

**The American Diploma Project (ADP) and
Partnership for 21st Century Skills (P21) Leadership Team
English Language Arts & Mathematics Design Teams**

**Recommendations for Successful Implementation of Revised Wisconsin Model
Academic Standards (WMAS)**

Strategies and Needs

In order to successfully implement revisions to Wisconsin's Model Academic Standards:

1. Revise the Wisconsin Model Academic Standards in English language arts and mathematics.

Revision of the Grade 12 standards requires a simultaneous rigorous process be implemented to revise all English language arts and mathematics standards K-12. The standards should reflect consistent content and formatting. In addition, the standards should be vertically aligned through explicit connections. The design team recommends developing grade band standards (e.g. PK-2, 3-5, 6-8, 9-12) as well as developing grade level (PK-8) and course (9-12) expectations. Set forth an appropriate timeline to ensure attainment of quality results.

2. Identify “power” or “essential” standards for classroom instruction and assessment

Cluster performance standards to provide a clear focus for instruction and assessment. Use language more specific than the broad content standards and more general than the specific performance indicators or standards to describe the most important and crucial content of these performance clusters. Show within each grade band (e.g. PK-2, 3-5, 6-8, 9-12) the grade-by-grade progress that is targeted for each “power” standard.

3. Integrate 21st century skills and foster cross curricular connections among disciplines

Embed essential skills that cross all disciplines by creating related standards for each discipline; embed the essential skills in the context of each content standard by adding integrated performance standard(s); and/or provide specific unit-level examples through grade-level guidance in a “Foundations” guide. The skills of the framework of the Partnership for 21st Century Skills should be infused into the standards of each discipline.

The design teams are concerned about having a stand alone standard for 21st century skills because of the need for the state to assess all content standards. We are unsure of how state exams would be able to assess skills such as creativity and innovation. Preliminary thoughts about how these 21st century skills might be embedded in the strands are provided via examples in the standards revision document. For mathematics, we recommend that the skills of the framework of the Partnership for 21st Century Skills be infused into the Mathematics Process Standard A unless their specificity suggests that they should be included within a particular content strand.

4. Align assessments with standards and develop a meaningful system of accountability

Evaluate the timing and content of high school and college assessments (e.g., WKCE and UW System Placement) to ensure alignment between standards and the assessment. It is critical that assessments are revised to reflect the changes to the standards. Use meaningful indicators of progress, formative assessments, and curriculum-embedded measures as elements of a PK-16 state system of accountability.

5. Promote comprehensive, varied and authentic assessment

Promote a balanced and student-focused assessment system at the local level that values deep mastery, thematic integration, metacognitive awareness, and skills alignment as expressed in the standards, employing:

- formative assessment
- performance-based assessment
- student portfolios
- technology enhanced assessment

In mathematics, particularly, attention to technology-enhanced assessment should address far more than whether calculators are allowed on portions of tests; it should include consideration of the extent to which technology affects the subject content, making some topics less important, others more so, and some possible.

Informing teaching and student learning, such assessments provide the means to achieve a meaningful system of accountability.

6. Facilitate high school students' transition to postsecondary credit-bearing coursework

Enhance communication between the PK-12 system, the two- and four-year colleges and universities, the technical colleges, and business and industry, in order to:

- Identify the common competencies for admission to college-level, credit-bearing coursework in English language arts, mathematics, and other disciplines, based on policies, curriculum, and coursework at Wisconsin Technical Colleges, University of Wisconsin campuses, and Wisconsin's private colleges and universities
- Help high school students know specifically what is required and how best to be prepared for postsecondary educational opportunities
- Coordinate the curriculum and rigor between high school and postsecondary coursework, facilitating the earning of college credits while in high school and reducing the need for remedial courses in postsecondary institutions.

7. Provide professional development

In order to achieve our vision of high expectations for all, professional development is necessary to enhance the ability of teachers to meet the needs of all students. Professional development must be sustained. Wisconsin's Model Academic Standards provide a focus on the rationale (the "why") and the content of a discipline (the "what"), with strong implications for pedagogy (the "how"). Professional development should focus on a depth of understanding of the subject area content, motivating and helping students to learn, differentiating instruction, and charting students' progress. Provide statewide coordination of professional development for educational leaders, teachers PK-12, faculty and staff within higher education as well as state agencies. Sustained, relevant professional development will ensure the successful implementation of the revisions. Monetary support from the state will be required to assist districts through this transition.

8. Create a portal to resources for teachers and curriculum planners

Provide access for teachers and curriculum planners to sample lessons/units, student work, and other resources that illustrate the pedagogies, assessments, levels of student proficiency, ways of thinking, and college/workplace skills that are identified in the standards documents. Educators need ready access to materials and other resources, organized and filtered by the standards addressed.

9. Involve postsecondary teacher education and content faculty with PK-12 educators

Involve postsecondary content and teacher education faculty plus PK-12 educators in exploring the implications of the new emphases of the standards document in relation to pedagogies—e.g., those that foster collaboration, authentic and applied application of subject area-specific skills, multiple perspectives, multiple learning systems, and higher order thinking skills—and cross curricular connections among English language arts, mathematics, and other disciplines.

