

# What Math Skills Do Students Need?

## Survey and Analyze to Inform Statewide Policy and Practice

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*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

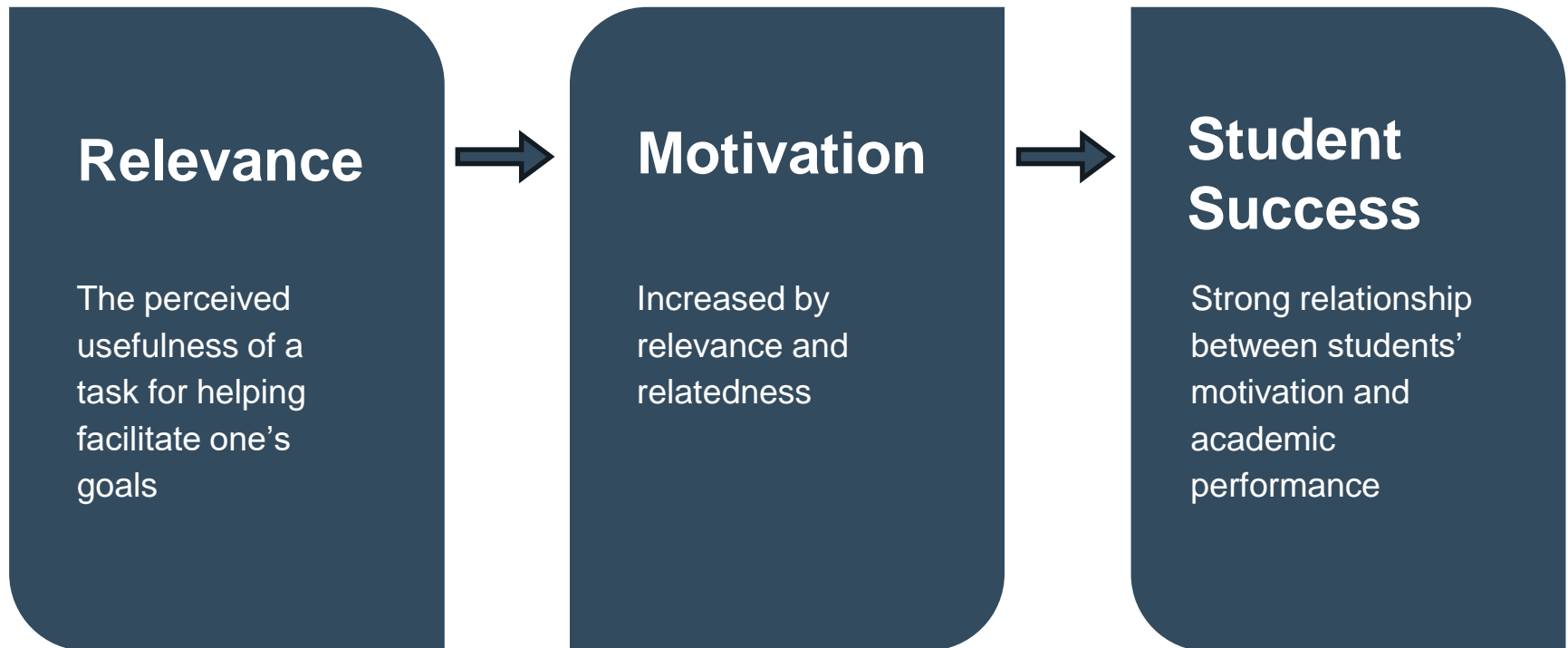
*Degree programs identify math courses  
that must be completed...however...*

*...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?**

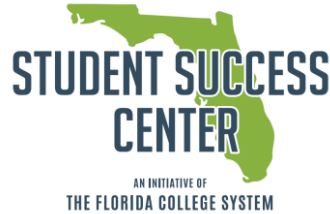
To address the ambiguity about mathematical knowledge, our group developed a program-level assessment to determine exactly which mathematical **skills** – opposed to **courses** – students need to be exposed to and master in order to be successful in the degree.

