What Math Skills Do Students Need?

Survey and Analyze to Inform Statewide Policy and Practice

Teresa Dorman, Adam Christopherson, Amy Comerford
Gail Burkett, Bonnie Smith, Paul Atchley, Robert Lenich

College to University Workgroup: Huddle 1
Overview

• **Our Challenge**

• **Recommendation #1:**
  Importance and necessity of conducting a statewide (FCS/SUS) survey

• **Recommendation #2:**
  Next steps and impacts (based on the survey results)

• **Connecting Workgroups:**
  How the survey and results align with and reinforce efforts of several other workgroups
Our Challenge

Communication about desired math outcomes for degree programs

Degree programs identify math courses that must be completed...however...
...however...

How do we know that these courses are teaching the necessary mathematical skills that are relevant to success in the program or the discipline?

To address the ambiguity about mathematical knowledge, our group developed a program-level assessment to determine exactly which mathematical skills – opposed to courses – students need to be exposed to and master in order to be successful in the degree.
With the intention of potentially increasing...

Relevance
The perceived usefulness of a task for helping facilitate one’s goals

Motivation
Increased by relevance and relatedness

Student Success
Strong relationship between students’ motivation and academic performance

http://www.nap.edu/catalog.php?record_id=10421
Recommendation #1

State-Level Practice Recommendation

Survey top-10 degrees within the FCS and SUS institutions regarding the mathematical skills required for academic success in those degrees and preparation for career upon completion of the degree.
Recommendation #2

State-Level Policy and Practice Recommendation

After analysis of survey, submit additional recommendations and strategies that allow students to experience meaningful and relevant mathematics for their program or major as early as possible on their academic pathways.
Survey (R1)
Purpose of Survey

• Intended to help recommend improvements to post-secondary mathematics curriculum across the state

• The purpose of the survey is to gather information from faculty of specific disciplines to better understand which mathematical skills and concepts are needed to prepare students for success in their intended academic and career goals after completion of a two- or four-year degree.
Who to Survey

Top 10 Majors in Florida (by CIP Code):

13.1202 Elementary Education
26.0101 Biology
42.0101 Psychology
43.0104 Criminal Justice
51.0000 Health Sciences
51.3801 Nursing
52.0201 Business Administration
52.0301 Accounting
52.0801 Finance
52.1401 Marketing

40 institutions
(30 FCS, 10 SUS)

52 programs
(AS, BA, BS, etc.)

https://tinyurl.com/C2U-H1Survey
What We’re Asking

• Examine a comprehensive list of 34 mathematical concepts by general area and with details for each area
• Identify concepts that are applicable in, used by, and important to prepare a student for program and career success

https://tinyurl.com/C2U-H1Survey
Dissemination

• Use Qualtrics survey developed by Huddle 1 Team accompanied by system-specific (SUS, FCS) cover letters

• Distribute survey to 40 institutions and 52 programs via identified channels to ensure responses:
  • SUS Data Request System
    • Institutional Data Administrators coordinate survey collection
    • Individual responses tracked in the System
  • FCS email distribution
    • Responses tracked by survey lead
Analysis

• Data available as Excel output
• Approach to analysis already determined by subgroup of Huddle 1 Team
  • Assess data for integrity and validity
  • Using course key of topics and outcomes\(^1\), assess viability of existing courses used by programs as they compare to skills needed
  • Review data for patterns, trends, etc.
• Results will inform strategies to be initiated

\(^1\)Examining eight (8) math/stats courses commonly used in Florida, the team developed a grid of surveyed skills and determined in which courses those skills are presently taught. See: [https://tinyurl.com/SkillByCourse](https://tinyurl.com/SkillByCourse)
The actual strategies to be initiated depend on the results of the survey.

Potential Strategies (R2)

Multiple strategies may be supported, including:

1. Using mathematics pathways or identifying specific courses that a program should require
2. Proposing actions on state policy, statutes, and rules
3. Creating or redesigning specific course(s)
4. Developing state-wide course supplements
Propose Adopting Mathematical Pathways

• Per specific discipline feedback, identify mathematical course sequences or “pathways” needed for the degree
  • Reinforce/ Support the use of prescribed pathways (e.g. Dana Center)
  • Propose new pathways that are appropriate for and specific to Florida degree programs
Propose FL Statute Action (1)

- Florida Statute § 1007.25(3) requires that the Mathematics Foundation of the GEP include a max of five statewide general education core course options.
  - The mathematical foundation statewide courses may need to be modified to revise or include course options that meet specific discipline math needs.
  - The number of statewide courses may also need to be increased (beyond five).

