

HIGH SCHOOL MATHEMATICS
AND
HONORS COURSES FOR MATHEMATICS AND SCIENCE
EXECUTIVE REPORT

February 2, 2018

Daniel Nerad, Superintendent of Schools

CURRICULUM BACKGROUND

On January 17, 2017 proposals were made and approved for the new high school mathematics curriculum. Our district's approved curriculum development process was utilized to develop the various proposals. Birmingham Public Schools implemented the new high school mathematics program beginning with the 2017-2018 school year. The new program, to be phased in over three years, replaces the current Algebra 1, Geometry, and Algebra 2 sequence. The new courses of Integrated Math 1, 2 and 3 present the same content as the traditional sequence, but in a different order, and with additional concepts not typically found in algebra and geometry.

What is Integrated Mathematics? Integrated Mathematics refers to the organization of the mathematics students learn. Instead of having separate courses for algebra and geometry, integrated programs present mathematical topics sequenced in ways that help students see both the connections between ideas and the coherence of mathematics as a discipline. This type of instruction is very rigorous and can result in increased student engagement and higher student achievement. The recursive nature of an integrated program provides several opportunities for students to learn concepts over time. These concepts are presented multiple times, in increasing complexity and depth, over the course of the three-year sequence. Not only does this approach to teaching cement the concepts students are learning, but it also lends itself to addressing the concern many experts have regarding material that appears on college entrance exams such as the ACT and SAT. Standardized tests are accessing concepts students learned in Algebra and Geometry, courses that were two to three years before the standardized test in the previous program model, leaving years between learning concepts and using them on the standardized assessment.

Why did Birmingham Public Schools choose to adopt an integrated program? Our decision to shift to an integrated mathematics curriculum reflects our commitment to offering our students the highest quality mathematics program we can envision for all students. That was the reason for moving to this curriculum approach and our need to address our achievement gaps was not the reason for developing an Integrated Math curriculum.

An integrated mathematics program affords students opportunities to focus on developing conceptual understanding and to see how the disciplines of mathematics are intertwined. Organizing mathematics learning around coherent strands of concepts allows students to more easily make sense of mathematics and reason with it to solve problems. Teaching algebra and geometry as separate courses, or even discrete concepts, can leave students with the false impression that they are not related. There is also much more to mathematics than just algebra and geometry. An integrated curriculum provides opportunities to investigate other topics such as functions, probability, statistics, trigonometry, and data analysis.

Was our old math program broken? Our shift in curriculum and instruction is more of a response than a reaction. Our high school mathematics program has been successful for many of

our students. Using traditional measures of success (e.g., ACT, SAT, and AP test scores), mathematics students at Groves and Seaholm have performed well. And yet, while these traditional measures did emphasize procedural and disciplinary fluency, they are changing in response to new standards. Feedback from colleges and employers highlight a different set of skills, both cognitive and non-cognitive, that can, and should be addressed in mathematics classrooms.

In addition, Birmingham Public Schools' Learner Profile highlights skills such as collaboration, creativity, critical thinking, motivation, and communication as valued skills for all our students. Our new program is intended to develop these skills and leverage them to deepen mathematical learning.

Does this new program adequately prepare my child for college? Our new program actually delivers more content than the traditional program it replaces. The new program delivers traditional algebra and geometry topics as well as topics in probability, statistics, trigonometry, and data analysis. In addition, our new program presents the content in a spiral manner, with concepts being revisited in greater complexity and depth as the three-year sequence progresses. Through this approach, students gain a better understanding and appreciation of how mathematics is used. The end result is that students will learn mathematics in more meaningful, durable, and transferable ways. After completing the three-year integrated sequence, students will be better prepared for courses like pre-calculus and statistics, as well as AP Calculus.

How does classroom instruction change in the new program? Classroom instruction will focus on developing a balance of conceptual understanding and procedural fluency. Our new program is a problem-based and student-centered curriculum. Mathematical practices are embedded within lessons that are focused on big ideas and mathematical connections. Guided by a knowledgeable and skilled teacher, students will interact in groups to foster mathematical discourse. Students will become independent learners who excel in reading and writing about, exploring, applying, and communicating mathematical concepts.

MATHEMATICS AND SCIENCE HONORS COURSES

When the high school mathematics curriculum changes were approved we understood that during the course of the 2017-18 school year that staff would continue to meet to finalize a recommendation regarding Honors Integrated Math 2 and 3 courses. In addition, in November, 2017 changes in the K-12 science curriculum were approved. As part of the science curriculum development work, recommendations were also brought forward regarding honors courses.