# With the intention of potentially increasing...



National Research Council: Committee on Increasing High School Students' Engagement and Motivation to Learn. (2003)

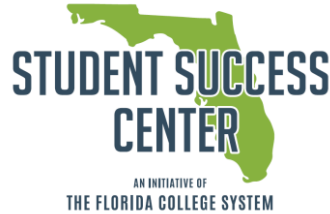
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# Recommendation #1

## 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.)



## Mathematics Re-Design Workgroup Florida College System to University Alignment

This survey was developed as a part of a Florida Mathematics Re-Design Workgroup and is intended to help recommend improvements to post-secondary mathematics curriculum across the state. Mathematics faculty, administrators and key stakeholders are participating in inter-connected workgroups to align mathematics topics, skills, and pathways that best prepare students for their intended academic and career goals. Ultimately, these workgroups are poised to develop recommendations for state and institutional policy and practice regarding mathematics with a focus on increased student and programmatic success.

The purpose of this survey is to gather information from 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 the two- or four-year degree. To do this, the survey examines 34 mathematical concept areas and asks you to identify which skills are relevant to your degree. Enclosed with this cover letter is a PDF of the complete survey, so you can preview what is being asked and determine to whom it should be distributed. Please distribute the survey as broadly as needed. Because of its comprehensive nature, this survey will take some thoughtful time to complete, so please allow 15 to 30 minutes to respond to the questions.

We seek input from faculty or individuals who can answer questions about the usefulness and necessity of mathematics and math-related skills in the following associate and bachelor's degree areas:

**Biology**  
**Business** (specifically: Accounting, Business Administration,  
Finance, Management, and Marketing)

**Criminal Justice**

**Elementary Education**  
**Health Sciences**  
**Nursing**  
**Psychology**

Every institution in the Florida College System (FCS) and the State University System (SUS) that offers degrees in the above disciplines is being asked to complete this survey. If you have knowledge of and can provide responses for more than one degree program, or if your degree has tracks (or focus areas) with different mathematical skills, you will be able to complete more than one survey.

You may be able to complete this survey yourself, but if not, we ask that you please distribute this survey to all appropriate individuals within your institution who can complete it. This may include faculty who are course or program coordinators in the disciplines identified above, discipline chairs or heads, and anyone else who understands the importance of mathematical skills in the above listed disciplines. This survey can be completed by more than one person at your institution. Please review the PDF of this survey to help determine who should complete it.

To start the survey, click below or copy and paste the link to your browser:  
[http://ucf.qualtrics.com/jfe/form/SV\\_8c8kTJIDoGR6KzP](http://ucf.qualtrics.com/jfe/form/SV_8c8kTJIDoGR6KzP)  
The survey is available until midnight, **May 3, 2019**.

Thank you for your willingness to participate. Your responses will help us guide discussions of mathematics in the state of Florida. If you have any questions or need further clarification on the math skills listed, please contact the Florida Mathematics Re-Design Workgroup representative, Dr. Teresa Dorman (teresa.dorman@ucf.edu).

# 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

## Categorical Data (4 of 34)

- ☐ All
- ☐ Summarize categorical data by constructing frequency tables and relative frequency tables
- ☐ Display categorical data with bar graphs
- ☐ Explore two categorical variables by analyzing contingency tables

## Inferential Statistics (12 of 34)

- ☐ All
- ☐ Understand statistics as a process for making inferences about population parameters based on a random sample from that population
- ☐ Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each
- ☐ Evaluate reports or print media articles based on statistical data

## Quadratic Functions (25 of 34)

- ☐ All
- ☐ Define a quadratic function
- ☐ Graph quadratic functions: vertex, intercepts, maximum or minimum
- ☐ Solve quadratic equations by factoring, using the quadratic formula, and graphing
- ☐ Solving quadratic inequalities

# 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<sup>1</sup>, 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

<sup>1</sup>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>

*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<sup>1</sup>.
  - 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).

<sup>1</sup>The 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.

# 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

## 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<sup>1</sup>”)

<sup>1</sup>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>

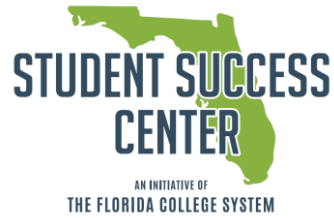
# Propose Changes to Required Course(s)

*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, state-wide 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.*

# 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.

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

*The state-wide survey (FCS/SUS) will determine which of the top-10 majors actually need College Algebra*

# College to University Workgroup

## 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.

*For the top-10 majors,  
the state-wide survey (FCS/SUS) will determine  
which sequence of courses – which pathway – are  
appropriate for a specific discipline/ major*