

TOPIC: USM P-20: First in the World Maryland Mathematics Reform Initiative

COMMITTEE: Education Policy and Student Life

DATE OF COMMITTEE MEETING: Tuesday, November 15, 2016

SUMMARY: Developmental mathematics is a serious challenge for higher education in general, and in Maryland, in particular. 40% of MD high school graduates who attend Maryland institutions of higher education in the following academic year need remediation. Of those, 90% need remediation in mathematics. (Angela K. Hennenberger, 2016)

USM's P-20 work in mathematics alignment is focused on reducing remediation and expediting students' progress through college developmental courses by redesigning courses to increase student engagement, and by building pathways to mathematics courses that are most appropriate to students' college majors and career aspirations. Remedial math courses impede students' progress to degree completion, increase costs, and unfairly impact the most vulnerable students.

In September 2015, USM was awarded a highly competitive four-year, three million dollar "First in the World" grant from the U.S. Department of Education FIPSE (Fund for the Improvement of Post Secondary Education) to develop new mathematics pathways for students that are aligned with their major programs of study.

This new project has been developed in collaboration with seven community colleges and five USM institutions, and is being heralded as a national model for mathematics reform in undergraduate education. This report describes the project's goals and objectives, and summarizes the first year of work.

ALTERNATIVE(S): This is an information item.

FISCAL IMPACT: This is an information item.

CHANCELLOR'S RECOMMENDATION: This is an information item.

COMMITTEE ACTION: Information Only

DATE: November 15, 2016

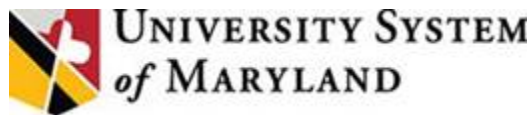
BOARD ACTION:

DATE:

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First in the World Maryland Mathematics Reform Initiative (FITW MMRI) 2016 Annual Report Performance Narrative

Introduction

The University System of Maryland, in collaboration with the Maryland Community Colleges and the other private and public institutions of higher education in Maryland, are working to address the mathematics “pipeline” issues that have created a significant bottleneck for postsecondary students. The Maryland Mathematics Reform Initiative (MMRI) is a collaborative effort currently underway between the public four-year USM institutions and the two-year community colleges in Maryland to develop and implement multiple high-quality mathematics pathways for students that are relevant for their chosen career path while also ensuring that the new courses have sufficient mathematical integrity and rigor to be deemed “college-level.”

Our grant from the U.S. Department of Education’s First in the World (FITW) program supports and supplements our statewide work by funding the development, implementation and evaluation of a new developmental statistics pathway leading to a general education statistics course. The twelve partnering institutions—five USM institutions and seven community colleges serving approximately 158,000 new students each year—will be the “early adopters” of the new mathematics pathway, launching their new statistics pathways this Fall 2016. Long term, we hope that the evaluation provides evidence that will allow this approach to be adopted at all of Maryland’s 29 public higher education institutions.

Partner Institutions

- Anne Arundel Community College
- Cecil College
- College of Southern Maryland
- Coppin State University
- Garrett College
- Harford Community College
- Howard Community College
- Montgomery College
- Towson University
- University of Baltimore
- University of Maryland, Baltimore County
- University of Maryland, University College

Progress to Date

FITW MMRI hypothesizes that one significant underlying problem with developmental mathematics course sequences is the “disconnect” between the mathematics content students are learning and the mathematics they need to be successful. The key intervention in the project proposed here focuses on a rigorous pathway in statistical reasoning by creating a single, intellectually-rigorous developmental course that meets the needs of students who are up to two levels below college-level math and for whom algebra is not a requirement, and prepares students for success in college-level statistics.

