

QEP Concept Paper Cover Page

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Topic or Theme:

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Pirate Pathways in Mathematics: A Student Success Initiative

Summary:

The many challenges university educators face from under prepared students in mathematics has been long-standing and well-documented (Dana Center). During 2018-19 academic year, 4,175 first-time, first-year students were enrolled at ECU with 1,838 students enrolled in a traditional remedial mathematics course. During the Fall 2019-20 academic year, 4,366 first-time, first-year freshmen entered ECU with 1,860 Pirates enrolled in remediation courses (Math 0001/0045). Thus, for the past two academic years, nearly 3,700 ECU students required remediation in mathematics and this was at a time *prior* to the impacts of COVID-19 on mathematics education. In the upcoming academic years, we anticipate these remediation numbers in mathematics to increase and look toward the development of this QEP plan to bring resources to help us address this impending crisis.

Remediation is a costly enterprise in education (Boylan et al., 1999; Rodgers et al., 2011). Through previous funding and individual course redesigns, adapted technologies (ALEKS) have been systematically implemented into our remediation program (Math 0001/0045) and two of our gateway course offerings (Math 1050 and Math 1065). The ECU Mathematics Department received a UNC Student Success grant to redesign our Math 1050 course and received university support to redesign the Math 1065 curriculum and its instructional development of “The Cave.” These efforts have been institutionalized with their curriculum continually reflected upon and further developed. In Summer 2019, we also received a UNC Math Pathways grant to run research study sections of College Algebra (Math 1065) to help answer the question, “which model of remediation (sequential versus co-remediation) leads to the highest-level learning and student success of under prepared students in College Algebra?” Simultaneously, an alternative pilot design was being considered to determine if using an adaptation of our existing remedial mathematics courses (Math 0045/0001) could serve as a co-requisite model. These projects were set to test conjectures regarding student success outcomes during the two semesters of the 2019-2020 academic year. These pilot tests were interrupted by the instructional format changes due to COVID-19, and thus we will be running new research study sections and pilots during the Spring 2021 semester. We expect to be able to have some feedback and data regarding student success from Spring 2021.

Thus, this QEP redesign pathway plan will build upon this previous course redesign work, what we have learned from the pilot test experiences, and will embrace the Math Pathways model for student success in mathematics based upon the well-documented and on-going work from The Dana Center at The University of Texas – Austin. The Math Pathways model uses a just-in-time mathematics learning strategy that allows students to move through their academic pathway, while, at the same time, gain targeted assistance on mathematical topics where misconceptions lie. This learning plan individualizes student instruction to offer “the right math at the right time for each student.” However, for our Pirates, this plan will need the development of careful mathematics placement procedures to enable such student success.

While the specifics of this QEP plan is a new initiative at ECU, it builds from our collective previous experience in course development along with our experience in the UNC System Mathematics Pathways Initiative. It builds a specific ECU Pirate Plan toward the improvement of student learning and student success in mathematics. Using data from 2019-20 academic year, our target population includes nearly 7,400 ECU students who are typically placed each year into one of the following mathematics courses: Math 0001/0045 (Intermediate Algebra), Math 1050 (Explorations in Mathematics), Math 1065 (College Algebra), and Math 2228/Math 2283 (Elementary Statistical Methods I or Statistics for Business). This target population includes mathematics courses that are general education requirements and entry-level service mathematics courses for many other majors. Of this number, nearly 1,900 students were placed into a remedial mathematics course which represents 26% of student enrollment into these courses.

We compiled DWF data from Fall 2019 semester for each of the gateway courses since that semester has been the most recent semester not impacted by COVID-19 changes to classroom instruction. Math 1050 DWF rate was 26%, Math 1065 DWF rate was 31%, Math 2228 DWF rate was 19%, and Math 2283 DWF rate was 41%. Through the re-design of ECU course pathways, an enhanced partnership with our already existing Pitt Community College mathematics programs, and with increased university support for this QEP, we anticipate meeting student success in mathematics with the following planned project goals:

Re-design Goal 1: To develop mathematics placement procedures for reliable and accurate placement of all students into three possible gateway path options: 1) remedial math course (Math 0001/Math 0045), 2) gateway course plus co-requisite course, or 3) a gateway course (Math 1050/Math 1065/Math 2228/Math 2283; higher if appropriate).

