistics II. STAT 1322 will focus on regression, which was removed from STAT 1222. STAT 1322 will use the same adaptive platform and flipped classroom format that is used in STAT 1222.

The general education redesign was in a different place compared to the math pathways project. This project was initiated with the formation of a Parameters Working Group in Fall 2020 and thus was beginning its formal development. A General Education Taskforce had been formed and would begin working in Spring 2021 with the charge of developing a purposeful, impactful general education curriculum. The proposed timeline for completing the work was the Fall semester of 2023 which coincided with the start of the QEP.

While each of the above topics explored had the potential to impact student success, the math pathways topic was selected as UNC Charlotte's QEP because it would be based on a model upon which a larger project could be built, and the following institutional data in Figures 2-5 would support our rationale (Full data in appendix B):

**Figure 2**

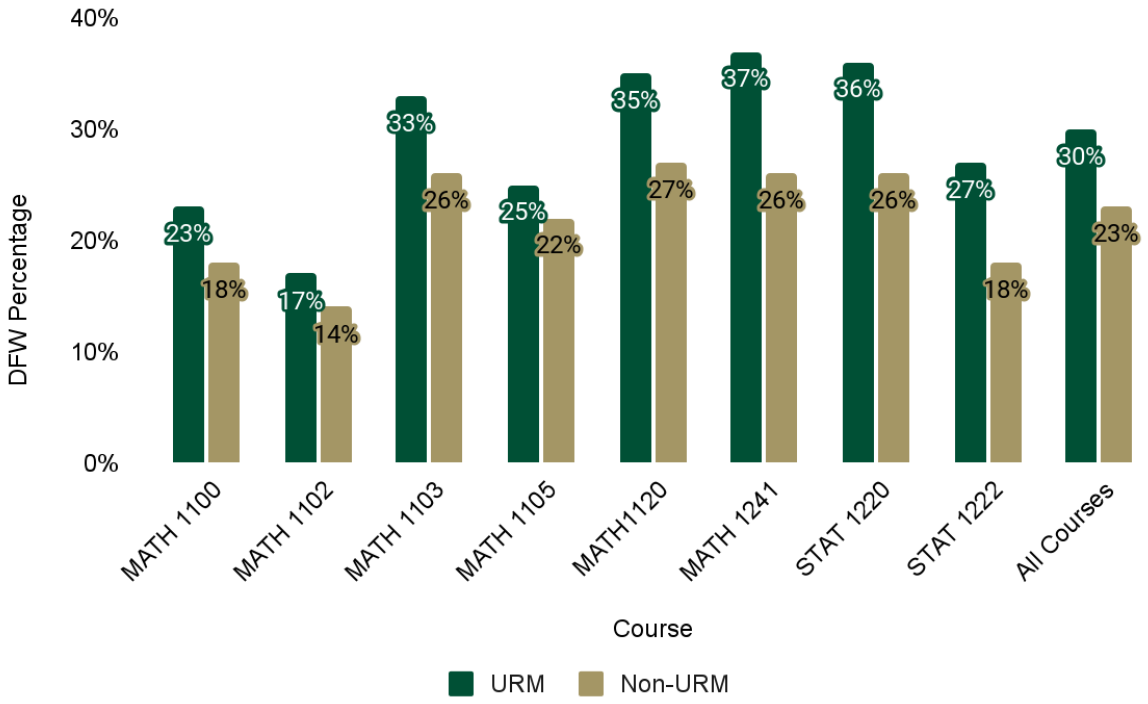
*Average Course DFW Rates from 2015 to 2018*




*Note.* DFW rates for individual courses (Math 1100 (College Algebra), Math 1102 (Introduction to Mathematical Thinking), Math 1103 (Pre-Calculus), Math 1105 (Finite Mathematics), Math 1120 (Calculus), Math 1240 (Calculus I), Stat 1220 (Elements of Statistics I), Stats 1222 (Introduction to Statistics) and all courses combined from fall 2015 to spring 2018.

**Figure 3**

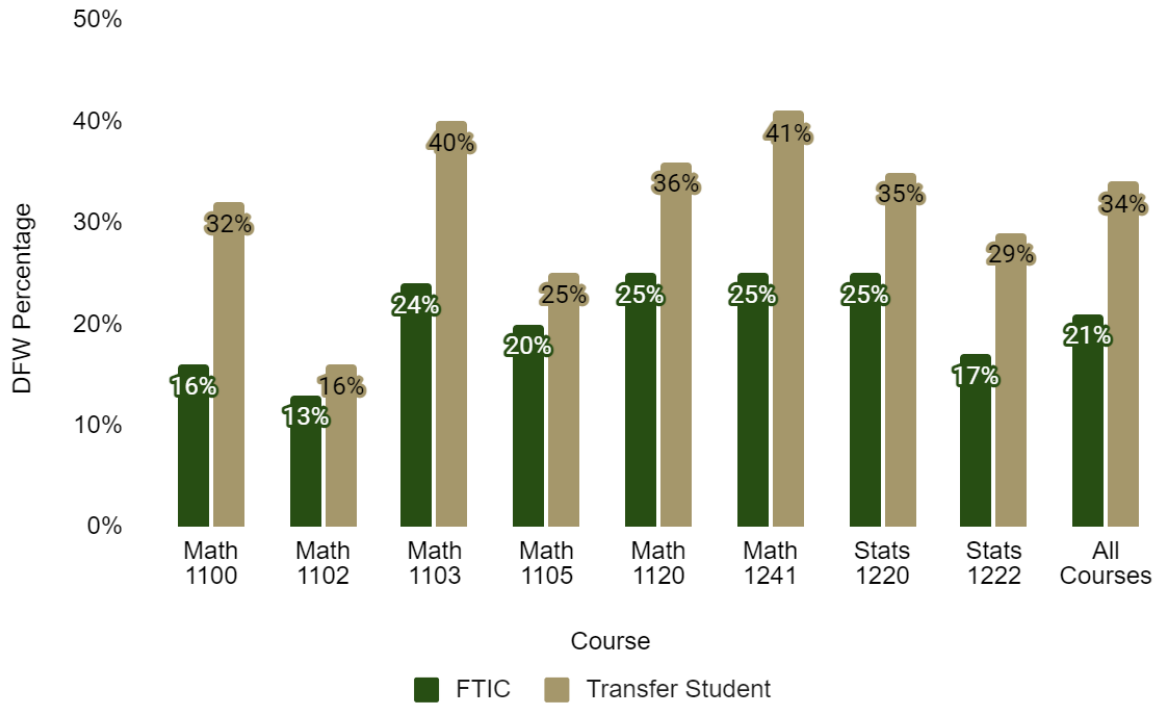
*Course DFW Rates of Underrepresented Minority Student Groups vs Non-underrepresented Minority Student Groups from 2015-2018.*




*Note.* Underrepresented minority (URM) student groups include American Indian or Alaska Native, Black or African American, Native Hawaiian/Other Pacific Islander, Hispanic and Two or more Races. Non-underrepresented minority (Non-URM) student groups include Asian, Non-Resident Alien, Unknown, and White.

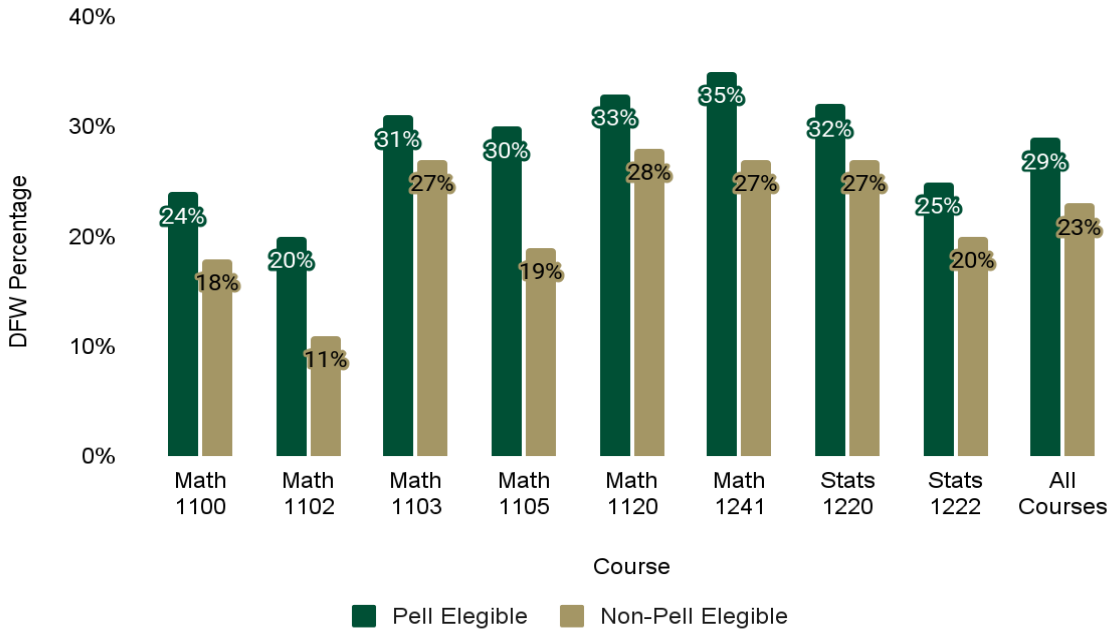
**Figure 4**

*Course DFW Rates for FTIC Students vs New Transfer Students from 2015-2018.*




*Note.* First time in college (FTIC) students are students who are enrolled in their first semester of college after high school graduation, regardless of the amount of college credit they have earned while in high school (Advanced Placement, College-Level Examination Program, International Baccalaureate credits, etc.) and/or the number of years between graduating high school and enrolling in college. Transfer students are students who have completed coursework at a college or university after graduating from high school, but before enrolling at UNC Charlotte.

**Figure 5**
*Course DFW Rates for Pell Eligible Students vs. Non-Pell Eligible Students from 2015-2018.*




*Note.* Pell eligibility is utilized as an indicator of socio-economic status.

As indicated in Figures 2-5, mathematics remains a challenge for many students, preventing them from further pursuing a particular degree or extending the time to a degree (Douglas & Salzman, 2020; Logue, 2016; National Research Council, 2013). The University's data suggests challenges experienced by the undergraduate student body as a whole and differences in success within segments of the population. While it is not uncommon for some students to be unsuccessful in a course, the institution recognizes that DFW rates at a quarter to over a third of a courses' enrollment are not acceptable. Therefore, the University has chosen to focus its attention for the QEP on student success by reducing the DFW percentages in mathematics and statistics courses. The University has devised a plan that involves curricular and pedagogical changes to increase student success in mathematics and statistics courses for the student body as a whole, as well as URM and Pell-eligible students.

## Broad-based Support

The alignment of the QEP to the University's strategic plan provided a base for strong institutional support for its success. This project aligns with the institution's commitment to transform students' lives through educational opportunity and excellence. The strategic planning committee, which consisted of faculty, staff, and student representatives (Appendix C) from across the institution, received input from nearly 6,000 members of the institution on multiple occasions via participation in discovery sessions, focus groups, and surveys. The strategic planning committee used the information gathered through these activities in building the four

strategic themes. Embedding strategies to provide students with core competencies including quantitative reasoning was one of the identified actions within the "Transform Student's Lives Through Educational Opportunities and Excellence" theme. A second action within the theme calls for the institution to identify and address equity gaps and barriers in programs and courses, and employ continuous improvement strategies to rectify performance gaps.

The selection of the math pathways as the topic for the institution's QEP places a significant amount of emphasis on the general education curriculum, specifically on the Department of Mathematics and Statistics. Identifying the appropriate individuals who were positioned within the institution to lead the development and implementation of the QEP was critical to building broad-based support. Therefore, the Senior Associate Dean in the Office of Undergraduate Education and the Undergraduate Coordinator in the Department of Mathematics and Statistics were selected as the Co-Chairs of the QEP Leadership Team. Each of these individuals is critical to the successful implementation of this project due to the nature of their work across the campus and within the Department of Mathematics and Statistics. The other members of the QEP Leadership Team (Appendix D) include the Executive Director of the Center for Teaching and Learning, the Director of Personalized and Adaptive Learning in the Center for Teaching and Learning, the Director of Assessment in the Office of Assessment and Accreditation, and the Director of Math Pathways in the Office of Undergraduate Education.

To ensure that campus stakeholders were well-informed about and would support the development and implementation of the QEP, the Office of Undergraduate Education hosted a series of town halls with them in Fall 2021. The purpose of these town halls was to share information about the QEP topic development process, introduce the idea of math pathways as UNC Charlotte's QEP, and solicit feedback for improvement. All town halls were held virtually via Zoom. The following meetings were held:

1. Colleges/departments: Town hall meetings were held with departments and colleges that either required MATH/STAT courses for the major or that had required courses for the major with MATH/STAT prerequisites. These meetings were held with groups of majors in colleges that had similar MATH/STAT requirements. For example, representatives from all of the majors in the Belk College of Business attended the same town hall because they all require students to complete MATH 1120 and STAT 1220. Meetings were held with the Belk College of Business; the William States Lee College of Engineering; the School of Architecture; the College of Health and Human Services; the departments of Physics and Optical Science, Biological Sciences, Chemistry, and Geography and Earth Sciences (STEM departments in the College of Liberal Arts and Sciences). Sixty-one faculty representatives attended these meetings and were asked to share the information with colleagues in their respective departments.

2. The Department of Mathematics and Statistics: Two town halls were held and all faculty in the department (including part-time faculty) were invited to attend. The department chair, Dr. Taufiquar Khan, and QEP co-chair, Dr. Kim Harris, presented about the QEP and solicited feedback from faculty. The 44 faculty in attendance were supportive of the goals and work involved with the QEP.