The following recommendations have been made regarding advanced, honors and Advanced Placement courses in these two areas of the curriculum:

Mathematics

Integrated Math 1 A, B, and C (replaced Algebra 1)

Integrated Math 2 A & B (replaced Geometry and **Honors** Geometry)

Integrated Math 3 A & B (replaced Algebra 2 and **Honors** Algebra 2)

Pre-Calculus A & B (no change)

Honors Pre-Calculus A & B (no change)

AP Calculus AB A, B, & C (no change)

AP Calculus BC A, B, & C (no change)

AP Statistics A & B (no change)

Pre-Algebra A & B (no change)

Math Analysis A & B (no change)

Operations Research A & B (no change)

The rationale for not offering honors options for Integrated Math 1-3 is that the CPM program is much richer, and includes greater rigor, than our previous program. The CPM Integrated Math program builds reading, writing, and mathematical literacy into each lesson and engages students throughout in the Standards for Mathematical Practice. The Integrated Math program offers many entry points into rich, high-demand tasks, thereby challenging our high-achieving students and supporting our struggling learners while building their fundamental learning in the areas of algebra and geometry. Once students complete the foundational courses of Integrated Math 1, Integrated Math 2, and Integrated Math 3, they would ALL have the option of choosing Honors Pre-Calculus or Pre-Calculus. The Honors Pre-Calculus course would prepare students for the AP Calculus BC course, the equivalent of two semesters of college Calculus, while the Pre-Calculus course would prepare students for the AP Calculus AB course, the equivalent of one semester of college Calculus.

Science

Core Biology A & B (combined regular and **honors**)

Chemistry A & B (combined regular and **honors**)

Physics A & B (no change)

AP Physics 1 (no change)

Core Global Systems A & B (new course)

Core Chemistry (new course)

Core Physics (new course)

Anatomy and Physiology A & B (combined regular and **honors**)

AP Biology (no change)

AP Physics 2 Algebra-based (no change)

AP Physics C Calculus-based (no change)

AP Environmental Science (no change)

Astronomy (no change)

Forensic Science (no change)

STEM/Physics (no change)

STEMx Research and Design (previously no regular, only **Honors**)

The rationale for not offering honors options for Biology and Chemistry is that the new standards require a three dimensional approach to instruction that includes the Science and Engineering Practices. Use of these practices as part of the instructional design was the key feature that set the honors and regular courses apart. Elevating the level of our regular classes to engage students in the Science and Engineering Practices increases the rigor of our regular courses to that of a pre-AP level. Having all students together increases the level of discourse, problem-solving, risk-taking, and modeling of all students, including our high-achieving and struggling learners. Continuing options for all AP classes provides students with a valuable first-year college level course that provides students additional opportunities to gain expertise in science.

Communication about Honors

As indicated, with mathematics it was the intention of our district to study and finalize a recommendation concerning honors courses during the 2017-18 school year. While this was the intent, in our Frequently Asked Questions document the following was described:

Will students still have an option of taking honors-level mathematics classes?

Yes, the high school mathematics program will still have honors courses. Students in the advanced math program in middle school will begin the integrated sequence in eighth grade, taking Integrated Math 1. Eighth-grade teachers of advanced students will continue to recommend whether a student enter high school in Integrated Math 2 or Honors Integrated Math 2. Students taking our college prep sequence in middle school will begin the integrated sequence in ninth grade. These students, in consultation with their teachers, will have the opportunity to move into and out of the honors program during high school.

This statement on our district's part has contributed to misunderstanding about our intentions and has resulted in parents and students believing that honors courses would continue in the manner they have in the past.

In addition, the curriculum planning process examined and researched the concept of heterogeneous mixing of students in core courses. This research coupled with a review of the curriculum and instructional practices in the Integrated Math program resulted in the recommendations regarding honors courses.

That said, it appears based on the feedback we have been provided, that there presently lacks a common understanding and acceptance of these research findings and the District's rationale for making the recommendation to have heterogeneous mixing of students and to not have honors courses for Integrated Math 2 and 3. The current situation is contributing to a mistrust of our district which needs to be addressed in how we proceed.

RECOMMENDATIONS

1. Continue with our implementation of the Integrated Mathematics curriculum at the high school level with the following recommended improvements:

- Engage parents in dialogue sessions/forums specifically around Integrated Math.

Work with the Communications and Family Engagement Department and Teaching and Learning Departments to develop dialogue/forum sessions. There is a need to design an effective format for these discussions, perhaps with facilitation support, and finalize a schedule for these sessions. Leadership Team members will be present to assist in noting the concerns of our parents and what actionable steps need to be taken, in the interim, as a result of these sessions. As part of this work, there is a need for additional information about the Integrated Math Program. For example, there exists misunderstandings about students teaching students, teachers not providing direction instruction and group grading that need to be clarified. There is also a need to address the needs of parents and students who feel there has been a decline in grades as part of the Integrated Math curriculum.

