Idaho State University

Momentum Pathways

Math Pathways and Co-Requisite Support Project Plan

DeWayne Derryberry
Co-Chair

Laura Ahola-Young
College of Arts and Letters

Teri Peterson
College of Business

Cory Bennett
College of Education

Andy Holland
College of Science and Engineering

Michael Matusek
College of Technology

Susanne Forrest
Co-chair

Abbey Hirt
Kasiska Division of Health Sciences

Chris Hunt
Office of the Registrar

Randa Kress
Department of Mathematics

Craig Thompson
Student Affairs

September 16, 2019

ROAR

Table of Contents

Project Team: Math Pathways and Co-requisite Support

COMMITTEE MEMBERSHIP

The project team was composed of staff and faculty from throughout the university with a strong representation from those with a mathematical background.

Co-chairs: DeWayne Derryberry (Chair of Mathematics), Susanne Forrest (Central Academic Advising)

Members: Laura Ahola-Young (College of Arts and Letters), Cory Bennett (College of Education), Abbey Hirt (Kasiska Division of Health Sciences), Andy Holland (College of Science and Engineering), Chris Hunt (Office of the Registrar), Rand Kress (Mathematics), Michael Matusek (College of Technology), Teri Peterson (College of Business), Craig Thompson (Student Affairs)

The committee met May 17, June 19, July 17, August 15, and August 30. The courses required, Math 1123Plus (Math in Modern Society with co-requisite support), Math 1153Plus (Statistical Reasoning with co-requisite support), and Math 1143Plus (College Algebra with co-requisite support) already exist, so our interest was in maximizing the success of these courses.

SUBCOMMITTEE STATEMENTS

PROBLEM STATEMENT

Lacking clearly aligned course offerings, meaningful institutional guidelines, or aggressive advising, the vast majority of our students do not complete a general education mathematics course in their first year. This has an adverse impact on retention and graduation rates.

VISION STATEMENT

Idaho State University will strengthen student retention, and ultimately completion, through clear campus communication and consistent and effective delivery of mathematics courses.

MATH PATHWAYS AND CO-REQUISITE SUPPORT AS PART OF THE SOLUTION

The Complete College America (CCA) initiative has shown that pairing clearly identified math pathways with co-requisite support for mathematics general education courses is an effective strategy for increasing graduation rates. The state of Idaho has found that almost all students are well served by one of three pathways: Quantitative Reasoning (MATH 1123 – Math in Modern Society), Statistics (MATH 1153 – Statistical Reasoning), or STEM (MATH 1143 – College Algebra or MATH 1170 – Calculus).

With co-requisite support, any student should be able to complete one of these courses in their first year of college. MATH 1123Plus (approved by ISU's curriculum council UCC), MATH 1153Plus (approved by UCC), and MATH 1143Plus (proposed to UCC) are all offered at ISU with co-requisite support. We do not believe there is a need to offer MATH 1170 in this format, as all students enrolled in MATH 1170 have completed MATH 1143 or MATH 1143Plus.

If these widely accessible pathways are available, the remaining question then is: *What prevents a student from taking a mathematics general education course in their first year?*

- Students often fear and/or avoid mathematics.
- Students may not know which mathematics course to take, or may waste time in the wrong course.
- Students may face artificial roadblocks.
- Students may fall off track.

STEP 1: GETTING STUDENTS INTO A MATHEMATICS GENERAL EDUCATION COURSE

The University has long recommended that students take a course to satisfy the math general education requirement in their first year. However, a satisfactory strategy to implement this recommendation has never been put forth – any plan restricting the registration of a student without a math course would discourage enrollment and overwhelm advising staff.

However, several committee members suggested that we could offer a modest discount on second-year tuition ($200-$500) to every student who completes their English and Mathematics requirements by the end of their first year on campus. If this reward increases retention as intended it will easily pay for itself, and it will advertise itself through student word of mouth. This incentive would complement a broader campaign to make it widely known around campus that completing the math general education requirement in the first year is the default expectation of all students. Even if we cannot enforce the policy, we can create a culture of clear expectations communicated through advisors and positive incentives.

Although math is something that everyone can do (and that employers rightfully expect of college graduates), many students arrive with negative experiences and expectations that hinder their progress. This may be remedied by advising students toward ACAD 1103 – College Learning Strategies for Mathematics. To reach a broader student population, the Mathematics department should also discuss elements of the ACAD 1103 curriculum such as "grit" and the "growth mindset" in their Plus classes.

STEP 2: GETTING STUDENTS INTO THE RIGHT MATHEMATICS GENERAL EDUCATION COURSE

Of course, it is important that students take the right courses, and to make sure that "the right courses" exist.

Over 50 (list compiled by Chris Hunt) programs at ISU do not direct students toward a specific math general education course. Without guidance, students may delay math enrollment or struggle in courses that are not personally beneficial. The mathematics department and members of the committee will meet with these programs to discuss which courses are most appropriate, and we will encourage programs to communicate these recommendations to their students in degree maps.