3. Campus faculty and staff: Faculty and staff across campus attended one of two open town halls where they could learn about the upcoming QEP and provide feedback. These meetings were attended by 55 faculty and staff members from across campus.

The success of NINERways is dependent on the broad-based support that was established through the town hall meetings. While the bulk of the work is situated within the Department of Mathematics and Statistics, the groundwork has involved and will continue to involve support from units across campus. The MATH/STAT faculty have collaborated with faculty in partner disciplines to determine what mathematics and statistical knowledge and skills their students need. Partner disciplines are the departments with majors that are aligned with one of the three pathways. In Fall 2021 academic support offices across campus were identified as key partners to ensuring the successful implementation of NINERways.

In Spring 2022, participants were identified from units from across campus and asked to participate in a campus-wide implementation team (Appendix E). This implementation team met monthly during the Fall 2022 semester. The team is composed of representatives from units in the academic affairs division who serve as points of contact between their respective units and the QEP leadership. As such, they provide feedback and guidance about proposed changes, share information about unit specific challenges and responsibilities, and also funnel relevant QEP information back to their units. These monthly meetings are expected to continue for at least the first three years of the QEP's implementation.

In Spring 2023, the institution enacted a communication plan (Appendix F) to promote NINERways to campus constituents including students, faculty, staff, administration, and Board of Trustees members began as we prepare for full implementation in Fall 2024. The director for the math pathways was hired in January 2023 to promote the NINERways project. This includes five town hall meetings were held providing information targeted to specific groups such as advisors, students, and faculty. In addition, the director has made presentations to various stakeholder groups and received feedback on the implementation of the project.

Current students begin registration for Fall 2023 courses in early April and advisors will begin discussing with them the three pathways developed as part of NINERways. Those students who have not completed the six required mathematics and logical reasoning credits in the general education program will be introduced to the pathway that aligns with their chosen major. UNC Charlotte requires all incoming students to participate in the Student Orientation and Academic Resources (SOAR) program. Materials introducing new students to NINERways will be constructed and integrated into SOAR programming for students enrolling in UNC Charlotte in Fall 2023.

## Design and Implementation

Graduates need a basic level of quantitative literacy in order to be informed and engaged global citizens (Charles A. Dana Center at The University of Texas at Austin n.d., 2020; GAISE College Report ASA Revision Committee, 2005; GAISE College Report ASA Revisions Committee, 2016; National Research Council, 2013; Saxe and Braddy, 2015). As such, students must have access to an excellent mathematical/statistical education in their gateway courses that

prepare them to succeed in their future professional and personal endeavors. The general education program at UNC Charlotte includes a requirement of six credit hours of quantitative reasoning courses. However, the data shows that high percentages of students are not successful in these courses and that some of the courses may not be preparing students appropriately for courses in their major.

Gateway courses have three characteristics: 1) they are foundational courses; 2) they are high-risk, and 3) they have high enrollments (Koch, 2017). Foundational courses are generally non-credit-bearing developmental education courses or college credit-bearing lower-division courses which are prerequisites for other courses. High-risk refers to courses identified by the high rates of D, F, and W grades earned across sections of the courses. High-enrollment courses are those identified by the number of students enrolled within and/or across courses sections.

UNC Charlotte's QEP will focus on gateway math courses because nationwide they are often a barrier to degree completion for students in higher education (Saxe and Braddy, 2015; U.S. Department of Education, 2017). At times, students cannot pass the mathematics/statistics (MATH/STAT) courses that are required for general education, delaying or preventing their graduation. College algebra, traditionally the default math class for many students, is a powerful example of this. College algebra has been referred to as the course with the highest failure rate in community colleges across the country, with approximately 50% of students earning a D, F or W (Saxe and Braddy, 2015; Ganga and Mazzariello, 2018). Small (n.d.) notes, "Thus, College Algebra blocks the academic opportunities and plans of approximately 200,000 students per semester." In other instances, while students can pass lower level MATH/STAT courses, they struggle to pass upper level gateway courses required for entry into their chosen major. This forces students to either repeat the course or switch majors (or sometimes both). Success in college math classes is a predictor of success in subsequent courses and retention, especially for STEM majors (Apkarian et al., 2021; Budny et. al., 1998; Callahan & Belcheir, 2017). This risk of failing a gateway MATH/STAT class is disproportionately higher among lower income, first generation and underrepresented minority students (Dana Center, n.d.; Koch, 2017).

High failure rates in gateway MATH/STAT courses are attributed to incorrect placement, ineffective developmental math courses, and curricular issues (Dana Center, n.d.). UNC Charlotte is already addressing two of these issues. In Summer 2022, UNC Charlotte overhauled its placement protocol and began using Assessment and Learning in Knowledge Spaces Preparation, Placement, and Learning (ALEKS PPL), in addition to SAT and ACT scores, to place students into appropriate MATH courses. In Fall 2022, the University eliminated its one credit developmental math course, MATH 0900 (Math Study Skills and Algebra Review). In its place, a four-credit version of college algebra that allows all students to take a gateway math course that satisfies a general education requirement, while also providing co-requisite with targeted support for students who need it. This leaves the third major factor that contributes to high failure rates - curricular issues - for the University to address in its QEP.

Addressing the University's gateway MATH/STAT failure rates involves curricular revisions which include course redesign and alignment, as well as the adoption of new pedagogies and classroom practices. This curricular and pedagogical revision rests on three pillars: Pillar 1 - Math Pathways Structure and Alignment; Pillar 2 - Course Curricula Coordination; and Pillar 3 –

Evidence-based Pedagogies and Classroom Practices. Each of these pillars is discussed in detail below. These pillars emerged from the recommendations of the UNC System Office Math Pathways report (University of North Carolina System, 2019). They were then shared with faculty in the Department of Mathematics and Statistics at UNC Charlotte during the summer of 2022 for their feedback.

The gateway courses included in the QEP are:

MATH 1101: College Algebra
MATH 1102: Introduction to Mathematical Thinking
MATH 1103: Precalculus Mathematics for Science and Engineering
MATH 1120: Calculus
MATH 1241: Calculus 1
STAT 1222: Introduction to Statistics
STAT 1322: Introduction to Statistics 2

All of the courses, with the exception of STAT 1322, have been regularly offered at UNC Charlotte. The mathematics department is repurposing an existing course number MATH 1102, for what will be a new quantitative literacy course. This course has been developed for students selecting majors that do not have a math requirement providing an alternative course to College Algebra. The new curriculum for this course will be piloted in Spring 2023 and rolled out across all sections in Fall 2023. STAT 1322 is a new course that will be offered for the first time in Spring 2023. This course will focus on regression, which was removed from STAT 1222. STAT 1322 will utilize similar active learning and adaptive learning courseware in the flipped classroom format used in STAT 1222. Both of these changes are being made as part of the development of two math pathways (see Pillar 1 below).

**Pillar 1: Math Pathways Structure and Alignment**

A math pathway is one or more MATH/STAT courses that are intentionally designed to align with a student's interests and career paths. This means the mathematical/statistical knowledge and skills that students develop in their MATH/STAT course(s) are ones they will utilize in their major, in their career and as an informed global citizen. Students are more likely to engage with and succeed in courses that are part of a pathway because they make connections with their course of study and intended careers. Research has demonstrated that math pathways result in reductions in DFW rates, improved transfer of learning, and an understanding of the relevance of MATH/STAT for a student's career and personal goals (Dana Center, n.d.; Ganga & Mazzariello, 2018; Rutschow & Diamond, 2015; Saxe & Braddy, 2015; Wang et al., 2022).

The idea of creating math pathways that are aligned with a field of study is not new. The traditional sequence of college math courses that starts with college algebra and leads students through calculus was designed to prepare students to major in STEM fields. The problem with this traditional STEM pathway is that until recently it was often the only pathway for students, regardless of their intended major. At many institutions, students who had no plans on majoring in a STEM field were required to complete college algebra, a course designed to prepare students to succeed in calculus. Some students, who did not need college algebra to succeed in their major, struggled to pass the course, leading to delays in completing their general education math

requirements. At times, it even led students to drop out of college (Ganga & Mazzariello, 2018; Saxe & Braddy, 2015; Small, n.d.).

Recently, there has been a call to create additional pathways for students in non-STEM majors (Dana Center, n.d.; Ganter, 2016; National Research Council, 2013; Saxe & Braddy, 2015; Shaughnessy, 2011). These pathways usually do not include college algebra. Instead, they focus on quantitative literacy, statistical thinking and data analysis. Most major higher education mathematics professional associations (e.g. the American Mathematical Association of Two-Year Colleges (AMATYC), the American Mathematical Society (AMS), the American Statistical Association (ASA), the Mathematical Association of America (MAA), and the Society for Industrial and Applied Mathematics (SIAM)) endorse the pathway approach to delivering a gateway MATH/STAT curriculum (Saxe & Braddy, 2015).

It is important to note that the creation of math pathways is much larger than reforming a single course. Instead, it is about viewing gateway MATH/STAT courses as part of a larger integrated curriculum. This integration happens across sequences of MATH/STAT courses (e.g. STAT 1222 and STAT 1322), as well as across MATH/STAT courses and required coursework in the major (e.g. STAT 1222, STAT 1322 and quantitative methods courses in social science major/disciplines) (Ganter, 2016; Saxe & Braddy, 2015). The creation of new, or alignment of existing, pathways is a collaborative effort between gateway MATH/STAT faculty and faculty in targeted majors/disciplines. This ensures that the content, pedagogies, assessments, etc. in the pathway truly align with the major/discipline. An example of how this will be done is discussed below.

**Structure**

Students at UNC Charlotte are required to complete six credit hours in quantitative reasoning according to the general education requirements. One course is selected from a list of 16 mathematics or statistics courses and a second course is selected from a list of 18 courses in mathematics, statistics, or deductive logic. Depending on the major selected by the student, there may be a specific sequence of courses required or the student is allowed to pick any two courses from the two lists. This current structure is commonly referred to as a cafeteria model, allowing students to select from a group of courses. The QEP will instead provide students with three pathways (A2C, STATways, and QUANTways) that provide students with a specific sequence of courses aligned with the major/discipline selected to provide the quantitative background necessary for success within the major/discipline.

***A2C pathway (algebra to calculus).*** As happens at most institutions, students at UNC Charlotte have been required to follow an algebra to calculus (A2C) sequence for various STEM and business majors. In the QEP, the A2C pathway will remain but only to STEM disciplines and business majors. The traditional STEM pathway consists of MATH 1100: College Algebra, MATH 1103: Precalculus Mathematics for Science and Engineering, and MATH 1241: Calculus 1. Students enter this pathway at different levels depending on their prior coursework or math placement score. This branch serves students majoring in STEM disciplines (e.g. engineering, meteorology, physics and optical science, chemistry). The business pathway consists of MATH 1100: College Algebra and MATH 1120: Calculus. This branch serves majors in the Belk College of Business. Math faculty will work closely with discipline partners in STEM and

business to redesign the curriculum so it more closely aligns with what students need to know in their subsequent coursework. Also, previously, students from all majors enrolled in college algebra. However, as part of the QEP, we will advise non-STEM and non-business majors into STATways or QUANTways.

***STATways***. This pathway will consist of a two-course sequence including STAT 1222: Introduction to Statistics and STAT 1322: Introduction to Statistics 2. This two-course sequence will be a specified pathway designed for students in social science and some health science majors. While STAT 1222 is an existing class, STAT 1322 is a brand-new course developed specifically for this sequence. It will initially be offered in Spring 2023 in preparation for the launch of this pathway in Fall 2023.

***QUANTways.*** The QUANTways pathway is intended for students in a major that does not have a specific MATH/STAT requirement (e.g. English, Philosophy, Dance, Art History). This pathway will consist of MATH 1102: Introduction to Mathematical Thinking followed by a second course of the student's choice. This second course will generally be either STAT 1222: Introduction to Statistics or PHIL 2105: Deductive Logic. Because PHIL 2105 is offered by the Department of Philosophy, it is outside of the scope of the QEP.

While MATH 1102 has been regularly taught, relatively few sections were offered and there was little standardization of the content. Because this course was not required for any major and it was not part of a sequence of courses, instructors had a wide degree of latitude as to what they taught in the course. In Summer 2022, an instructional team, which includes the course coordinator and faculty teaching course, began a redesign of this course with the goal of creating a consistent educational experience across sections that emphasized the importance of quantitative literacy as a career competency in a wide variety of fields. Pilot sections of the redesigned course will be offered in Spring 2023 and a full roll out will occur in Fall 2023.

**Alignment**

The process for revising STAT 1222 will serve as a model for creating alignment within each of the pathways. With facilitation from the Office of Undergraduate Education and the Center for Teaching and Learning, MATH and STAT faculty will meet with major/discipline faculty to discuss course content in both areas, student competencies in the major/discipline, and how to align the two.

**Timeline**

***Pre-QEP: AY 22-23.*** While each of these pathways is at a different point in its development and maturity, the goals for AY 22-23 will remain the same for each course. The goal is to develop initial, aligned versions of the classes in each pathway so we can launch a full roll out in Fall 2023, the first year of the QEP.

**Fall 2022.** Instructional teams spent the fall aligning MATH/STAT courses between sections of the same course (e.g. all sections of college algebra) and within pathways (e.g., alignment within the A2C pathway). They will develop common course learning outcomes and a calendar of topics for each course in the sequence. They will then work to make sure course level outcomes and calendars flow between courses in the same pathway. Final course learning

outcomes and sequences will be approved by the departmental curriculum committee. After approval, they will be used in all sections of a course in Spring 2023.

