

Supporting College and Career Readiness for Each and Every Wisconsin Student (DRAFT)  
*A joint statement of the Wisconsin Mathematics Council, the Wisconsin Association of Mathematics Teacher Educators, and the Wisconsin Department of Public Instruction*

Supporting students in being college and career ready (CCR) in Wisconsin means providing mathematical experiences that prepare all students for adult life with a strong set of mathematical tools. This includes students who will be entering college (in majors with mathematics either in the foreground or the background), students who will ultimately move into careers that require flexible thinking and problem solving, and those who engage in career-focused training to learn a specialized skillset. Recognizing the dynamic and shifting landscape of careers and the trends of the current generation to move flexibly across majors, specializations, and careers, mathematics educators must support a broad preparation that includes mathematics content, practices, and dispositions. In practice, this means providing all students with mathematical experiences that empower them to see mathematics as useful and doable throughout their future lives. In particular, we must avoid sending messages to students about who can and cannot do mathematics, either explicitly through tracking or implicitly through our daily classroom interactions.

This equitable and egalitarian stance towards high school mathematics does not absolve us of the importance of attending to students' future opportunities. One such hurdle is the issue of college entry and the determination of college readiness. Placements in a first collegiate course that are too challenging or not challenging enough in the first semester can have a detrimental effect on time-to-degree and choices of major. In the past, determination of college readiness has focused almost exclusively on high school courses taken, Advanced Placement credits, and written placement tests. In the statement that follows, we describe the process and rationale used by UW System to determine first collegiate course placement in the transition to college, and how that process relates to the mathematics taught and learned in high school. Following this statement, we situate that process in the broader work of supporting all students in becoming college and career ready.

Representatives of UW System agree on the following statement with respect to first-course mathematics placement:

*“The new system-wide cut scores for placement into credit-bearing Algebra courses are aligned with the Wisconsin Academic Standards and so students should expect to place into a credit-bearing course as long as they are proficient in all unplussed standards (not just those for Algebra). Students who believe they are proficient at this level, who have not placed into a credit-bearing Algebra course, and who need to take such a course, should contact an academic advisor to discuss their options. Many students will not need to take a credit-bearing Algebra course to complete their chosen degree program, and those students may still place into an alternative credit-bearing mathematics course with a lower cut score.”*

We now enlarge upon this statement from the following points of view:

1. The general level of mathematics content in a first credit-bearing mathematics course
2. The role of algebra as opposed to more general mathematical experiences
3. The role of Algebra courses in students' college programs
4. The role and interpretation of the UW System mathematics placement test

### **The General Level of Content in a First Credit-bearing Mathematics Course**

It is important to understand that “college ready” in mathematics does not necessarily mean “STEM ready”: students taking a non-STEM college major may need far less (and different) mathematics than future scientists or engineers. College ready for all students means that they will be prepared to engage in credit-bearing collegiate mathematics experiences in support of their intended major. In the UW System, this minimally implicates being prepared for a quantitative literacy course sequence. Meeting the goal of having all students college ready in mathematics does not therefore imply that all college-bound students should take calculus in high school—or even be prepared to take calculus in their first year of college. Future elementary teachers, for example, will be well served if they are prepared to take a *Mathematics for Elementary Teachers* course in their first college semester; potential social science or humanities majors may be best served by an introductory statistics or quantitative reasoning course; and business and accounting majors should be prepared to enter specialized mathematics sequences in their domains related to numeracy, algebra, functions, and statistics. High schools can best serve a diverse set of college-bound students through broad mathematical preparation as compared to a narrow focus on algebra positioned as preparation for calculus. The level and nature of mathematics content required as a prerequisite for these courses is adequately covered by the suite of unplussed standards in the Wisconsin standards.

### **The Role of Algebra as Opposed to More General Mathematical Experiences**

In many high schools at the present time, curriculum structures and course offerings are designed to maximize the number of students taking calculus in Grade 12. (In an increasing number of schools, unfortunately, the goal has become to take Calculus I and II in Grade 11, so that students may take third and fourth semesters of calculus as seniors.) While it is undeniable that a small number of students can benefit from this experience, an inappropriate emphasis on calculus leaves far too many students without mathematical experiences that are meaningful for them, and forces many important and interesting mathematical topics to be omitted from the curriculum entirely, because they are not seen as relevant for calculus preparation. The result of these omissions is that even those students who are successful in calculus in high school have had an impoverished overall mathematical experience. The goal of having all students college and career ready would be better served by de-accelerating and broadening the high school mathematics curriculum.