- Continue support for Integrated Mathematics teachers.

Integrated Math 1 teachers attended in-district visioning sessions and planned professional development in preparation for the shift in instruction that accompanied CPM Integrated Math. All teachers attended four days of intensive training led by a CPM facilitator during June, 2017. Three additional full-day professional learning sessions occurred during this school year focused on the mathematics presented and instructional tools needed for upcoming units.

We will increase the frequency and focus of professional development around the integrated approach. Based on feedback, we have added professional learning session on January 31st, as well as a previously scheduled session on February 9th. Also, we will continue to support our teachers learning through teacher labs and classroom observations. A top priority will be focused on this work and we will utilize internal and external resources in a coaching capacity in classrooms.

There is also a need to finalize a plan for professional development for the teachers of Integrated 3, which we expect to be established by the spring of 2018.

- Support students as they continue to transition from traditional Mathematics to an Integrated approach.

We will equip students with the necessary skills and learning strategies necessary to be successful in group work. We also need to provide additional rationale to students on the “why we are doing what we are doing”, as well as encouragement for persisting in this

rigorous content. We will also provide additional direct instruction as students require, and provide more opportunities to develop mastery over time. We are in the process of examining options for this additional direct instruction and when this work is completed we will provide an additional communication. Also, as Teaching and Learning staff works with our teachers, supported by our department heads, additional strategies will be implemented. In addition, grading practices during this implementation will be examined.

- Expand the understanding with our administrators and staff on the rationale for our shift to an Integrated approach for mathematics. There is a need to increase the intensity of communications, both face-to-face and in print, to our staff so they can become better equipped to understand this change and answer questions and concerns from students and parents.
2. As described in recommendation #1, the priority focus for our district at this time should be on the effective implementation of the new high school mathematics and science curricula. We also recognize there is a great deal of confusion and mistrust about the changes in honors courses. To be clear, this change in honors level courses is supported by the administration and our math and science teachers, but now may not be the appropriate time to make this change in honors courses. In addition, better two-way dialogue is needed to develop greater understanding regarding the rationale and cost/benefit of modifying honors courses.
- Pending the completion of a Task Force Study of all advanced, honors and Advanced Placement courses, the District will continue to offer Honors Integrated Mathematics 2 and 3 (the district does not currently offer an Honors Algebra course thus the offering of a math honors course first at Integrated 2) and Honors Biology, Honors Chemistry, Honors Anatomy and Physiology and Honors STEMx R & D courses. Approval of the recommendations from this Task Force will guide future course offerings.
 - This Task Force will study our Advanced, Honors and Advanced Placement courses and make recommendations regarding the future of these courses in our district. For the work of this Task Force, the following will be reviewed and completed:
 - A review of research about these types of courses and an examination of the benefits and limitations of tracking and heterogeneous grouping.
 - Research on best practices to support effective instruction.
 - Instructional methods and programs to address the disproportionality of students with disabilities and students of color in these courses.

-Recommendations regarding these courses across all levels of the school district, including the criteria used for determining advanced, honors and advanced placement courses.

-How and whether these recommendations extend across all curricular areas as a philosophy, or whether these recommendations come with specific subject area recommendations based on research.

This Task Force will be composed of parents, students, teaching staff and administration. There will be input opportunities for parents and students during both the study and recommendation phases of the Task Force. The work of this Task Force will be completed by approximately October 2018 to allow for various recommendations to be reviewed and implemented for the 2019-20 school year.

3. Regarding the revised curricula in the areas of mathematics and science, it has been stated that we lacked transparency in communicating with parents and students. These concerns related to transparency need to be addressed. While there currently is an opportunity for parent and student involvement concerning curricular changes, through the District's Learning and Development Council, that involvement is limited by the small number of parents and students that sit on this Council. In addition, regarding the changes in mathematics and science, we have provided information about the involved changes to parents through a series of meetings. This information sharing, though, has been post-approval of the curriculum.
 - The District will revise the current curriculum development process to embed additional opportunities for parent and student involvement during the planning process itself. The input from these opportunities will be considered in finalizing various curriculum-related proposals prior to recommendations being presented to the District Learning and Development Council, the Superintendent's Learning and Character Development Committee and to the Board of Education. We will also need to develop additional ways to communicate about curriculum changes that are being considered and for those that have been approved. Finally, it is recommended that the District move to a two-month curriculum approval process. The first month, the Board would have a proposal presented as a report and the second month they would be asked to approve the curriculum.