¹The five statewide general education course options are: MAC1105C, MAC2311C, MGF1106, MGF1107, and STA2023.
https://tinyurl.com/FS1007-25
Propose FL Statute Action (2)

- Florida Statute § 1007.25(10) determines the course transfer articulation policy
  - Any changes to courses that are recommended must be accepted anywhere if a student transfers between institutions.
  - May need additional course articulations to ensure course transfer alignment.
  - For program changes that result in new courses, those courses should be added to all institution catalogs.

https://tinyurl.com/FS1007-25
Propose Common Prerequisite Changes

- Florida Statute § 1007.25(5),(6) determines the common program prerequisites
  - Common program prerequisites (FLShines-DLSS) should be reviewed and revised, if necessary, to ensure they include courses that meet specific discipline math needs
- Eliminate multiple prerequisite tracks
  - Make “common” prerequisites common to a program across the state, thus eliminating institution-specific tracks

https://tinyurl.com/FS1007-25
https://dlss.flvc.org/admin-tools/common-prerequisites-manuals

www.floridacollegesystem.com
Propose BOG Regulation/ DOE Rule Change

- BOG Regulation 6.017 and DOE Rule 6A-10.030(2)(b), FAC require six hours of math coursework at college algebra or higher
  - Students may be required to take unnecessary math not relevant to the skills needed by the program
  - Course requirements vary both by courses and institution and meeting the requirement at one institution does not guarantee the requirements are met at another institution
  - The “Gordon Rule” algebra requirement should be removed or revised (e.g. “college-level mathematics\(^1\”))

\(^1\)If “mathematics” is understood to mean both math and statistics courses.
https://www.flbog.edu/board/regulations/regulations.php
https://www.flrules.org/default.asp
www.floridacollegesystem.com
Propose Changes to Required Course(s)
Align offerings with skills and needs.

• Develop/ Incorporate new course(s)
  • Used by multiple disciplines
  • Used by specific discipline
    (e.g. "Math for Nurses" or “Quant Reasoning for Health Professions”)
  • Using existing, multi-function courses
    (e.g. MACX241 and MACX242 Life Science Calculus)

• Revise existing course(s)
  • Ensure necessary content is covered as appropriate for discipline and in appropriate courses
Propose Developing Statewide Modules

• Develop in-course modules (open source, statewide shareable)
  • Applicable to multiple or individual courses
  • Address gaps of mathematical knowledge
  • Discipline-specific applications of the necessary skills

• Potential alternative to new course development
Connecting Workgroups
High-School to Postsecondary Workgroup

Huddle 4: Improving Fundamental Math Concepts and Skills

• Rec #1: Personalized just-in-time brush-up modules covering foundational skills, especially algebraic manipulation and procedural techniques needed for success on current topics.

  We may also propose course modules at the college/university level. Any modules developed should be shared K-20.

• Rec #2 Connect grade/course specific math topics to real-world application and meta-majors

For the top-10 majors, our group’s work will recommend the math skills needed for success in meta-majors.

www.floridacollegesystem.com
FCS Math Sequences Workgroup

Huddle 2: Multiple Sequences/ Pathways

• Rec #2: All public institutions of higher education in Florida adopt multiple math pathways aligned to the meta-majors.

For the top-10 majors, our group’s work will recommend the appropriate courses to include in the pathways.

• Rec #3: Make adjustments to state policy to discourage over-reliance on College Algebra as a default gateway course and to support the implementation of newly defined math pathways.

We need to ensure we align any FCS rule/statute changes to SUS changes: e.g. D.O.E. Rule 6A-10.030(2)(b) (Gordon Rule), revise common prerequisites.
FCS Math Sequences Workgroup

Huddle 4: Advising and Placement

• Rec #2: Institutions system-wide should use meta-major pathways to place students into appropriate pathways.

Huddle 5: Revisit Prerequisites for Commonalities

• Rec #3: College Algebra should only be used as a prerequisite course and not as a terminal course for any degree program.

For the top-10 majors, our group’s work will recommend the appropriate courses to include in the pathways.

The state-wide survey (FCS/SUS) will determine which of the top-10 majors actually need College Algebra.
Huddle 2: Course Alignment

- Rec #2: Develop three College Algebra Tracks or Pathways:
  1) College Algebra for STEM majors
  2) College Algebra for Business and Social Science Majors
  3) College Algebra emphasizing quantitative reasoning for all other majors

Huddle 4: Prerequisite Alignment

- Rec #1: Implementation of math pathways.