MATH 1143 is designed specifically to prepare students for calculus, and doubles as a prerequisite for subsequent requirements in STEM programs. As such, it is already included in degree requirements and is a natural fit for students in these fields. Programs that do not require Calculus should never require MATH 1143, making it a poor math pathway for students outside STEM fields. So what considerations do or should go into their choice between MATH 1123 and MATH 1153?

There are some issues related to MATH 1153 that are worth noting. MATH 1108 has long been the prerequisite for MATH 1153 in spite of the widespread understanding that it is poorly suited for this purpose. (This misalignment is reflected in the fact that MATH 1153Plus classes cover very little MATH 1108 content.) Furthermore, MATH 1108 has a low success rate, so many programs avoid MATH 1153 only to spare students the MATH 1108 prerequisite. This barrier should be removed to encourage students who might use statistics to take MATH 1153, and this will be discussed alongside other placement issues below.

The issues with MATH 1123 run much deeper. While the content and approach of MATH 1153 and MATH 1143 are well defined nationally, the curriculum of MATH 1123 is not standardized statewide, let alone shaped by a nationally consistent model. At ISU MATH 1123 is often taught by adjuncts with minimal guidance regarding content. The usefulness of the course could be improved and standardized by input from the programs that recommend it to their students. Mathematics will meet with representatives of the College of Arts and Letters, beginning in October, to reexamine the content of the course and align it with student needs. Furthermore, the College of Technology has already replaced MATH 1123 with TGE 1140 as the preferred general education course for many of their programs.

Finally, there is not a current math pathway that is well suited for business students, and this appears to be a statewide problem. At ISU we have met with the College of Business and found some interest in creating a 1100-level (non-remedial) course to serve as a pre-requisite for the business statistics General Education course. Such a course could also replace MATH 1108 as a prerequisite for MATH 1153.

STEP 3: REMOVE UNNECESSARY PLACEMENT AND PREREQUISITE ROADBLOCKS

In order to register for any of these classes students have traditionally needed to place into them by tests or prerequisites, but CCA content experts are skeptical of using many forms of placement. We currently use ALEKS, ACT, and SAT tests for placement.

It is well known that ACT and SAT are poor placement tools for mathematics classes because they fail to isolate the specific competencies that courses build on. To the extent that these tools are successful at discriminating people by race and/or social class, but unsuccessful at discriminating people by mathematics preparation, their use as a filter for mathematics classes can be not only unhelpful but actively problematic.

We should strive to avoid these flawed tools whenever students can readily access better ones such as the ALEKS placement system. For those STEM students whose location prevents them from using ALEKS, we should warn them that the ACT and SAT have limited reliability as a placement tool for mathematics, and we should try to accommodate students with better ALEKS access wherever possible.

When it comes to MATH 1123 and MATH 1153, even ALEKS has little placement value. ALEKS places people on an algebra skill continuum, but because these courses teach material that is not on that continuum the ALEKS placement is potentially meaningless. Worse, the discrimination issues previously mentioned still apply.

It would be nice if there were a placement tool for assessing preparation for MATH 1123 and MATH 1153, but we know of none, and it is possible that no math placement or prerequisite is particularly useful for these courses. Therefore, MATH 1123Plus and MATH 1153Plus courses should require no placement at all. The SBOE is expected to adopt such a policy in the near future, after which the mathematics department will submit the paperwork to UCC at ISU. This strategy aligns with the suggestion by a CCA content expert to enroll everyone in MATH 1123Plus or MATH 1153Plus, and let only those who actively opt out to take the “normal” non-Plus option.

On the other hand, a solid grasp of English is often critical to success in MATH 1123 and MATH 1153 courses in which interpretation of results and stating conclusions is important. We should explore requiring ENGL 1101 as a pre-requisite or co-requisite for these courses, which could improve success rates without delaying math completion beyond the first year.

A second issue relates to MATH 1108, which is a STEM course designed with the sole purpose of preparing students for MATH 1143. Students in the health sciences often take this course only as a pre-requisite for required Chemistry and Biology courses. Is this course useful to them, especially if they plan to take a statistics course that may no longer require it?

Drs. Derryberry and Hill met with Chemistry to discuss this issue, and Chemistry will pilot a CHEM 1101Plus course as an alternative to the current MATH 1108 pre-req. Similar plans to meet with Biology are forthcoming.

STEP 4: KEEPING STUDENTS ON THE PATH

Some students fall off the path to math completion but can be brought back into step with minimal effort if they are identified. The key is to quickly spot students who need a helping hand. Annik Martin of Mathematics and Susanne Forrest of Central Academic Advising are piloting an

aggressive early intervention program in 14 sections of mathematics courses. This effort requires a lot of work and a significant level of engagement from both instructors and the intervening advisor; if successful, it may require extra staff and software to scale up. Anecdotal evidence from Ms. Martin and Ms. Forrest is that this program has had a positive impact.

Our committee also considered the possibility of using the midterm grade reporting software to more quickly identify students struggling or not attending. The idea is to collect information after there is something meaningful for instructors to report, but before it is too late for students to correct course. We envision generating a week 3 or week 4 report on student engagement that could inform advisor action.