**Spring 2023.** The instructional team for each course, which is composed of gateway faculty who are teaching the course during that semester, will participate in retreats where they will work with discipline partners to align the course content with intended majors. Gateway faculty will use this feedback to begin/continue aligning the course content during the Summer 2023.

***QEP: AY 23-24 through AY 27-28.*** The three pathways will be implemented in Fall 2023 (the first semester of the QEP). During the next five years of the QEP, gateway faculty will use an iterative design process to continually improve the courses and pathways. Iterative design is an approach that incrementally develops and revises courses using a data driven evaluation process. While iterative design is a process often used to rapidly generate courses and materials, the size and scope of the QEP will require gateway faculty to take a more measured approach, as they are working to transform over 78 sections taught by over 30 instructors. It will take time to transform the culture of teaching in the MATH/STAT department in order to effect institutional change at this scale.

**Figure 6**

*Pillar 1: Math Pathways Timeline*

| Tasks | Fall 2022 | Spring 2023 | Summer 2023 | Fall 2023 | Spring 2024 | Summer 2024 | Fall 2024 | Spring 2025 | Summer 2025 | Fall 2025 | Spring 2026 | Summer 2026 | Fall 2026 | Spring 2027 | Summer 2027 | Fall 2027 | Spring 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Common course SLO | | | | | | | | | | | | | | | | | |
| Calendar of topics | | | | | | | | | | | | | | | | | |
| Instructional Team/Partner Discipline Retreats | | | | | | | | | | | | | | | | | |
| Pilot MATH 1102 | | | | | | | | | | | | | | | | | |
| Pilot STAT 1322 | | | | | | | | | | | | | | | | | |
| Course Content Alignment | | | | | | | | | | | | | | | | | |
| Implementation of 3 Math Pathways | | | | | | | | | | | | | | | | | |
| Examine DFW data and make adjustments based on analysis | | | | | | | | | | | | | | | | | |

## Pillar 2: Course Curricula Coordination

The second pillar of the University's QEP is curricular coordination of gateway MATH/STAT courses. At UNC Charlotte, instructors currently have a fair degree of latitude in how to teach gateway MATH and STAT courses. Gateway faculty have the freedom to decide how to cover the topics (a reference to sequencing and pedagogy) and create their own assessments (aside from the common final) and grading policies. Some of these requirements do not exist for MATH 1102; instructors are free to include whatever content they wish and there is no common final. Course coordination for the purposes of the QEP will consist of adopting common course content and classroom practices across all sections of a course, as well as regular meetings of the instructional teams. We envision a version of course coordination that Rasmussen and Ellis

(2015) call "coordinated independence." Coordinated independence allows instructors to maintain a level of autonomy within a larger structured system (Rasmussen and Ellis, 2015). As such, the items that instructional teams develop will likely be a combination of required, recommended and optional items (Adeyemi et al., 2022; Bennoun and Holm, 2020; Williams et al., 2021).

This course coordination process will be facilitated by six course coordinators who will be identified for the following QEP courses: college algebra (MATH 1100 and 1101), MATH 1102, MATH 1103, MATH 1120, MATH 1241 and statistics (STAT 1222 and 1322). These course coordinators are responsible for scheduling and leading regular meetings (twice a month during the fall and spring semesters). Attendance at these meetings is mandatory for all instructors teaching that semester. During these meetings, gateway faculty will review course data, identify areas for improvement, discuss challenges they are encountering, and identify possible solutions, as well as engage in professional development. Course coordinators will also be responsible for sharing course materials and supporting instructors who are teaching the course for the first time. Finally, course coordinators will be responsible for archiving all supporting materials and documentation for future semesters.

There are four significant benefits to course coordination. One is maintaining consistency and quality across multiple sections of a course. Currently, the gateway courses that are part of the QEP are taught by a diverse group of faculty members, which include full-time faculty, part-time faculty, as well as graduate students; each brings a different level of experience and preparation to their classes. Given the large number of instructors who rotate through these courses, coordination is a critical step to maintain consistency across sections and also across time. Coordination also makes it easier for instructors who are new to teaching (e.g. graduate students) and/or new to the course by reducing their "start-up time." Providing new instructors with course structures, content, elements and resources makes it easier for instructors to hit the ground running and teach in alignment with other sections of the same course (Williams et al., 2022; Adeyemi et al., 2022).

In addition to maintaining consistency, course coordination can help to create a community of practice for instructors, in essence working as a faculty learning community (Adeyemi et al., 2022; Bennoun and Holm, 2020; Cox, 2001, Teague and Anfara, 2012, Rasmussen et al., 2021; Rasmussen and Ellis, 2015; Richlin and Cox, 2004, Williams et al., 2021). Coordination will provide the mechanism for gateway faculty to develop a set of shared values and vision for the course. The instructional team meetings will also provide needed support as instructors experiment with and adopt evidence-based pedagogies and classroom structures (see Pillar 3). This community of practice provides a space where instructors can share strategies and materials, problem solve, and support each other as they experiment with new teaching techniques. As such, coordination has the potential to transform teaching from a largely individual endeavor to a collaborative one and one where the gateway faculty are invested in the success of the course, and by extension all students, not just their individual section.

Course coordination will also facilitate the rollout of additional supports and structures that will happen during the process of iterative design. For example, coordinating the calendar of topics and texts that are used in a course makes it easier for external student support units (e.g. tutoring

in the University Center for Academic Excellence) to support larger numbers of students. Instead of offering one or two review sessions before a high stakes exam that are tied to a single section of a course, multiple, large review sessions can be offered that meet the needs of students across all sections of the course. This makes it easier for students to find review sessions that work for their schedule. Active learning classrooms (classrooms with physical layouts that facilitate group work) provide an example of how coordinated courses make structural supports easier to manage. If all sections of a course are capped at the same size (which is currently not the case), then it is possible to request priority access to an appropriately sized active learning classroom for all sections of the course. This ensures that students in all sections have the same access to technology support.

Finally, course coordination is a key strategy for reducing course and section level variation in DFW rates. In an analysis of grade distributions among different instructors, Adeyemi et al. (2022) found that prior to coordinating sections of an introductory statistics course, grade distributions were statistically correlated to instructors for the course. After coordination, however, grade distributions appeared to be statistically independent of the instructor. A number of studies also document improvements in student learning as measured by increased scores on common finals and reductions in DFW rates when using course coordination techniques (Golnabi et al., 2021; Villalobos et al., 2020). This research indicates that when faculty work towards a common educational experience across sections of the same course, this mediates instructor ability and experience, which would reduce section-level variation in DFW rates.

**Timeline**

***Pre-QEP: AY 22-23.*** In AY 22-23, time was spent establishing the foundation for course coordination. During Summer 2022, small groups of faculty members worked together to identify common starting points for course coordination. They decided to create common calendars and grading policies for each QEP course. Instructional teams, led by course coordinators, developed calendars and grading policies in the Fall 2022. These were adopted across all sections of a course in Spring 2023. Instructional teams will also review DFW data in the fall and spring semesters and identify one to three priorities for course coordination that they can work on during the subsequent semester.

***QEP: AY 23-24 through AY 27-28.*** This faculty-driven process of incrementally coordinating elements of each course will continue each Fall and Spring semester during the five years of the QEP. Each semester, each instructional team will:

- Review data from previous semesters (see Assessment Plan for a discussion of these data).
- Identify the next steps in course coordination.
- Work on modifications during the subsequent semester.
- Implement changes in the next two semesters.

This means instructional teams will be implementing new strategies and designing/developing new ones during a given semester.

We are intentionally using a gradual faculty-driven approach to course coordination that relies on consensus, instead of imposing a top-down model of complete coordination at the outset of the QEP. This model of coordination provides the flexibility to adapt to the needs of different courses and pathways. In addition, this approach should also work to cement faculty

buy-in for the work involved in the QEP (Williams et al., 2022). It is anticipated that this gradual rollout of course coordination will lead to more faculty support since all coordination will be decided upon and developed by instructional teams.

**Figure 7**

*Pillar 2: Course Curricula Coordination Timeline*

| Task | Fall 2022 | Spring 2023 | Summer 2023 | Fall 2023 | Spring 2024 | Summer 2024 | Fall 2024 | Spring 2025 | Summer 2025 | Fall 2025 | Spring 2026 | Summer 2026 | Fall 2026 | Spring 2027 | Summer 2027 | Fall 2027 | Spring 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Instructional Team | ■ | ■ | | ■ | ■ | | ■ | ■ | | ■ | ■ | | ■ | ■ | | ■ | ■ |
| Common calendar for courses | ■ | | | | | | | | | | | | | | | | |
| Common grading policy for courses | ■ | | | | | | | | | | | | | | | | |
| Impementation of calendar and grading policy | | ■ | | | | | | | | | | | | | | | |
| Examine DFW data | | | ■ | ■ | ■ | | ■ | ■ | | ■ | ■ | | ■ | ■ | | ■ | ■ |
| Select 1-3 priorities for course coordination improvement | | | ■ | ■ | ■ | | ■ | ■ | | ■ | ■ | | ■ | ■ | | ■ | ■ |
| Implementation of course coordination changes | | | | ■ | ■ | | ■ | ■ | | ■ | ■ | | ■ | ■ | | ■ | ■ |

**Pillar 3: Evidence-Based Pedagogies and Classroom Practices**

Research is clear about the importance of how you teach. This is why Pillar 3 of the University's QEP focuses on the adoption of evidence-based pedagogies and classroom practices. Currently, many of UNC Charlotte's gateway MATH/STAT courses rely heavily on traditional lecture-based pedagogies and classroom structures where students are the passive recipients of expert knowledge.

While gateway faculty will be asked to change how they teach, they will be allowed to decide to some degree with which pedagogies and classroom practices they would like to experiment with and ultimately adopt based on identified positive impact on student learning. This is in line with the coordinated independence model (Rasmussen and Ellis 2015). Gateway faculty must adopt over a period of time practices in each of the categories: (1) active teaching and learning techniques, (2) peer to peer interaction, and (3) equitable and inclusive practices.

***Evidence-based active teaching and learning practices.*** There is a large, and continually growing, body of evidence that conclusively demonstrates student success increases in MATH and STAT courses which utilize active learning techniques (Caleb and Dove, 2018; Code et al. 2014; Collins 2019; Keengwe and Onchwari, 2016; Freeman et al., 2014; Lopez Belmonte et al., 2019; Love et al., 2014; Yang et al., 2021). Students in lecture-based classes have failure rates 55% higher than students in classes that use active teaching and learning strategies (Freeman et al., 2014). In addition, research demonstrates that while all students benefit from active teaching and learning, certain underrepresented minority students disproportionately benefit from this type of instruction (Haak et al., 2011; Handelsman et al., 2022; Tanner, 2013; Theobold et al., 2020). This body of research has led all of the major higher education mathematics professional

associations to emphasize the need to move away from traditional lecture or "sage on the stage" and start actively engaging students in the learning process (Saxe and Braddy, 2015).

Active teaching and learning techniques span a continuum. At one end of the continuum are flipped classrooms where there is little to no lecture and students spend their time actively engaged in learning while in the classroom (Caleb & Dove, 2018; Collins, 2019; Cronhjort et al., 2018; Turra et al., 2019; Lopez Belmonte et al., 2019; Yang et al., 2021). Faculty who utilize a flipped classroom model often use active learning pedagogies like problem-based learning (Lewis & Estis, 2019; Lewis et al., 2021; Lewis & Powel, 2016; Love et al., 2014), team-based learning (Clontz & Lewis, 2019; Lewis et al., 2021; Nanes, 2014; Patterson & Sneddon, 2011; Peters et al., 2019), Process-Oriented Guided Inquiry Learning (Beneteau et al., 2017), and inquiry-based learning (Davis, 2018; Ernst et al., 2017; Laursen & Rasmussen 2019). At the other end of the continuum are classrooms that mainly utilize lecturing but sprinkle in classroom practices like think/pair/share, jigsaw, and muddiest point, which periodically engages students actively in their own learning.

***Peer to Peer Interaction.*** Peer to peer interaction can take different forms and occur in different venues. In some cases, it happens during active learning as students work collaboratively on tasks during class time or form study groups that meet outside of class. These interactions can also occur when undergraduate peer mentors support the learning of students during the class (e.g. undergraduate teaching assistants) or outside of class (e.g. tutoring). Research demonstrates that peer to peer interactions lead to decreases in DFW rates (Baier et al., 2019; Drane et al., 2014; Hooker, 2011; Liou-Mark et al., 2010; Morales et al., 2016; Petrucci & Rivera-Figueroa, 2021; Reinholz, 2015; Reisel et al., 2014; Spivey et al., 2021); increased time on task (Hooker, 2011); increased self-efficacy (Dennehy & Dasgupta, 2017; DeFeo et al., 2022; Morales et al., 2016); and improved mathematical conceptual learning (Hooker, 2011; Srougi & Miller, 2018). These gains are often more pronounced for students with weaker mathematical and statistical skills, though even high performing students benefit from peer to peer collaboration (Drane et al., 2018; Srougi & Miller, 2018; Spivey et al., 2021). As such, gateway faculty will be introduced to existing peer mentoring programs on campus (e.g. tutoring and peer-assisted learning), as well as other classroom strategies that utilize peer to peer learning.

***Inclusive Classroom Practices.*** Inclusive classrooms incorporate practices and structures that lead to environments where all students feel welcome, respected, and included. Some require little time, yet can yield a substantial return, while others can require longer time investment to yield a positive return. These practices include strategically reviewing syllabi to make sure they are clear and reflect a growth mindset (Gin, 2021; Peterson, 2021; Sathy & Hogan, 2022); incorporating short writing assignments (Cohen et al., 2006); sharing the achievements of women and Black, Indigenous, and People of Color (BIPOC) individuals in mathematics (McIntyre et al., 2003); or instructors sharing stories of times they struggled academically (Sathy & Hogan, 2022). Increasing the class structure by explicitly defining tasks and expectations is another practice that creates a more inclusive classroom. (Eddy & Hogan, 2017; Sathy & Hogan, 2022; Tanner, 2013).