In the first year of this project, we have been working with all twelve of our partner institutions to support their faculty and staff in creating this new statistics pathway, a new developmental course, and preparing our evaluation plans. Support has included the development of an online portal for networking and communication; two whole-project face-to-face meetings (one in December 2015,

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and one in June 2016); several small workshops both face-to-face and by webinar for faculty, advisors, and data liaisons; monthly “office hours” with experts in the new math pathways work from the Charles A. Dana Center at the University of Texas at Austin; campus visits from our senior advisor, Uri Treisman; and the development of resource library to support the teams with tools, templates, and exemplars from other institutions. In addition, we have convened an impressive advisory council for the project to guide our work, and held our first meeting with them in Spring 2016. *[See Other Documents for a listing of our advisory council members]*

The development of the new pathway has included three major strands of work: curriculum development; institutionalization and implementation; and evaluation. Each is briefly described below with a summary of the status of each strand.

a) Curriculum Development

This work began with the creation and adoption of a shared set of course outcomes for the foundational developmental course to be inclusive of statistics concepts, as well as the shared adoption of the course outcomes for a general education, credit-bearing statistics course. *[See Other Documents section for a copy of the approved course outcomes].*

Once the course outcomes were defined, faculty were supported through consultation with the experts at the Dana Center, and through a course development workshop to source and select course materials and consider innovative pedagogical methods for teaching statistics and foundational mathematics skills. In addition, funds from the FITW grant supported faculty in attending conferences and workshops to support their readiness to teach this new pathway. Faculty spent spring and summer 2016 developing their courses, and the first courses launched the week of August 29th as classes began for the Fall 2016 semester.

Fall 2016 Enrollments by Institution

Institution	Number of Sections	Number of Students
Anne Arundel Community College	2	36
Cecil College	30	331
College of Southern Maryland	3	25
Coppin State University	1	13
Garrett College	2	40
Harford Community College	3	74
Howard Community College	3	45
Montgomery College	4	95
Towson University	8	179
University of Baltimore	2	40
University of Maryland, Baltimore County	2	81
University of Maryland, University College	N/A	N/A*
TOTAL	60	959

**UMUC is still developing course materials and will launch their new course in Spring 2017.*

**First in the World Maryland Mathematics Reform Initiative (FITW MMRI)
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Each of our twelve partner institutions has developed and is actively implementing an institutional strategic plan for how they will create a new pathway at their institutions and determine for which students this new pathway is most appropriate. These cross-functional, cross-institutional teams included faculty, advising, placement, registrars, enrollment staff, and College leadership. Each institution's plan included strategies for gaining buy-in across campus, communicating about this work to faculty, staff, and students, developing the new courses with high level of rigor and pedagogical innovation, advising students on the appropriate pathways, and collecting the data needed for the evaluation.

According to our FITW MMRI theory of action, this pathway will be more appropriate, more relevant, and more useful for students who are either undecided about their major or whose college major relies on a fundamental-studies statistics course either in place of, or in addition to a traditional college algebra course. A significant amount of time, therefore, was spent at each institution to meet with their stakeholders across the disciplines to determine which majors and programs of study required college algebra and which would be better served with this new statistics pathway, and developing clear guidance for advising staff, faculty, and students to be able to support students in choosing the correct pathways *[See Other Documents for sample materials from each institution developed to support adoption and enrollment in their new pathway]*.

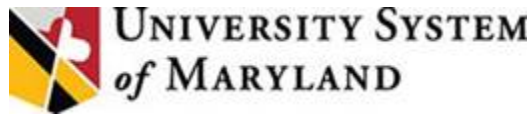
This work will continue into the next couple of years as the new pathway becomes institutionalized at each campus.

c) Evaluation

Our evaluator, Westat, spent a significant amount of time over the course of this first year discussing the evaluation requirements and expectations with our institutions and discussing what student-level data are readily available in order to track their progress and success through the new pathway, as well as the progress of our comparison groups. In addition, each institution received IRB exemption for the collection of anonymized student data over the course of the study. Each institution has assigned a data liaison to work with Westat and provide the necessary data over the course of the evaluation.