As noted in the joint Mathematical Association of America (MAA)/National Council of Teachers of Mathematics (NCTM) position statement on Calculus, “Although calculus can play an important role in secondary school, the ultimate goal of the K–12 mathematics curriculum should not be to get students into and through a course in calculus by twelfth grade but to have established the mathematical foundation that will enable students to pursue whatever course of study interests them when they get to college. The college curriculum should offer students an experience that is new and engaging, broadening their understanding of the world of mathematics while strengthening their mastery of tools that they will need if they choose to pursue a mathematically intensive discipline.”

The road to college readiness at the high school level, as well as the set of first courses made available to students upon college entry, must reflect a more broad and diverse view of mathematics. Course offerings in statistics, discrete mathematics, and modeling can provide late-career high school students with opportunities to deepen their mathematical

skills and develop strong problem-solving approaches and dispositions. At the collegiate level, meaningful first-year courses should build on and deepen students' problem solving and sense of mathematical inquiry while preparing them for specialized mathematics courses as appropriate for collegiate career paths.

### **The Role of Algebra Courses in Students' College Programs**

As stated above, many college students will not need a college-level algebra course in order to complete their degree. While it is impossible and inappropriate to decide a student's degree path too early, it is possible for students to decide for themselves whether they will likely choose a degree that will require knowledge of algebra, or more advanced mathematics. Students should not take an Algebra course in college as the default, or because it "opens doors" that they are unlikely to want to walk through. Rather, they should decide on their broad course of study--science, humanities, social work, business, etc.--and choose the mathematics courses that are most appropriate for that course of study. In many cases, these courses will have equal or lesser prerequisites than the first credit-bearing Algebra course, so thoughtful course choices can radically reduce the student's time to degree completion.

In conjunction with this point, it is incumbent upon schools and colleges within the Wisconsin higher education sphere to provide meaningful mathematics options that align well with the needs of students in the major. We advise Wisconsin institutions of higher education to carefully re-examine native mathematics-related course offerings, prerequisites, and general education requirements to focus on algebra where absolutely necessary, and broader quantitative literacy or statistics skills where collegiate-level algebra is not strictly necessary.

### **The Role and Interpretation of the UW System Placement Test**

The UW System Mathematics Placement Test, like other placement exams, has one and only one purpose: to determine students' likelihood of success in existing college courses. The relevant courses are either Algebra courses, or have Algebra courses as prerequisites, which explains the heavy emphasis on algebraic skills on the placement test. The placement test is not intended to provide a summative assessment of a student's high school mathematics learning, and the algebraic emphasis on the test should not be taken as an indication that high school mathematics should focus exclusively on algebra. Indeed, data shows that students who do relatively well on the geometry questions on the placement test are more likely to succeed in their college mathematics courses, including any Algebra courses they may take.

While it is often interpreted as a basic skills test, the UWM System test in actuality addresses mathematical practices and reasoning skills more than may be apparent on the surface. Many problems can be solved quickly by students with good number sense or reasoning skills, when a reliance on memorized procedures would take much longer. In any case, a rich set of mathematical experiences in high school will prepare students for the placement test far better than an over-emphasis on calculation and procedures. Stigler, Given, and Thompson note (What Community College Developmental Mathematics Students Understand about Mathematics, MathAMATYC Educator, Vol. 1(3), May 2010), struggling students tend to use inappropriate computational strategies on any test problem that looks remotely algebraic, even when they are perfectly capable of answering the same problem by reasoning when it is presented to them in a less algebraic form.

### **Concluding Remarks**

The Wisconsin Mathematics Council and the Wisconsin Association of Teachers of Mathematics are both heavily invested in the success of each and every student of mathematics. Students should leave their high school mathematics experiences prepared for the wide variety of college, career, and citizenship opportunities available to them at the close of their secondary education. High schools and colleges in Wisconsin should work in tandem to provide a broad mathematics preparation that includes, but is not limited to, algebra and algebraic thinking. Attending to geometry, statistics, modeling, and quantitative reasoning will provide students with stronger opportunities for success in whatever post-secondary path they choose. Colleges and universities in the state should honor this effort by ensuring that first-year course experiences represent a stronger breadth of mathematical experiences that align well to the mathematics dispositions, concepts, and skills that will be useful in students' careers.