Inclusive classroom practices are often associated with reductions in equity gaps. While these practices benefit all students, certain groups of students (underrepresented minority student

groups, low income, first-generation) benefit more than others. This is because these practices reveal the hidden curriculum, foster a sense of belonging, and cultivate a growth mindset (Dewsberry & Brame, 2019; Freeman et al., 2007; Handelsman et al., 2022; Sathy & Hogan, 2022).

**Timeline**

***Pre-QEP: AY 22-23***

**Fall 2022.** Faculty were exposed to a variety of evidence-based pedagogies and classroom practices through a series of workshops and during the instructional team meetings in the fall semester. Some of the workshop topics include using peer mentors, adaptive learning, fostering a growth mindset, creating a sense of belonging, managing collaborative learning in large classes, and teaching with Poll Everywhere. Faculty exposure to inclusive classroom practices also draw on UNC Charlotte's work as part of the Student Experience Project. Each semester, the Office of Undergraduate Education leads workshops for MATH/STAT faculty designed to introduce them to low effort/high reward strategies that add structure, foster a growth mindset and cultivate a sense of belonging in the classroom (https://studentexperienceproject.org/)

Faculty who are teaching a pathways course in the spring will be asked to identify an evidence-based pedagogy and classroom practice from one of the three categories (active teaching and learning techniques, peer to peer interactions, or equitable and inclusive practices) to incorporate into their class in Spring 2023. MATH/STAT faculty will work with the Center for Teaching and Learning, the Office of Academic Diversity and Inclusion, and the Office of Undergraduate Education to prepare for the spring implementation. Since many of our gateway faculty will be new to active teaching and learning and inclusive classrooms, we anticipate these first changes will be small.

**Spring 2023.** Faculty who are teaching gateway courses in Spring 2023 will implement the evidence-based pedagogy and classroom practice they identified and developed in the Fall 2022. A variety of data will be collected and gateway faculty will be asked to reflect on the actual implementation and examine the impact of those changes to their students' learning. Based on the analysis, gateway faculty will determine if they need to make any adjustments prior to the fall semester. Campus partners will work with gateway faculty to prepare them for the second use of the selected evidence-based pedagogy and classroom practice in the Fall 2023 semester.

***QEP: AY 23-24 through AY 27-28.*** Faculty will be asked to continue to experiment with, refine, and adopt evidence-based pedagogies and practices each semester throughout the five years of the QEP. This will be a data-informed process supported by instructional teams, the Center for Teaching and Learning, and the Office of Undergraduate Education. Faculty will be asked to review their DFW rates and implementation fidelity to identify areas for improvement. This reflective process should lead faculty to develop strategies to continually improve their teaching.

**Figure 8**
*Pillar 3: Evidence-Based Pedagogies and Practices Timeline*

| Tasks | Fall 2022 | Spring 2023 | Summer 2023 | Fall 2023 | Spring 2024 | Summer 2024 | Fall 2024 | Spring 2025 | Summer 2025 | Fall 2025 | Spring 2026 | Summer 2026 | Fall 2026 | Spring 2027 | Summer 2027 | Fall 2027 | Spring 2028 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Evidence-based pedagogies and classroom practices workshops | | | | | | | | | | | | | | | | | |
| Development of active teaching and learning and/or classroom practice for course | | | | | | | | | | | | | | | | | |
| Implementation of 1 active teaching and learning technique and one classroom practice | | | | | | | | | | | | | | | | | |
| Scale up new techniques and practices that produce positive results | | | | | | | | | | | | | | | | | |

## Student Success Initiatives

UNC Charlotte's QEP is a student success focused project. The following outcomes are aligned with measuring the progress of the project:

1. ***Decrease the annual DFW rate in gateway mathematics/statistics courses by 30% over the next 5 years.***
2. ***Reduce the variation in DFW rates between sections of the same course so that the rates are not statistically correlated with instructors.***
3. ***Reduce equity gaps in DFW rates so that differences between racial/ethnic groups, transfer/first time in college (FTIC) students, and Pell-eligible/non-Pell eligible students are no longer statistically significant.***
4. ***Increase the four-year graduation rate of FTIC by 5%.***

These measures, as well as course specific data from Fall 2018 to Spring 2021, are discussed below. While we are reusing an existing course number for MATH 1102, beginning in Fall 2022, the course content is entirely new. STAT 1322 is also a new course that will be offered for the first time in Spring 2023. Because these are both new classes they lack baseline data and do not appear in the tables below.

By implementing evidence-based pedagogies and classroom practices, UNC Charlotte anticipates an increase in student success in gateway mathematics statistics courses for all students but in particular, Black/African American, Hispanic/Latinx, Native American, Two or more races, transfer and Pell-eligible students. The student success outcomes that will be measured are DFW rates in all gateway courses; variation in section level DFW rates; variation in DFW rates for racial/ethnic groups, transfer/FTIC, and Pell-eligible/non-Pell eligible students;

and four-year graduation rates. As a result of implementing the three pillars, the expectation is a reduction in all of these measures. These measures, as well as course specific data from Fall 2018 to Spring 2021, are discussed below.

It is important to note unanticipated factors that have likely impacted these DFW rates. In Spring of 2019, final exams in all courses were optional as a result of the campus shooting that occurred on April 30. This likely influenced pass rates in classes where the final was heavily weighted. The sudden shift to remote learning also impacted student learning in Spring 2020, as did the continued disruptions caused by the pandemic during the Fall 2020 and Spring 2021 semester. However, because UNC Charlotte has experienced so many "unusual" semesters during the past four years, it is important to include these data as a point of reference.

***Student Success Outcome 1: Decrease annual DFW rates in individual gateway math/statistics courses by 30% over the next 5 years.***

The DFW rates for gateway mathematics and statistics courses at UNC Charlotte have been among the highest for courses offered at the institution. Students who do not pass these courses on their first attempt must repeat the course or choose a different course that will fulfill the general education requirement; this may result in an extended path to graduation. Thus, the reduction of DFW rates in these gateway courses will reduce the need for more students to repeat courses, allowing them to stay on track for graduation.

Table 1 presents course-level DFW data from the past four years for gateway courses in the QEP. MATH 1100 (College Algebra) has the lowest DFW rates, while the calculus courses (MATH 1120 and 1241) have the highest rates. Of note, Spring 2022 saw the highest DFW rates in all courses except MATH 1120. The University seeks to reduce the average annual (fall and spring) DFW rates in each course by 30% of the baseline established using the 2022-2023 academic year DFW rates.

**Table 1**

*Course-level DFW Rates*

| Course | Semester | AY 18-19 | AY 19-20 | AY 20-21 | AY 21-22 |
|---|---|---|---|---|---|
| **MATH 1100** | Fall | 14.2% (295) | 16.5% (307) | 11.7% (229) | 12.9% (226) |
| | Spring | 21.5% (149) | 15.9% (91) | 15.5% (87) | 24.1% (172) |
| **MATH 1103** | Fall | 21.0% (137) | 20.5% (146) | 15.6% (110) | 26.2% (180) |
| | Spring | 22.3% (90) | 26.7% (90) | 23.2% (89) | 35.9% (134) |
| **MATH 1120** | Fall | 34.5% (277) | 27.2% (207) | 18.6% (160) | 31.8% (270) |
| | Spring | 27.9% (232) | 19.8% (157) | 22.0% (172) | 24.8% (215) |
| **MATH 1241** | Fall | 33.8% (362) | 29.7% (292) | 22.5% (197) | 35.2% (313) |
| | Spring | 27.7% (166) | 29.2% (172) | 28.0% (163) | 39.6% (247) |

| | | | | | |
|---|---|---|---|---|---|
| **STAT 1222** | Fall | 27.3% (234) | 25.8% (203) | 26.4% (220) | 20.6% (166) |
| | Spring | 13.2% (149) | 14.8% (155) | 13.9% (143) | 19.7% (204) |

***Student Success Outcome 2: Eliminate variation in DFW rates between sections of the same course so that the rates are not statistically correlated with instructors.***
Part of ensuring *all* UNC Charlotte students have access to an excellent mathematical and/or statistical education entails building consistent educational experiences between sections of the same course. Students in different sections of the same course should have similar opportunities to learn. One way to measure whether sections of the same course are providing consistent learning experiences is to examine the variation in DFW rates among sections of the same class. Given the recent history of "unusual" semesters at UNC Charlotte, it is important to compare section level variation in the same semester.

Table 2 presents a summary of the range of section level DFW data by class and semester for the past four years. For example, in Fall of 2021 the DFW rate in MATH 1100 varied from a low of 3.6% in one section to a high of 38% in another. There has consistently been a wide range of variation in the section-level DFW rates for gateway courses. While this variation is likely due to a variety of factors (e.g. grading policies, instructor ability and experience, mode of delivery, etc.), it does suggest students may be receiving inconsistent educational experiences.

Data from AY 21-22 will be used as the benchmark for MATH 1101, 1103, 1120, 1241 and STAT 1222 because the department is starting to work on coordinating these courses in AY 22-23. Benchmark data will be collected for STAT 1322 and MATH 1102 in AY 22-23 because that will be the first time these courses are offered. The goal is to reduce the variation in DFW rates between course sections and to have a grade distribution that is statistically independent of the section at the end of five years.

**Table 2**
*Section Level DFW Variation*

| Course | Semester | AY 18-19 | AY 19-20 | AY 20-21 | AY 21-22 |
|---|---|---|---|---|---|
| **MATH 1100** | Fall | 4.4%-42.0% | 0%-28.0% | 0%-26.0% | 3.6%-38.0% |
| | Spring | 10%-48.6% | 5.9%-30.0% | 0.8%-48.6% | |
| **MATH 1103** | Fall | 11.5%-60.5% | 6.7%-53.2% | 2.3%-27.10% | 8.7%-43.6% |
| | Spring | 11.7%-46.7% | 10.9%-44.4% | 8.7%-43.6% | |
| **MATH 1120** | Fall | 20.5%-44.2% | 9.5%-53.2% | 7.7%-36.4% | 19.7%-50% |
| | Spring | 11.5%-58% | 4.3%-38.6% | 5.6%-38.2% | |

| | | | | | |
|---|---|---|---|---|---|
| **MATH 1241** | Fall | 7.9%-47.8% | 17.2%-48.8% | 13.6%-48% | 20.5%-48.3% |
| | Spring | 11.4%-34.3% | 13.1%-40.5% | 13.5%-35.8% | |
| **STAT 1222** | Fall | 4.9%-51.1% | 2.5%-37.2% | 16.7%-50% | 10.3%-31.3% |
| | Spring | 0%-32.5% | 8.2%-30.9% | 16.9%-21.4% | |

***Student Success Outcome 3: Close equity gaps in DFW rates between racial/ethnic groups, transfer/FTIC students, and Pell-eligible/non-Pell eligible students such that the difference is statistically insignificant.***

A second part of ensuring *all* UNC Charlotte students have access to an excellent mathematical and/or statistical education is reducing the DFW rates such that groups of students identified by race, admissions status, or socio-economic status are equitable. These groups are discussed in more detail below. The goal is to reduce these differences in DFW rates so that they will be statistically insignificant by the end of five years.

Table 3 contains data on the DFW rates for Underrepresented minority (URM) students including American Indian or Alaska Native, Black or African American, Native Hawaiian/Other Pacific Islander, Hispanic and Two or more Races and Non-underrepresented minority (Non-URM) students including Asian, Non-Resident Alien, Unknown, and White students for all of the QEP courses except MATH 1102 and STAT 1322. The data in this table demonstrate a pattern of differences in DFW rates by racial category over time. It appears that the smallest DFW rate difference is in MATH 1100. While racial equity gaps in MATH 1103 were less than one percent during the AY 18-19, they have increased during the last 5 semesters. Also, while the racial equity gap in MATH 1120 seemed to hover around 6%-7%, it has also crept up in the last two semesters. The course with the largest DFW rate difference is MATH 1241.

DFW data for both Underrepresented minority students and Non-underrepresented minority students will be collected for AY 22-23 for all of the QEP courses. These data will serve as the benchmark against which data collected will be compared. The goal is to achieve statistically insignificant DFW rates for Underrepresented minority students and Non-underrepresented minority students. In the event that parity is achieved for one or more of the three identified population groups, the goal is to maintain parity in the QEP courses.

**Table 3**

*DFW Rates by Ethnicity/Race*

| Course | Group | Fall 18 | Spring 19 | Fall 19 | Spring 20 | Fall 20 | Spring 21 | Fall 21 |
|---|---|---|---|---|---|---|---|---|
| **MATH 1100** | Non-URM | 12.9% | 18.8% | 15.9% | 13.5% | 10.9% | 14.8% | 12.9% |
| | URM | 16.3% | 24.5% | 17.7% | 19.0% | 13.0% | 16.3% | 13.0% |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **MATH 1103** | Non-URM | 20.7% | 22.6% | 18.4% | 25.7% | 13.3% | 20.7% | 23.6% |
| | URM | 21.3% | 21.9% | 24.0% | 28.6% | 19.5% | 26.5% | 30.0% |
| **MATH 1120** | Non-URM | 29.2% | 25.2% | 26.0% | 17.0% | 16.7% | 19.3% | 28.5% |
| | URM | 43.7% | 32.2% | 29.4% | 24.9% | 21.9% | 25.7% | 37.3% |
| **MATH 1241** | Non-URM | 30.3% | 29.0% | 25.9% | 23.3% | 19.6% | 23.5% | 28.6% |
| | URM | 44.0% | 25.6% | 38.0% | 40.4% | 28.2% | 35.0% | 48.5% |
| **STAT 1222** | Non-URM | 21.8% | 11.2% | 23.6% | 15.2% | 24.7% | 12.7% | 19.5% |
| | URM | 33.9% | 15.9% | 28.5% | 14.3% | 28.8% | 15.4% | 22.3% |

***Transfer Students***

A student is considered a Transfer student if he or she has completed coursework at a college or university after graduating from high school, but before enrolling at UNC Charlotte. First time in college (FTIC) students are students who are enrolled in their first semester of college after high school graduation, regardless of the amount of college credit they have earned while in high school (Advanced Placement, College-Level Examination Program, International Baccalaureate credits, etc.) and/or the number of years between graduating high school and enrolling in college. Post-baccalaureate and early college students are not included in either of these categories.