Challenges

Our main challenges this first year has been with the short amount of time from when we were awarded the grant to the initial implementation this Fall 2016. In higher education, there is a rigorous and careful process of course and curricular review and approval that often takes more than two semesters to complete. In addition, new processes and procedures needed to be developed at each institution to allow students to complete an alternative pathway of courses to meet their mathematics requirements for graduation, and buy-in needed to be gained from faculty in various disciplines to accept the alternative pathway. This work requires intense collaboration across many areas of the institutions that may not traditionally work together. In addition, establishing course outcomes and creating new courses to meet these outcomes is likewise an intensive process, requiring faculty and academic leaders to hold extensive meetings and manage theoretical, curricular



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and pedagogical conversations about what students need to know and be able to do to be successful in college-level courses utilizing quantitative skills.

Changes

To address these challenges stated above, we have extended our implementation and evaluation timeline to use SY 2016-2017 as a pilot year. This will allow participating institutions adequate time to develop and seek approval for the new course, for staff and college leadership to develop and refine their registration, recruitment, enrollment, and data collection processes, as well as to permit faculty to make needed revisions to their courses during the spring and summer semesters, in advance of generating evidence of its effects.

Westat will pilot implementing the study using administrative data about eligible students who enroll in college for the first time in SY 16-17. The pilot study will follow students for one year and is expected to yield preliminary findings about actual demand for the new course, feasibility of conducting an adequately powered study, whether participating IHEs have adequate capacity to provide needed data, and an opportunity to pilot implementing the evaluation. The main evaluation study will begin in SY 17-18 and will follow students for three years, through the end of SY 19-20. Students entering college two levels below college level math may need more time to advance to college credit bearing coursework than students who enter college one level below. Given this, we will calculate exploratory estimates of the impact on progress through developmental math and credit accumulation for these students.

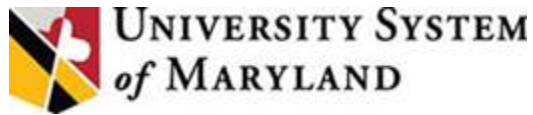
Control/Treatment Groups

Westat (our independent evaluator) will be conducting a multisite quasi-experimental study with matched comparison groups at 12 participating IHE sites to assess student postsecondary outcomes. The goal of the project evaluation will be to generate evidence of the effects of a newly designed developmental statistics course on student rates of enrollment and success in a college-level statistics course, college retention, and persistence towards degree completion when compared to a matched comparison group of students who take traditional developmental algebra courses.

To establish comparable samples for the pilot study and the main evaluation, we will select comparison groups within each IHE by matching treatment students (students in the Stats Pathways course) and students who take traditional developmental courses (Intermediate or Elementary Algebra) on a series of baseline characteristics, such as ACCUPLACER scores (or scores on another continuously scored measure of math achievement), socio-economics status (Pell eligibility), race/ethnicity, enrollment in a community college, and age. Only students with complete baseline and follow-up data will be included in the pilot's analytic sample. A propensity score matching (PSM) technique will be applied as the quasi-empirical "correction strategy" to correct for selection bias when making causal inferences about the impact of the Stats Pathway course on student outcomes. Westat will obtain eligible students' demographic data from the IHEs and identify a comparison group within each IHE based on the matched results.

Evaluation Status

The goal of the project evaluation will be to generate evidence of the effects of a newly designed developmental statistics course on student rates of enrollment and success in a college-level statistics



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course, college retention, and persistence towards degree completion when compared to a matched comparison group of students who take traditional developmental algebra courses.

We have spent this first year refining our evaluation plan with the support of the FITW TA Team, and are pleased with how it has progressed. We are very satisfied with the support and input provided by Westat and by their high quality work in designing a meaningful evaluation that both meets the WWC standards and provides actionable data to our institutions to support student success. We are excited to begin collecting initial pilot data this school year.

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