Re-design Goal 2: To create three co-requisite course offerings to support lower-prepared/lower-performing students while they simultaneously complete their gateway mathematics course. We plan to expand our existing partnership with PCC in the development and implementation of co-requisite course offerings for gateway mathematics courses.

Student Success Outcome Goal 1: To decrease the number of students enrolled in a traditional remedial mathematics course by 10 percent.

Student Success Outcome Goal 2: To decrease the DWF rates in gateway mathematics courses by 5-10 percentage points. The target gateway courses are Math 1050, Math 1065, and Math 2228/Math 2283.

We anticipate working with IPAR to empirically identify and isolate factors most responsible for inhibiting student success in mathematics and will allow opportunities for faculty teaching these courses to reflect and discuss implications from the data so as to inform and adjust instruction.

Relationship to University Mission and Goals:

ECU's Mission statement includes, "... to be a national model for student success ..." We look to help students understand and experience mathematics, as the queen and servant of science. Our QEP supports student success in mathematics by redesigning the path a Pirate might walk toward successful completion of their undergraduate mathematics experience. It balances student success with academic rigor by providing several path options that any one student may follow, based upon their specific background and learning needs. It ensures that appropriate support be given "at the right time" to those who need it. Yet, it does not hinder those students who are ready to move forward. Further, it continues to allow for sequential remediation of students, because, for some of our Pirates, their learning styles need this sequential model.

Our project goals maximize student success by improving retention, graduation rate, and time to degree thereby minimizing student debt; all of which can be found in ECU's "Relation to University Strategic Plan (<https://strategicplan.ecu.edu/our-commitments/>).

Thus, through careful coordination of student placement, data-driven instruction, and our commitment to maximize student success by better preparing them in mathematics appropriate for their "success in their degree programs, in their professional pursuits, and in their role as citizens in an increasingly global society," we contribute toward the reduction of DWF rates, time to degree, and student hours at graduation (Unit Mission of HCAS Strategic Plan).

Available ECU Expertise:

During the 2018-2019 academic year the College Algebra Course Coordinator ran the first co-remediation pilots for underprepared students. The success of these pilots provided the foundation of our proposal, “Remediation of Underprepared Students in College Algebra,” for the UNC System Office Math Pathways grant. Research study sections for this grant are being offered Spring 2021. We believe the results from these research study sections will provide empirical data in support of the co-requisite remediation approach.

An additional pilot began in Spring 2020 and continues through Spring 2021. This pilot is being conducted by the ECU/PCC Mathematics Partnership Director and is modeled after successful corequisite designs utilized by the North Carolina Community College System (NCCCS). Corequisite methods were adopted by NCCCS through the NC RISE Initiative beginning in 2016.

Our current QEP planning team is compiled of mathematicians and mathematics educators from both ECU and Pitt Community College (PCC). It includes senior-level ECU mathematics faculty members in departmental leadership positions (including the department chair and the undergraduate coordinator) and a senior-level ECU mathematics teaching faculty member. Our team also includes mathematics educators in state-wide leadership positions, including the director of ECU/PCC Mathematics Partnership (a PCC mathematics faculty member and ECU part-time instructor who is also the current President of the NC Mathematics Association of Two-Year Colleges), as well as the interim director of NC Early Math Placement Testing.

Should this concept paper move forward, we anticipate our group will expand to include mathematics faculty members who are gateway course coordinators and advising colleagues from other departments.

References:

Boylan, H. R., Bonham, B. S., & White, S. R. (1999). Developmental and Remedial Education in Postsecondary Education. *New Directions for Higher Education*, 1999(108), 87–101. <https://doi.org/10.1002/he.10806>

The Case for Mathematics Pathways: https://dcmathpathways.org/sites/default/files/resources/2019-03/CaseforMathPathways_20190313.pdf

Corequisite Remediation: Spanning the Completion Divide: https://dcmathpathways.org/sites/default/files/2016-08/Corequisite%20Remediation_%20Spanning%20the%20Divide.pdf

Co-requisite Remediation Pilot Study- Fall 2014 and Spring 2015 and Full Implementation Fall 2015:

<https://dcmathpathways.org/sites/default/files/2016-08/Corequisite%20Remediation%20Study%20%28TBR%20report%29.pdf>

Rodgers, K., Posler, B., & Tribble, L. (2011). A Faster Track: Decreasing the Number of Semesters Students Spend in Developmental Mathematics without Lowering Academic Expectations. *Primus*, 21(3), 252–262. <https://doi.org/10.1080/10511970902995708>