Table 4 contains data on the DFW rates for Transfer and FTIC students for all of the QEP courses except MATH 1102 and STAT 1322. The data in this table demonstrate a pattern of differences in DFW rates which is consistently higher for Transfer students than FTIC students. This pattern holds across all semesters, with the exception of Spring 2020 for MATH 1100 College Algebra. The DFW rate difference is most pronounced in MATH 1241.

DFW rate data on Transfer and FTIC students will be collected for AY 23-24 for all of the QEP courses. These data will serve as the benchmark against which data collected during the QEP will be compared. The QEP should reduce DFW rates for FTIC and transfer students so that the difference is no longer statistically significant.

**Table 4**
*DFW rates by Enrollment Status*

| Course | Group | Fall 18 | Spring 19 | Fall 19 | Spring 20 | Fall 20 | Spring 21 | Fall 21 |
|---|---|---|---|---|---|---|---|---|
| MATH 1100 | FTIC | 11.2% | 17.0% | 14.0% | 19.0% | 9.9% | 15.3% | 10.8% |
| | Transfer | 26.3% | 24.6% | 28.2% | 13.6% | 19.9% | 16.4% | 23.2% |
| MATH 1103 | FTIC | 18.6% | 20.4% | 16.1% | 23.0% | 12.4% | 19.7% | 23.5% |
| | Transfer | 28.7% | 25.5% | 38.7% | 35.1% | 33.7% | 31.2% | 36.5% |
| MATH 1120 | FTIC | 29.6% | 22.8% | 23.0% | 18.2% | 16.2% | 19.1% | 28.1% |
| | Transfer | 39.3% | 36.3% | 33.3% | 21.7% | 21.8% | 27.6% | 36.3% |
| MATH 1241 | FTIC | 28.4% | 26.4% | 23.9% | 26.7% | 18.8% | 23.9% | 29.9% |
| | Transfer | 54.7% | 30.2% | 48.8% | 35.8% | 35.8% | 41.3% | 57.5% |
| STAT 1222 | FTIC | 20.8% | 10.4% | 19.7% | 11.1% | 21.4% | 12.4% | 15.7% |
| | Transfer | 34.2% | 20.0% | 32.9% | 23.7% | 32.3% | 17.3% | 29.2% |

***Pell-eligible students***
UNC Charlotte uses eligibility for federal Pell grants as a proxy measure for socio-economic status. Federal Pell grants are awarded to students who demonstrate exceptional financial need. This need is determined by a student's Free Application for Federal Student Aid (FAFSA) form submission. It is important to note that students in the non-Pell eligible category are not necessarily affluent or financially stable. Since Pell eligibility cannot be determined without a current FAFSA, it is possible that some students who would be eligible, but who did not complete a FAFSA, are included in the non-eligible group. Also, since the threshold for Pell eligibility is very low, many students who still require some form of financial assistance will be included in the non-Pell eligible category.

Table 5 presents data on DFW rates for Pell eligible and non-Pell eligible students for all QEP courses except MATH 1102 and STAT 1322. It appears that DFW rates for both groups of students fluctuates by semester. However, in most semesters, Pell eligible students do have slightly higher DFW rates.

DFW data on Pell eligible and non-Pell eligible students will be collected for AY 23-24 for all of the QEP courses. These data will serve as the benchmark against which data collected during the five years of the QEP will be compared. The goal is to reduce the DFW rates for Pell-eligible students so that the differences are no longer statistically significant.

**Table 5**
*DFW Rates by Pell Eligibility*

| Course | Group | Fall 18 | Spring 19 | Fall 19 | Spring 20 | Fall 20 | Spring 21 | Fall 21 |
|---|---|---|---|---|---|---|---|---|
| MATH 1100 | Non-Pell | 14.5% | 22.5% | 14.7% | 13.9% | 10.9% | 14.2% | 12.2% |
| | Pell Eligible | 13.6% | 20.4% | 20.5% | 19.1% | 13.3% | 17.7% | 14.1% |
| MATH 1103 | Non-Pell | 20.1% | 24.2% | 18.9% | 22.3% | 13.6% | 22.5% | 23.3% |
| | Pell Eligible | 22.4% | 19.5% | 24.0% | 37.0% | 20.3% | 24.4% | 31.5% |
| MATH 1120 | Non-Pell | 34.6% | 26.3% | 25.8% | 17.5% | 16.4% | 18.8% | 28.5% |
| | Pell Eligible | 34.3% | 31.2% | 29.8% | 23.9% | 23.1% | 27.5% | 38.0% |
| MATH 1241 | Non-Pell | 31.7% | 27.6% | 26.4% | 27.5% | 20.8% | 25.9% | 31.9% |
| | Pell Eligible | 38.9% | 27.9% | 36.2% | 32.5% | 26.7% | 32.6% | 43.6% |
| STAT 1222 | Non-Pell | 25.8% | 12.0% | 22.2% | 13.2% | 26.2% | 13.2% | 19.2% |
| | Pell Eligible | 29.3% | 14.8% | 30.5% | 17.4% | 26.7% | 15.1% | 23.2% |

***Student Success Outcome 4: Increase the 4-year graduation rate by 5%.***
Currently, UNC Charlotte students must complete six credits of mathematics and logical reasoning from a list of approved courses to satisfy their general education requirements. The first course ***must*** be a MATH or STAT class, while the second course can be a MATH, STAT, Deductive Logic, or Introduction to Computer Science Principles course. Students must receive a D or higher in these courses to satisfy their general education requirements.

Table 6 represents the four-year graduation rates for all students, URM students and Non-URM students. This data shows that rates for all three have increased each year except for the Fall 2014 underrepresented minority students who had a slight decrease from the previous year. In

addition, the gap between underrepresented minority students and non-underrepresented minority students has been decreasing from a high of 5.1 percent in 2014 to 2.5 percent in 2017. Since a 12.7% increase for all students may be challenging to replicate, a more modest target of 5% was set.

**Table 6**
*Four-year Graduation Rates for the Cohort of Students Entering in the Fall Semester*

| | Fall 2013 Cohort | Fall 2014 Cohort | Fall 2015 Cohort | Fall 2016 Cohort | Fall 2017 Cohort |
|---|---|---|---|---|---|
| **All Students** | 37.2% | 37.8% | 42.8% | 48.1% | 49.9% |
| **URM Students** | 34.5% | 34.0% | 38.6% | 45.5% | 48.0% |
| **Non-URM Students** | 38.1% | 39.1% | 44.4% | 48.9% | 50.5% |

## Commitment of Resources to Support the QEP

The financial, human, and technological resources required for the implementation of the QEP at UNC Charlotte are outlined below. The total five-year budget for the QEP is $3,353,486. Estimated annual program costs (year one) of ~$675,000 will be funded by a combination of new funds to the institution (~50%) and a reallocation of existing funds (~50%). One-time and program start-up costs will also be funded by existing funds (~$50,000 year one). A tuition increase request for nonresident students has been approved by the Chancellor and Board of Trustees and a portion of these funds will be allocated to the QEP program as an extension of our strategic priority of supporting student success. Existing funds will be allocated by the Provost as a part of an annual pool of funds dedicated to support strategic initiatives. Currently these funds are allocated to various priorities including investments in physical plant, equipment and technology. These costs can vary each year and it is at the Provost's discretion to direct these funds to the highest priorities for the university.

The projected fiscal responsibilities associated with the implementation of the QEP include the following personnel and associated activities.

**Personnel ($3,354,486)**

*Director of Math Pathways:* Position that is responsible for implementing and managing the QEP in the MATH department, overseeing faculty development, assessing the project, and submitting reports to SACSCOC. The job description for this position is found in Appendix G. Dr. Evan Wantland, Assistant Teaching Professor in the Mathematics and Statistics Department, was hired as the Director in January 2023.

*Two Instructional Designers:* Staffing is required to lead the multi-year, iterative design process of develop-pilot-scale-revise. Instructional designers (IDs) in the Center for Teaching and Learning will provide ongoing project management and continuous support for faculty teams through the redesign of all courses. IDs will also provide the pedagogical and technical support, professional development, reporting and analytics, and vendor/partner management for the technical infrastructure of the course including Bookstore, OneIT, and external academic technologies. Furthermore, IDs will provide project management for the redesign of the student support infrastructure to address the QEP as an ecosystem of success, meaning interfacing with Advising, Tutoring, Supplemental Instruction, Institutional Research, etc. Each course in the QEP is not a project to be completed but considered as a new service line for the Center for Teaching and Learning, requiring ongoing maintenance by IDs for continuous improvement, professional development, pedagogical and technical user support, course revision cycles, etc. The job description for this position is found in Appendix H.

*Six Course Coordinators:* Six faculty will coordinate the following courses: college algebra (MATH 1100 and 1101), MATH 1102, MATH 1103, MATH 1120, MATH 1241 and statistics (STAT 1222 and 1322). Coordinators for MATH 1102, MATH 1103, MATH 1120 and MATH 1241 will receive $6,000 per year. There will be $9,000 allocated to support the coordination of college algebra and statistics since there are significantly more sections of these courses, coordinating them will entail more work. Coordinators will be responsible for updating course calendars/schedules, managing student support, serving as the bookstore liaison, new faculty training, leading monthly meetings, and data reporting. The job description for this position is found in Appendix I.

*Graduate Teaching Assistants:* The graduate teaching assistant (GTA) will work under the direct supervision of a math or statistics faculty member. The GTA responsibilities my include grading papers, keeping class records, preparing instructional materials, providing supplemental instruction in the classroom, and teaching an independent section of a course.

*Undergraduate Student Support:* Preceptors partner with the course instructor to develop and assist in implementation of active learning strategies in the classroom. Preceptors provide multiple avenues for students to seek out and participate in review and analysis of course content. Examples may include holding office hours, creating review materials/study guides, leading small group sessions, holding review sessions, and commenting/responding to discussion posts in Canvas. Preceptors also provide support and mentoring to students during their transition from high school to college/community college to four-year college. They model what success looks like in the specific class they are precepting for as well as in general with respect to students' overall college experience. The estimated cost for a preceptor per semester is $1600 ($12.5 x 8 hours x 16 weeks).

*Faculty Summer Appointments:* Faculty stipends will be provided to faculty who participate in professional development and curriculum development. Because the QEP involves a process of continual improvement, we will fund faculty during each summer of the QEP (summers 2023 through 2027). Most stipends will be $1000, though they may be higher or lower depending on the tasks completed.

*Math Pathways Graduate Assistant*: A graduate student will support the Director of Math Pathways by collecting, analyzing, and reporting a wide variety of assessment data. Funding will support either a Ph.D. student from Educational Research, Measurement, and Evaluation or an M.A. student in Math Education.

**Professional Development/Travel ($94,500)**

*Programming Symposia:* The Office of Undergraduate Education will host three symposia for the math faculty per year for the five years of the QEP. These will occur at the start of the fall semester, between the fall and spring semesters, and at the end of the spring semester. One of the annual symposia will feature speakers (usually tenured math faculty from other institutions) who can present on new pedagogies and technologies in math education and can consult with instructional teams on the adoption of these new pedagogies and technologies. These other two provide faculty members the opportunity to showcase their work associated with the QEP. Food will be served at each symposium. Estimated attendance is based on previous symposia.

*Conference Travel:* The Director of Math Pathways will need funding to attend conferences and participate in professional development opportunities. Initially, this funding will support his development as a faculty developer, math educator, and a learning outcomes assessor. Once the QEP has been fully implemented, the Director will be expected to present about the activities and impact of the QEP at conferences.

*Travel to Arizona State University (ASU)*: The Office of Undergraduate Education will send a team of five instructors to ASU to learn about their use of adaptive learning across all of their gateway math courses. In 2020, ASU started up Operation Math which focused on high failure rate first-year math courses including college algebra, college math, and precalculus. This has included the use of peer support and active learning techniques in the classroom. In addition, ASU faculty have been developing adaptive learning technology to provide students with personalized support on the topics they need to review without having to take a complete course.

The projected fiscal responsibilities associated with academic student support are below.

**One-time Costs ($40,000)**

*Adoption of Adaptive Courseware:* If the math department decides to utilize adaptive learning there is often an initial start-up cost. There are expenses for customizing courseware and/or faculty training. The exact cost will vary depending on which platform is utilized and the number of gateway courses that adopt adaptive courseware.

*Tutoring:* The QEP may require additional funding to support tutoring (e.g. embedded Peer Assisted Learning (PALs) and INSCRIBE (online community learning space)) depending on decisions made by the department.