Specific to English Language Arts:

1. Maintain the integration of English Language Arts and reading

Specific to Mathematics:

1. Expand time required and provide multiple pathways to meet standards

Presently, it is extremely difficult to achieve the current standards in two credits of high-school mathematics within the existing PK-12 system. With only two credits of mathematics, it would be even more difficult to ensure deep understanding and retention of the additional mathematical content necessary to more closely align WMAS with the ADP Benchmarks. While attainment of appropriate standards is more important than the number of credits required for mastery of the content, the committee recognizes that the proposed revisions—even more so than the current standards- will be difficult to meet with two credits of high school math, and **so recommends a state requirement of at least three credits of mathematics for graduation.** The ADP/P21 Mathematics Design Team recommends multiple pathways for meeting the standards with three credits (might include cross-curricular coursework that meets the standards).

Examples of Options For Meeting the WMAS		
Option A:	Option B:	Option C:
Algebra 1	Integrated Math 1	Algebra
Geometry	Integrated Math 2	Geometry/Trigonometry
Algebra 2	Integrated Math 3	Statistics/Probability
In order to meet the standards, Algebra 2 would begin from the study of quadratics and move beyond. This course should include more statistics and probability than many traditional textbooks. Basic Trigonometry should be included either in Geometry or Algebra 2.	In order to meet the standards, each course should integrate the following strands of mathematics: algebra and functions, geometry and trigonometry, and probability and statistics.	In order to meet the standards, the Algebra course would need to cover topics traditionally introduced in Algebra 2 and not address topics that will be covered in Geometry/Trig and Statistics. Another possibility is to have 1 ½ years of Algebra, 1 year of Geometry/Trig and ½ year of Statistics/Probability.

A suggestion for curriculum mapping should be added to a revised version of the Guide to Curriculum Planning in Mathematics to demonstrate how all of the standards could be covered in a three credit sequence.

2. Encourage continuity of mathematics study

Ideally students *should* study mathematics each year in high school to promote retention of mathematical concepts and to encourage in depth study beyond the standards.

3. Address how to identify a next tier of content in a document of standards intended for all students

Discuss the philosophical and programmatic implications for including standards in the WMAS that are not intended for all students. For example, we have considered creating additional standards for advanced or continuing study in order to better align to ADP. This set of standards would be a narrow focus beyond the required elements. Since calculus is not the goal for all students, we resist identifying such standards as only for “Calculus-bound” students. We further question whether these narrowly focused standards should be included in the WMAS, a document for all students. Another example is those elements of probability, statistics, and discrete mathematics that are beyond the WMAS standards, but are not necessarily calculus prerequisites and could be included in a standards document.

Examples for courses beyond the standards may include:
Pre-Calculus
Calculus
Advanced Placement Calculus
Integrated Math 4
Discrete Mathematics
Advanced Placement Statistics
Transcripted or Dual-Credit Course
Project Lead the Way (Engineering and Mathematics)
International Baccalaureate Mathematics

The standards below are not an exhaustive list as much more thorough analysis is needed; however, the list does provide a sense of the types of topics that would be appropriate for the next tier of study in mathematics, beyond the requirements for all students to graduate high school. Examples of such additional topics from the ADP benchmarks are as follows:

B.12.4

- explain why the graph of a function and its inverse are reflections of one another over the line $y = x$
- recognize, define, and perform operations with rational exponents, including the use of properties

B.12.8

- Complex number operations should be added to requirements for calculus bound students

C.12.2

- use the standard formula for the area of a triangle, $A = \frac{1}{2}bh$, to explain the area formula, $A = \frac{1}{2}ab\sin C$ where a and b are the lengths of two sides of a triangle and C is the measure of the included angle formed by these two sides, and use it to find the area of a triangle when given the lengths of two of its sides and the included angle

C.12.6 Understand and apply trigonometric properties

- Know that the trigonometric functions sine and cosine, and thus all trigonometric functions, can be extended to periodic functions on the real line by defining them as functions on the unit circle, that radian measure of an angle between 0 and 360 degrees is the arc length of the unit circle subtended by that central angle, and that by similarity, the arc length s of a circle of radius r subtended by a central angle of measure t radians is $s = rt$.
- Know and use the basic identities, such as $\sin^2(x) + \cos^2(x) = 1$ and $\cos(\pi/2 - x) = \sin(x)$ and formulas for sine and cosine, such as addition and double angle formulas.
- Graph sine, cosine and tangent as well as their reciprocals cosecant, secant and cotangent; identify key characteristics.
- Know and use the law of cosines and the law of sines to find missing sides and angles of a triangle.

E.12.5

- understanding the binomial theorem and its connections to combinatorics, Pascal's triangle and probability

F.12.1

- find the sum of an infinite geometric series whose common ratio, r , is in the interval $(-1, 1)$

F.12.2

- combining functions by composition, as well as by addition, subtraction, multiplication and division, in a context as well as abstractly
- using logarithmic properties to solve exponential equations

F.12.3

- solve systems of three linear equations in three variables

F.12.5

- factor polynomials by removing the greatest common factor
- factor quadratic polynomials

F.12.7 Graph ellipses and hyperbolas whose axes are parallel to the x and y axes and demonstrate understanding of the relationship between their standard algebraic form and their graphic characteristics

- complete the square to transform equations