**Table 7**
*Budget Summary*

| Budget Summary (July 1 - June 30) | | | | | | |
|---|---|---|---|---|---|---|
| | Year 1 2023-2024 | Year 2 2024-2025 | Year 3 2025-2026 | Year 4 2026-2027 | Year 5 2027-2028 | Total |
| Personnel | | | | | | |
| QEP Director (Full-time); Estimated at $85,000 plus fringe benefits | $110,655 | $112,868 | $115,125 | $117,428 | $119,777 | $575,853 |
| Instruction Designer (2 positions); Estimated at $81,000 plus fringe benefits | $211,592 | $215,824 | $220,140 | $224,543 | $229,034 | $1,101,133 |
| Course Coordinators (6 positions) | $42,000 | $42,000 | $42,000 | $42,000 | $42,000 | $210,000 |
| Graduate Teaching Assistants (12 positions) | $160,000 | $160,000 | $160,000 | $160,000 | $160,000 | $800,000 |
| Peer Mentors | $90,000 | $90,000 | $90,000 | $90,000 | $90,000 | $450,000 |
| Graduate Assistant | $18,500 | $18,500 | $18,500 | $18,500 | $18,500 | $92,500 |
| Faculty Summer Appointments | $25,000 | $25,000 | $25,000 | $25,000 | $25,000 | $125,000 |
| Personnel Subtotal | $657,747 | $664,192 | $670,765 | $677,471 | $684,311 | $3,354,486 |
| Director Travel | $10,000 | $10,000 | $10,000 | $10,000 | $10,000 | $50,000 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Professional Development | $7,100 | $7,100 | $7,100 | $7,100 | $7,100 | $35,500 |
| Travel - One time only (Arizona State University) | $9,000 | | | | | $9,000 |
| Professional Development/Travel Subtotal | $26,100 | $17,100 | $17,100 | $17,100 | $17,100 | $94,500 |
| Adaptive Courseware (Start-up cost) | $25,000 | | | | | $25,000 |
| Tutoring | $15,000 | | | | | $15,000 |
| One-time Expense Subtotal | $40,000 | | | | | $40,000 |
| Total | | | | | | $3,488,986 |

## Assessment Plan

The assessment plan for this QEP will focus on collecting, analyzing, and making data informed decisions based on the level of success of the students enrolled in the gateway math and statistics courses. There are a number of different individuals and groups involved in collecting, analyzing, and making decisions based on the data including the gateway faculty and instructional teams, Director of Math Pathways, Course Coordinators, and the Math Pathways Graduate Assistant. This plan will utilize quantitative methods to provide a complete picture of the curricular and pedagogical adjustments made to the courses and the impact on student success.

***Implementation Fidelity***

The ability to determine if a change in student success correlates with the planned changes to the learning environment is dependent on knowing how well the planned changes are implemented. Therefore, we will utilize implementation fidelity practices to monitor the actual implementation of the planned curricular and pedagogical changes for each course. The syllabi for the courses will be collected for analysis of content related to the coordination of the courses including the calendars and grading policies and other items agreed upon over the five years. Faculty members will be asked to compare the plan developed for implementing evidence-based pedagogies and classroom practices with what actually occurred in the classroom. This

information will be used in conjunction with the data collected on student success discussed below.

***Data Collection and Processing***

Each year the Office of Institutional Research will collect student course grade data for the gateway math and statistics courses that will be disaggregated by section and disaggregated based on demographic characteristics. The Director of Math Pathways will contact the Office of Institutional Research following the end of each semester to request grade data for each of the gateway mathematics and statistics courses. Upon receipt of the data, the Director of Math Pathways and Math Pathways Graduate Assistant will organize and complete the necessary statistical analysis of the data for each of the course teams. While some of the data analysis will be simple rate calculations, others will require specific statistical tests. For example, a Chi-Square Test for Independence will be used to analyze the variation in DFW rates between sections of the same course for student success outcome 2. It will also be used to analyze variation between student populations for the three identified equity characteristics for student success outcome 3. The data analysis for student success outcome 4 will not begin until after the 2026-2027 academic year to allow students time to achieve graduation. This information will then be passed along to each of the Course Coordinators to be shared with the instructional teams.

The instructional teams, led by the Course Coordinators, and the Director will meet following each semester to discuss the results and review the information collected about implementation of the curriculum and pedagogical revisions from the meetings during the semester. These meetings will be used to identify areas for improvement, prioritize which areas to address, and develop action plans for the following academic year. The Instructional Designer will work with each instructional team to integrate smaller changes into the course between fall and spring semesters. Significant adjustments to the courses will take place over the summer when faculty will have fewer responsibilities and can focus on this work.

**Table 8**

*Assessment Timeline*

| | Baseline 2022-23 | Year 1 2023-24 | Year 2 2024-25 | Year 3 2025-26 | Year 4 2026-27 | Year 5 2027-28 |
|---|---|---|---|---|---|---|
| **DFW Rates in Gateway Course** | X | X | X | X | X | X |

| | | | | | | |
|---|---|---|---|---|---|---|
| **DFW Rates by Section** | X | X | X | X | X | X |
| **DRW Rates by Demographic Characteristics** | X | X | X | X | X | X |
| **Four-year Graduation Rates** | X | | | | X | X |

## Summary

In summary, this QEP was identified through UNC Charlotte's institution-wide planning and evaluation process. Broad-based support has been achieved thus far through town hall meetings with stakeholders from across the institution. The roll out of the NINERways project will provide UNC Charlotte's students with an opportunity to engage in mathematics and statistics courses aligned with their chosen major and prepare them for success.

As a result of the implementation of the NINERways project, the institution expects to accomplish the following student success outcomes:

1. ***Decrease the annual DFW rate in gateway math/statistics courses by 30% over the next 5 years.***
2. ***Reduce the variation in DFW rates between sections of the same course so that the rates are not statistically correlated with instructors.***
3. ***Reduce equity gaps in DFW rates so that they are no longer statistically significant.***
4. ***Increase the 4-year graduation rate by 5%.***

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Appendix A: STAT 1222 Retreat Attendees

Garvey Pyke, Executive Director, Center for Teaching and Learning, School of Professional Studies
Angela Mitchell, Director, First Year Writing, Teaching Professor, Writing, Rhetoric & Digital Studies, College of Liberal Arts and Sciences
Aziz Issaka, Assistant Professor of Mathematics, Department of Mathematics and Statistics, College of Liberal Arts and Sciences
Bruce Richards, Senior Instructional Technologist, The Center for Teaching and Learning, School of Professional Studies
Celia Sinclair, Senior Lecturer & Dir. Undergrad Studies, Department of Religious Studies, College of Liberal Arts and Sciences
Cindy Lohan, Senior Director, Strategic Partnership
Deborah Thomas, Interim Associate Vice Chancellor for Research, Professor, Department of Geography & Earth Sciences, College of Liberal Arts & Sciences
Elizabeth Bumgardner, Teaching Assistant Professor, Department of Mathematics and Statistics, College of Liberal Arts and Sciences
Elizabeth Stearns, Professor, Associate Chair, Department of Sociology, College of Liberal Arts & Sciences
Heather Brown, Executive Director of the Women + Girls Research Alliance
Jason Giersch, Associate Professor, Department of Political Science and Public Administration, College of Liberal Arts & Sciences
Jaya Bishwal, Associate Professor of Mathematics, Department of Mathematics and Statistics, College of Liberal Arts & Sciences
Jeff McAdams, Engineering and Open Education Librarian, J. Murrey Atkins Library
Kiran Budhrani, Director of Personalized & Adaptive Learning, The Center for Teaching and Learning, School of Professional Studies
Lori Van Wallendael, Associate Professor, Department of Psychological Science, College of Liberal Arts and Sciences
Lyn Exum, Associate Professor and Associate Chair, Criminal Justice and Criminology, College of Liberal Arts and Sciences
Manuel Perez Quinones, Software and Information Systems Professor, College of Computing and Informatics
Mohammad Kazemi, Associate Chair and Professor of Mathematics, Department of Mathematics and Statistics, College of Liberal Arts and Sciences
Nicole Peterson, Associate Professor, Department of Anthropology, College of Liberal Arts and Sciences
Robert McEachnie, Lecturer, Department of History, College of Liberal Arts and Sciences
Shannon Sullivan, Professor of Philosophy and Health Psychology, Department of Philosophy, College of Liberal Arts & Sciences
Wan Rabiatul Hountondji Wan Othman, Lecturer, Department of Mathematics and Statistics, College of Liberal Arts and Sciences
Yang Li, Assistant Professor of Statistics, Department of Mathematics and Statistics, College of Liberal Arts and Sciences
Charles Houck, Senior Lecturer, Director of undergraduate studies, Global Studies, College of Liberal Arts and Sciences

Coral Wayland, Associate Prof. Associate Dean for curriculum at university college, Department of Anthropology, College of Liberal Arts and Sciences
Debra Basalik, Part Time Faculty, Department of Communication Studies, College of Liberal Arts and Sciences
Jessica Kapota, Director, Human Resources, Division of Business Affairs
Monica Rodriguez, Associate Professor of Spanish & Graduate Director, Department of languages and cultural studies, College of Liberal Arts & Sciences
Jennifer Munroe, Professor of English, Department of English, College of Liberal Arts and Sciences
Sarah Birdsong, Assistant Teaching Professor, Department of Mathematics and Statistics, College of Liberal Arts and Sciences
Shaoyu Li, Associate Professor of Statistics, Department of Mathematics and Statistics, College of Liberal Arts and Sciences
William Garcia, Senior Lecturer, Department of Geography and Earth Sciences, College of Liberal Arts and Sciences

Appendix B: Math DFW Data 2015 to 2018

**Course Level**

| Course Title | Course Number | ABC | DFW | Total Students | DFW (% of total) |
|---|---|---|---|---|---|
| College Algebra | MATH 1100 | 6,527 | 1,616 | 8,143 | 20% |
| Quantitative Reasoning | MATH 1102 | 560 | 98 | 658 | 15% |
| Pre-Calculus | MATH 1103 | 2,158 | 845 | 3,003 | 28% |
| Quantitative Reasoning | MATH 1105 | 105 | 32 | 137 | 23% |
| Calculus | MATH 1120 | 3,862 | 1,636 | 5,498 | 30% |
| Calculus | MATH 1241 | 3,101 | 1,263 | 4,364 | 29% |
| Introductory Statistics | STAT 1220 | 3,286 | 1,344 | 4,630 | 29% |
| Introductory Statistics | STAT 1222 | 5,092 | 1,408 | 6,500 | 22% |
| All courses | | 24,691 | 8,262 | 32,933 | 25% |

**Race/Ethnicity**

| Course Title | Course Number | Group | ABC | DFW | Total Students | DFW (% of total) |
|---|---|---|---|---|---|---|
| College Algebra | MATH 1100 | Non-URM | 4,460 | 988 | 5,450 | 18% |
| | | URM | 2,067 | 628 | 2,697 | 23% |
| Quantitative Reasoning | MATH 1102 | Non-URM | 391 | 63 | 456 | 14% |
| | | URM | 169 | 35 | 204 | 17% |
| Pre-Calculus | MATH 1103 | Non-URM | 1,550 | 549 | 2,099 | 26% |
| | | URM | 608 | 296 | 906 | 33% |
| Quantitative Reasoning | MATH 1105 | Non-URM | 67 | 19 | 86 | 22% |
| | | URM | 38 | 13 | 51 | 25% |
| Calculus | MATH 1120 | Non-URM | 2,777 | 1,047 | 3,825 | 27% |
| | | URM | 1,085 | 589 | 1,674 | 35% |

| | | | | | | |
|---|---|---|---|---|---|---|
| Calculus I | MATH 1241 | Non-URM | 2,452 | 879 | 3,333 | 26% |
| | | URM | 649 | 384 | 1,034 | 37% |
| Introductory Statistics | STAT 1220 | Non-URM | 2,438 | 868 | 3,311 | 26% |
| | | URM | 848 | 476 | 1,326 | 36% |
| Introductory Statistics | STAT 1222 | Non-URM | 3,259 | 737 | 3,996 | 18% |
| | | URM | 1,833 | 671 | 2,505 | 27% |
| All Courses | | Non-URM | 17,364 | 5,142 | 22,506 | 23% |
| | | URM | 7,327 | 3,092 | 10,419 | 30% |

**Enrollment Type**

| Course Title | Course Number | Group | ABC | DFW | Total Students | DFW (% of total) |
|---|---|---|---|---|---|---|
| College Algebra | MATH 1100 | FTIC | 5087 | 945 | 6033 | 16% |
| | | Transfer | 1440 | 671 | 2114 | 32% |
| Quantitative Reasoning | MATH 1102 | FTIC | 259 | 39 | 300 | 13% |
| | | Transfer | 301 | 59 | 360 | 16% |
| Pre-Calculus | MATH 1103 | FTIC | 1650 | 509 | 2159 | 28% |
| | | Transfer | 508 | 336 | 846 | 40% |
| Quantitative Reasoning | MATH 1105 | FTIC | 40 | 6 | 50 | 20% |
| | | Transfer | 65 | 17 | 87 | 25% |
| Calculus | MATH 1120 | FTIC | 2490 | 848 | 3339 | 25% |
| | | Transfer | 1372 | 788 | 2160 | 36% |
| Calculus I | MATH 1241 | FTIC | 2403 | 782 | 3186 | 25% |
| | | Transfer | 698 | 481 | 1181 | 41% |
| Introductory Statistics | STAT 1220 | FTIC | 2165 | 724 | 2889 | 25% |
| | | Transfer | 1121 | 728 | 2496 | 29% |

| | | | | | | |
|---|---|---|---|---|---|---|
| Introductory Statistics | STAT 1222 | FTIC | 3324 | 679 | 4003 | 17% |
| | | Transfer | 1767 | 728 | 2496 | 29% |

**Pell Eligibility**

| Course Title | Course Number | Group | ABC | DFW | Total Students | DFW (% of total) |
|---|---|---|---|---|---|---|
| College Algebra | MATH 1100 | Non-Pell Eligible | 4,654 | 1,017 | 5,673 | 18% |
| | | Pell Eligible | 1,873 | 599 | 2,471 | 24% |
| Quantitative Reasoning | MATH 1102 | Non-Pell Eligible | 329 | 40 | 371 | 11% |
| | | Pell Eligible | 231 | 58 | 289 | 20% |
| Pre-Calculus | MATH 1103 | Non-Pell Eligible | 1,525 | 561 | 2,088 | 27% |
| | | Pell Eligible | 633 | 284 | 917 | 31% |
| Quantitative Reasoning | MATH 1105 | Non-Pell Eligible | 67 | 9 | 83 | 19% |
| | | Pell Eligible | 38 | 7 | 45 | 30% |
| Calculus | MATH 1120 | Non-Pell Eligible | 2,602 | 1,005 | 3,608 | 28% |
| | | Pell Eligible | 1,260 | 631 | 1,891 | 33% |
| Calculus I | MATH 1241 | Non-Pell Eligible | 2,261 | 819 | 3,081 | 27% |
| | | Pell Eligible | 840 | 444 | 1,286 | 35% |

| | | | | | | |
|---|---|---|---|---|---|---|
| Introductory Statistics | STAT 1220 | Non-Pell Eligible | 2,237 | 840 | 3,954 | 20% |
| | | Pell Eligible | 1,049 | 504 | 1,557 | 32% |
| Introductory Statistics | STAT 1222 | Non-Pell Eligible | 3,172 | 782 | 3,954 | 20% |
| | | Pell Eligible | 1,920 | 626 | 2,547 | 25% |

Appendix C: UNC Charlotte Strategic Planning Committee

Joel Avrin, Faculty President and Professor of Mathematics, College of Liberal Arts and Sciences
Kevin Bailey, Vice Chancellor for Student Affairs
George Banks, Co-Chair, Associate Professor of Management, Belk College of Business; Organizational Science Program, College of Liberal Arts and Sciences
Steve Coppola, Assistant Provost for Institutional Research
Celeste Corpening, Staff Council President, Applications Analyst, OneIT
Sharon L. Gaber, Chancellor
Jose Gamez, Interim Associate Dean for Research and Graduate Programs and Professor of Architecture, College of Arts and Architecture
Tehia Glass, Associate Professor of Elementary Education and Educational Psychology, Cato College of Education
Doug Hague, Executive Director of the School of Data Science
Jesh Humphrey, Vice Chancellor for Institutional Integrity and General Council
Robert Keynton, Dean, The William States Lee College of Engineering
Jeffrey Leak, Professor of English, College of Liberal Arts and Sciences; Director, American Studies Program
Joan Lordan, Provost and Vice Chancellor for Academic Affairs
Stephanie Moller, Director of the Public Policy Doctoral Program; Professor of Sociology, College of Arts and Sciences
Pinku Mukherjee, Co-Chair, Irwin Belk Distinguished Professor of Cancer Research; College of Liberal Arts and Sciences Associate Dean of Research and Graduate Education
Jay Raja, Senior Associate Provost
Tahlieah Sampson, Student Body President
Karen Singer-Freeman, Director of Academic Planning and Assessment
Alex Suptela, President of Graduate and Professional Studies Government
Rick Tankersley, Vice Chancellor for Research and Development
Catrine Tudor-Locke, Dean, College of Health and Human Services
Cheryl Waites Spellman, Interim Special Assistant to the Chancellor for Diversity and Inclusion

Appendix D: QEP Leadership Team

Co-Chairs
Coral Wayland, Senior Associate Dean, Office of Undergraduate Education
Kim Harris, Undergraduate Coordinator, Department of Mathematics and Statistics, College of Liberal Arts and Sciences

Members:
Mitchel Cottenoir, Director of Assessment, Office of Assessment and Accreditation
Kiran Budhrani, Director of Personalized and Adaptive Learning in the Center for Teaching and Learning, School of Professional Studies
J. Garvey Pyke, Executive Director, Center for Teaching and Learning, School of Professional Studies
Evan Wantland, Director of Math Pathways, Office of Undergraduate Education.

Appendix E: QEP Implementation Team

Coral Wayland, Senior Associate Dean, Office of Undergraduate Education
Kim Harris, Undergraduate Coordinator, Department of Mathematics and Statistics, College of Liberal Arts and Sciences
Evan Wantland, Director of Math Plathways, Office of Undergraduate Education
Tanya Hunt, Assistant Dean for Student Services, College of Liberal Arts and Sciences
Kris Byrd, Director of Assessment, Planning, and Accreditation, College of Liberal Arts and Sciences
Bojan Cukic, Dean and Professor, College of Computing and Informatics
Emily Makas, Associate Professor of Architecture, College of Arts and Architecture
Artie Zillante, Professor and Chair of Department of Economics, Belk College of Business
Teresa Petty, Senior Associate Dean of Undergraduate Education and Professor, Cato College of Education
Courtney Green, Teaching Professor, Freshman Lecturer and Advisor, College of Engineering
Rajib Paul, Associate Professor of Public Health Sciences, College of Health and Human Services
Garvey Pyke, Executive Director, Center for Teaching and Learning, School of Professional Studies
Mitchel Cottenoir, Director of Assessment, Office of Assessment and Accreditation
Lesley Harris, Assistant Dean and Director of Academic and Career Coaching, Advising
Kristen Siarzynski, Director, University Transfer Center
Jeff McAdams, Engineering and Open Education Librarian, Atkins Library
Sarah Humphries, Director, Office of Undergraduate Admissions
Kimberly Rodgers, Director, University Center for Academic Excellence
Ree Liker, Lecturer and Coordinator of Math Placement, Math Learning Center
Tracy Beauregard, Assistant Registrar, Office of the Registrar
Derrick Isler, Business Intelligence Analyst, Office of Institutional Research
Taufiquar Khan, Professor and Mathematics and Statistics Department Chair, College of Liberal Arts and Sciences
Elizabeth Adkisson, Director, Teacher Education Advising and Licensure, Cato College of Education
Student Preceptor STAT 1222

Appendix F: University Communication Plan

**Plan for QEP – NINERWays: The Path to Math Success**

*Phase 1: January through March 2023*

**Communications Objective:**

- Educate key stakeholders on the process of a SACSCOC visit and the University's Quality Enhancement Plan (QEP) ahead of on-campus visit March 20-23, 2023, as part of Charlotte's reaffirmation of accreditation.

**Strategies:**

- Invite audiences to participate in virtual and in-person opportunities to learn more about the QEP.
- Provide digital resources to educate campus about the QEP.
- Distribute collateral throughout campus to drive audiences back to digital resources.
- Create resources to help guide key audiences through the process of a SACSCOC on-site visit and ensure they have the necessary information to share with reviewers.

**Measures of Success:**

- Faculty, staff and students have an appropriate understanding of the QEP and SACSCOC standards, policies and practices and can respond to questions from the on-site review team.
- The University receives a favorable assessment of the on-site visit

**Audiences:**

- Cabinet
- Deans, department heads and directors
- Academic advisors
- Faculty
- Board of Trustees
- Staff
- Student leaders
- Undergraduate students

**Key Messages:**

- The on-site visit is an important component of our reaffirmation of accreditation, and we look forward to welcoming our visitors to demonstrate Charlotte's excellence.
- Our QEP, NINERWays: The Path to Math Success, is designed to improve student success.
- NINERWays will result in a sequence of math courses designed to be relevant to a student's major.
- NINERWays will reduce equity gaps across student populations by reducing grades of D/F or course withdrawals; ensure a uniform experience and grading across course selections; and increase the graduation rate for first-time-in-college students.

| Date | Communication | Audience | Responsible | Additional Information |
|---|---|---|---|---|
| Jan.23-Feb. 15 | Virtual Townhalls | Two each for Academic Affairs leaders and advisors, and faculty (with staff also invited); and one for students | L. Zenk for scheduling<br><br>J. Howe and C. Jackson for advertising and support in running | 1/23: 1:30-2:30<br><br>1/27: 10-11 (AA Leaders/Advisors)<br><br>2/1: 10-11 (AA Leaders/Advisors)<br><br>2/6: 2-3 (Faculty/Staff)<br><br>2/7: 10-11 (Faculty/Staff)<br><br>2/14: 9-10 (Students) |
| By Jan. 20 | Website update | Leaders, faculty, staff, students, visitors | J. Howe and C. Jackson | |
| Jan. 18 | Presentation | Dean's Council | L. Zenk | WIll include handout resource for participants to take with them |
| By Jan. 20 | Graphic treatment created | Leaders, faculty, staff, students, visitors | J. Howe and R. Honeyman | |
| Beginning Jan. 20 and continuing through March 20 | Bi-weekly updates from Provost's Office | Academic Affairs faculty and staff | J. Howe/C. Robinson/L.Zenk | Updates each week in the Academic Affairs digest on the visit and/or things to know about QEP. Essentially to serve as a touch point/reminder that it is coming and what it's |

| | | | | |
|---|---|---|---|---|
| | | | | about. |
| Jan. 24 | Presentation | Chancellor's Cabinet | E. Wantland | |
| Jan. 27 | Presentation | Chancellor's Leadership Team (CLT) | E. Wantland | WIll include handout resource for participants to take with them |
| Feb. 2 | Meet a Niner: Evan Wantland | Faculty, staff and students | J. Howe | Introduction to Evan as the QEP director |
| Feb. 8 | Presentation | Board of Trustees | E. Wantland | WIll include handout resource for participants to take with them |
| Feb. 9 | Presentation | Faculty Council Meeting | E. Wantland | WIll include handout resource for participants to take with them |
| By Feb. 20 | Pitch to NT | Faculty, staff and students | B. Stephens | Pitch Niner Times on doing story in March on QEP and visit |
| By March 6 (Two weeks out from visit and first day back from spring break) | Collateral in place throughout campus | Faculty, staff, students | J. Howe and C. Jackson | Table tents, posters, bus ads, cup wraps, yard signs and digital signage in place driving audiences back to website for more information. |
| March 10 | Presentation | Academic Affairs Council | E. Wantland | WIll include handout resource for participants to take with them |
| March 13 (One week out) | Special edition of Niner Insider | Faculty, staff and students | J. Howe and C. Jackson | Special edition focusing on the visit and the QEP |
| By March 15 | Prep Sessions | Key faculty, staff and students meeting with the on-site team | L. Zenk/C. Jackson/J. Howe | To include prep materials on visit and QEP |
| March 20 | Niner Insider story | Faculty, staff and students | J. Howe and C. Jackson | Reminder about on-site visit starting that day. |
| TBD | Presentation | AAIT | E. Wantland | WIll include handout resource for participants to take with them |

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| TBD | Presentation | Staff Council | E. Wantland | WIll include handout resource for participants to take with them |
| TBD | Presentation | Student Government | E. Wantland | WIll include handout resource for participants to take with them |
| TBD | College Meetings | Faculty | E.Wantland | WIll include handout resource for participants to take with them |

Appendix G: Director of Math Pathways Position Description

This position will be responsible for implementing Charlotte's 2023 Quality Enhancement Plan (QEP), which focuses on improving student learning in gateway math/statistics courses, closing equity gaps in gateway math/statistics courses, reducing DFW rates, and shortening the time it takes students to complete their general education math/statistics coursework. The QEP rests on 3 pillars: 1.) developing math pathways that align with majors; 2.) coordinating sections of gateway math/statistics courses; 3.) redesigning gateway math/statistics courses to use innovative pedagogies and technologies. The Director of Math Pathways will serve as the QEP lead within the Department of Mathematics and Statistics. This entails overseeing the creation/revision of math pathways, working with course coordinators to ensure a consistent learning environment, championing pedagogical innovation, supporting faculty as they adopt new ways of teaching, allocating the QEP budget within the Department of Mathematics and Statistics and collecting assessment data for reporting and revision. The Director of Math Pathways will also serve as the primary liaison between the Department of Mathematics and Statistics and campus/system stakeholders.

This is a 12-month, non-tenure track special faculty appointment that will be renewable every 5 years. In addition to their administrative role in the Office of Undergraduate Education, the Director of Math Pathways will have a faculty appointment on the "Teaching Professor" track in the Department of Mathematics and Statistics. They will teach one gateway undergraduate math/statistics course per semester.

**Leadership of Curriculum Development and Implementation**
- Engage with faculty and departments to design and develop an integrated curriculum for the gateway MATH/STAT sequence in the context of the university's curriculum as a whole.
- Lead faculty teams in the department responsible for course design and developing content and assessments for gateway courses.
- Lead Gateway Course Coordination Team, sustaining high quality and consistent delivery of the redesigned QEP curriculum
- Collaborate with the Center for Teaching and Learning on curriculum projects, especially with the team for Personalized & Adaptive Learning

**Math and Statistics Faculty Member**
- Appointment on the "Teaching Professor" track in the Department of Mathematics and Statistics with eligibility for promotion as per departmental criteria
- Teaching load of 1/1
- Member of the department's administrative leadership team for gateway courses
- Other service responsibilities assigned as commensurate with administrative role

**Assessment, Evaluation, and Reporting**
- Manage data reporting and dashboards for course redesign, student success, achievement gaps, and other success metrics needed for the QEP and beyond.
- Create processes for the use of analytics in courses and programs for immediate interventions during course implementation.

- Create formal and ad hoc reports on projects and programs as a regular and ongoing effort for continuous improvement.

**Instructional Supports Coordinator**
- Develop and champion innovative means of student support in tutoring, supplemental instruction, and other approaches.
- Develop and coordinate training for the individuals (chiefly graduate and undergraduate students) providing these supports.
- Collaborate with and develop partnerships with student success centers and support professionals to integrate student support approaches.

**Campus Engagement & Communications**
- Engage the campus and the broader field through presentations and publications about campus successes in these areas as part of the "Charlotte Model" as outlined in the University Strategic Plan.
- Engage University leadership, faculty, and other stakeholders for the promotion of innovative STEM teaching and learning.
- Serve as campus liaison with UNC System Office for Math Pathways and other related initiatives.
- Collaborate with leadership of the Transforming STEM Academy and other campus entities working to improve pedagogy and student success in STEM

**Minimum**
· 5+ years of teaching math or statistics at the college/university level
· A demonstrated record of excellence in teaching
· Demonstrated use of innovative pedagogies in STEM teaching and learning
· Strong written and oral communication skills
· Experience with and/or knowledge of strategies for addressing equity gaps

**Preferred**
· Experience using adaptive courseware
· Experience developing Math Pathways
· Experience in leading and managing collaborative curriculum development initiatives
· Experience in an academic leadership role at the departmental or university level
· Experience with project assessment and evaluation

Appendix H: Instruction Designer Position Description

**Primary Purpose of Position:**

The Instructional Designer/Technologist manages large scale instructional innovation projects, namely adaptive learning projects, from initiation through design and development and implementation. These projects are mission critical and directly related to student success in STEM areas of high need to shorten time to degree and reduce DFW rates in large enrollment courses, particularly as part of the Math Pathways Quality Enhancement Plan (QEP). This essential position will collaborate with faculty and other instructional staff in building out mass scale course projects for the university and for the UNC system partner universities, including development of content, curriculum structure, and instructional technique.

Specifically, the position provides project oversight and coordination across multiple departments and units, including faculty, other instructional designers/technologists, stakeholders from leadership in partner units at the university and other UNC schools, graduate assistants, working as a team for design, development, revision, management, and scaling up of multiple adaptive learning projects.

Instructional in nature, these duties are associated with the regular academic and educational experiences provided by the university, are uniquely supportive of those academic and educational experiences, and involve significant and independent interaction with participants in the university's instructional and educational program.

This is an advanced role in an Instructional Design and Technology position to plan, design, and implement academic technology and/or innovative approaches that directly support faculty effectiveness in instructional design and delivery for student success, chiefly in the major personalized and adaptive learning projects and initiatives for student success. This position requires an advanced degree in a teaching or instructional design related field and teaching experience in higher education. Given the need to continually advance and promote the use of mixed teaching methodologies that incorporate the use of technology to not only enhance traditional classroom-based instruction but also broaden the basis for online and blended/hybrid courses, this position involves engaging with faculty, departments, and partner units across the university in multiple ways for course design and delivery, implementation and evaluation.

**Summary of Position Responsibilities:** This position provides project management, oversight, and coordination across multiple departments and units, working as a team for design, development, revision, management, and scaling up of multiple large-scale course redesign learning projects. This will include planning and coordination for these strategic initiatives, supporting and fostering learning innovation, promoting systems thinking and design thinking for faculty and student success, leading the design and redesign of learning environments and instructional systems. The work involves a highly complex chain of functions requiring strong consultancy skills in fostering change and the ability to execute and deliver results. The position requires that a substantial proportion of the work commitment is devoted to instructional activities and the direction of educational/academic supportive activities.

The Instructional Designer/Technologist position is an advanced role for digital innovation and strategic projects in personalized and adaptive learning. The position includes functions on curriculum development, implementation and support; educational technology management; data analytics, faculty development and performance support, and capacity building and stakeholder engagement. As such, the position requires significant project management skills for strategic instructional initiatives, architecting the use and support of instructional technology, functioning as data learning analyst, and acting as pedagogical consultant for learning innovation, particularly with personalized and adaptive learning and other innovative approaches for faculty and student success. The ID/T position also requires advanced skills in consultation, support, and training for technology-based instructional systems as well as providing expertise in the use of academic technologies, instructional design, and best practices in teaching and learning. This will include planning, implementing, promoting, managing and evaluating the changes associated with learning environments and instructional systems. The position requires that a substantial proportion of the work commitment is devoted to instructional activities and the direction of educational/academic supportive activities for student success.

## DUTIES AND RESPONSIBILITIES

**Project Management for Curriculum Development, Implementation, & Support (25%)**

- Serve in a curriculum development, course implementation, and course support function for the personalized and adaptive learning team
- Coordinate with faculty and vendor teams to facilitate design sessions, develop curriculum maps, and align course outcomes
- Provide consultations with faculty and stakeholders on designing adaptive learning pedagogical, learning pathways, prerequisites and remediation strategies, and adaptive assessment strategies
- Collaborate with relevant stakeholders on content development efforts, including the selection, evaluation, and integration of OER resources
- Monitor course implementation, student engagement, faculty engagement on personalized and adaptive courses during the academic semester
- Perform quality assurance on adaptive learning course content and media for quality, consistency, formatting, and relevance, and accuracy
- Provide support for faculty and student users of adaptive courseware through troubleshooting issues and resolving support tickets
- Develop and lead efforts to ensure accessibility and provide support on meeting accessibility policies/guidelines / coordinate with stakeholders (Disability Services, vendors, OneIT) to test accessibility of modules
- Collaborate across all stakeholders to ensure implementation success and to communicate changes, particularly with the vendor, faculty, and OneIT
- Update and test courses on a semesterly and/or continual basis to ensure proper functioning prior to the start of the semester
- Ensure student access to systems by coordinating with faculty, vendors, OneIT, and Bookstore to create robust and reliable processes for all learning platforms

**Specialized Faculty Development and Performance Support (20%)**

- Serve in a faculty development, training, and/or performance support function for the personalized and adaptive learning team
- Lead and collaborate with team members on faculty development programs and documentation related to personalized pedagogy and adaptive learning technologies, including onboarding for new faculty
- Serve as a consultant for learning innovation and the effective use of instructional technologies
- Develop and coordinate ongoing / just-in-time performance support resources, media, or projects for faculty and/or student users of adaptive learning platforms and related systems
- Develop and execute innovative approaches to faculty development and TA development

**Stakeholder Engagement & Capacity Building (15%)**

- Serve in a capacity building function for the personalized and adaptive learning team
- Collaborate with team members to determine strategies for engaging internal and external stakeholders on the promotion and adoption of personalized pedagogy and adaptive learning systems on campus
- Research / identify gaps and opportunities to streamline and strengthen on-going projects, document workflow processes, and improve products of the adaptive learning enterprise
- Coordinate or contribute to a personalized and adaptive learning knowledge base, peer learning communities, outreach, partnerships, training events, or promotional /website materials
- Consult with faculty, departments, colleges, committees, ad hoc groups to develop requirements and to proactively establish technical directions for such

**Instructional Systems / Technology Management (20%)**

- Provide technical expertise in enterprise instructional systems and adaptive technologies
- Select, evaluate, test, integrate, and maintain vendor tools and enterprise academic technologies/systems such as the LMS, SIS, mobile applications, smart learning applications, and others
- Update and test courses on a semesterly and/or continual basis to ensure proper functioning prior to the start of the semester
- Coordinate with stakeholders such as vendors, registrar office, OneIT, bookstore, and others to ensure all adaptive platforms are functional and integrated efficiently with the LMS (Canvas), SIS (Banner), mobile responsive platforms, and smart learning applications
- Coordinate with units and vendors to obtain contract agreements/protocols for Single Sign On, privacy, security, compliance, licensing, copyright, and IP Agreements, per OneIT and university policy to ensure successful educational technology adoption among stakeholders
- Convene working stakeholder groups across functions within unit and among partner support units for analyzing problems, developing solutions, and communicating solutions with enterprise level instructional technologies,
- Collaborate with team members on the preparation of user documentation, manuals, or job aids to support adaptive learning system adoption
- Develop and lead vendor management protocols to ensure project success

- Determine and execute strategies for engaging university partner units, including academic and technical and student services units
- Responsible for addressing faculty and student support tickets in all support collection points in a tiered support structure (vendors, OneIT, CTL, et al.)

**Learning Analytics & Reporting (20%)**

- Serve as data learning analyst for process improvement in faculty effectiveness, student success, and the associated systems and technologies in support thereof
- Collect, organize, analyze, and interpret quantitative and qualitative data to describe, diagnose, predict, and prescribe student outcomes
- Assist and collaborate with stakeholders, especially faculty, in using analytics to drive design decisions and to impact student success during course delivery
- Create and oversee ongoing evaluation efforts for projects and courses
- Identify new sources of data, methods, and infrastructure to improve data collection, analysis, and reporting.
- Develop key performance indicators/measures and implement evaluation/assessment efforts on faculty and/or student access, efficiencies, effectiveness, engagement, success outcomes, and perceptions
- Produce reports, data dashboards, and data visualization on an annual and ad hoc basis about the effectiveness of projects and programs, including for institutional reporting
- Disseminate knowledge, results, and/or recommendations to stakeholders in support of the university's academic mission as related to personalized and adaptive learning

**Sensitive Duties:** Direct responsibility for secure handling of sensitive and/or confidential information.

**Describe fully the independence and/or administrative authority and discretion this position has:** The position requires the exercise of discretion in determining the nature and content of the instructional and educational activities assigned and evaluating their effectiveness. The person in this position is expected to perform independently when initiating dialogue, performing required services, collaborating, and following up with faculty members and team members concerning course design and pedagogical needs. Items with which they are tasked, such as projects, course development, assessments, evaluations, and research will be handled by this person as they deem necessary with a minimum of supervisory input. This person will be responsible for appropriate course and resource design and development as well as evaluating and assessing each of these.

**Describe level of guidance or supervision this position receives and from what source(s)**: The position receives supervision and guidance primarily from the Associate Director of Personalized and Adaptive Learning through frequent collaboration in both regular and informal meetings, in individual and team settings alike. Supervision will generally be provided to initiate projects, processes, and general support services, but the development and continuation will be up to this individual. This coordination will be provided by the Associate Director, and additional supervision may be provided by the unit Director.

Appendix I.: Course Coordinator Position Description

Course coordinators serve as the team leader for instructors who teach a targeted Top 40 MATH/STAT courses. The course coordinator is responsible for maintaining consistency and quality of instruction across the multiple sections of the target course. A partial list of responsibilities is enumerated below.

Coordinators are appointed for 1 full year (fall, spring, summer). Ideally, the coordinator role will rotate among faculty so that ownership of the course is shared.

Coordinators will receive $6,000/$9,000 a year. This funding can be taken as a stipend or used to fund a one course buyout with the remaining funds being received as a stipend. Using this funding for a course buyout is contingent on whether the department can find suitable part-time faculty to teach the course. Coordinators will need to discuss potential buyouts with the department chair and the QEP director in the spring semester prior to their appointment.

Course coordinators will report to the QEP director in their role as coordinator.
However, course coordinators will need to coordinate / communicate with relevant stakeholders regularly (UGE, Math Department, CTL)

**Course Coordinator Responsibilities:**
Note some may be phased in as the QEP is implemented. These duties may vary based on the nature of the course, the technology integrations, enrollment of the course, and the faculty teaching the course.

*Update the course calendar/schedule*

- Update the course schedule/calendar every semester to reflect the current dates
- Share the course schedule with faculty who will be teaching the course.

*Manage student support*
If the target course has graduate/undergraduate student support across all sections the course coordinator:

- Requests funding for the upcoming semester (undergraduates) or year (graduates) from the QEP director.
- Works with faculty to recruit students for the next semester.
- Works with the MATH department support staff to make sure student hiring paperwork is completed in time for the student to attend training.
- Matches students with sections and notifies both students and instructors about the match.
- Serve as the point of contact for students who are experiencing problems with the faculty member they are supporting.

*Bookstore liaison*
If the target course uses adaptive courseware and/or First Day, the coordinator works with the QEP director to:

- Ensure all sections have orders placed by the bookstore's deadlines.

- Coordinate with vendors / CTL to identify ISBN codes and send these to the bookstore partners for integration with Vital Source)
- Ensure the registrar is informed that the course is utilizing adaptive courseware or First Day
- Ensure student access codes are available and sufficient to meet student enrollment needs
- Update course descriptions in Banner (through the Registrar) to ensure students are informed on the fees associated to bookstore materials
    - Example text in Banner:
      STAT 1222 This course is part of the First Day™ program. Required digital course materials are delivered in Canvas at the discounted rate of $47.73 billed to your student account. Please visit the First Day website to learn more about the program. https://aux.uncc.edu/first-day
- Coordinate with CTL on any adaptive courseware or First Day requirements and ensure student access codes are linked into Canvas navigation menus

*New faculty training*
The coordinator is responsible for training faculty/instructors of record who have not previously taught a coordinated version of the course. This involves making sure new faculty are clear on the common course elements and how to deliver them.

*Monthly meetings*
Monthly meetings are integral to the coordinated course model. They provide faculty opportunities for support and are critical to the continuous improvement of the course. As such, the course coordinator:

- Schedules meetings twice a month and invites faculty and the QEP director
- Develops the meeting agenda
- Facilitates the meeting
- Summarizes changes to be made to the course and directs this feedback to the relevant group (e.g. UCAE, CTL, etc.)
- Regularly communicates faculty and student feedback/ concerns related to course technology or instructional strategies to the CTL

*Data reporting*
Course coordinators are responsible for collecting assessment data and submitting it to the QEP director.

**Eligibility criteria:**

- Full-time faculty member of any rank (lecturer, tenure-track)
- Prior experience teaching the course
- Agree to teach a minimum of 2 sections of the course during the year they serve as coordinator. They should teach a minimum of 1 section per semester in the fall and spring. There are no summer teaching requirements.