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| **Virginia Board of Education Agenda Item** | **Seal of the Commonwealth of Virginia** |

# Agenda Item: N

## Date: January 28, 2021

### Title: First Review of Approval of the Timeline for the Virginia Mathematics Pathways Initiative (VMPI)

#### Presenter: Ms. Tina Mazzacane, VDOE K-12 Mathematics Coordinator

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## Purpose of Presentation:

Other initiative or requirement. Specify below:

The VMPI team presented during the January 22, 2020 Board of Education (BOE) Work Session, providing an initial overview of the initiative and seeking feedback from board members to further develop proposed changes. The BOE directed Virginia Department of Education (VDOE) staff to solicit feedback from stakeholders. Over the past year, the team has convened meetings to further develop proposed actions and met with multiple groups of stakeholders to collect and analyze feedback related to the proposals. The VMPI team is now updating the BOE regarding progress of the initiative, considerations from select groups of stakeholders, and seeking board member feedback and approval in moving forward with actions to support implementation of the initiative.

**Executive Summary:**
The Virginia Mathematics Pathways Initiative (VMPI) is a joint initiative between the Virginia Department of Education, the State Council of Higher Education for Virginia (SCHEV), and the Virginia Community College System (VCCS). This multi-phased project focuses on ensuring that all students have equitable access to high-quality mathematics instruction by strengthening the articulation between K-12 and postsecondary opportunities. The Virginia Mathematics Pathways Initiative will:

* Improve equity in mathematics learning opportunities for each and every student that builds the numeracy and critical thinking processes needed to make wise decisions in their personal lives;
* Empower students to be active participants in a quantitative world by building mathematical agency and identity;
* Provide experiences where students see themselves as knowers and doers of mathematics;
* Identify K-12 mathematics pathways that will support success in postsecondary education and career opportunities; and
* Establish relationships with multiple stakeholders to identify and align common needs and next steps to advance mathematics education.

**Phase 1** of the project occurred during the 2019-2020 school year. A leadership team consisting of twelve members representing K-12 and higher education institutes (including the State STEM Coordinator and an executive director from the National Council of Teachers of Mathematics) met to establish the scope of work for the initiative. Three teams, an Essential Mathematics Concepts team, a Mathematics Pathways team, and a Communications team, consisting of 15 additional members, were established. Members of the leadership team led these groups to develop

* a draft set of essential mathematics concepts for grades 8-10;
* potential high school mathematics pathways; and
* a communication plan.

**Phase 2** of the project is currently underway during the 2020-2021 school year. The existing leadership team coordinates the efforts of the three teams.

The Essential Mathematics Concepts team met to review the existing 2016 *Mathematics Standards of Learning* and further define a set of essential mathematics concepts for grades 8-10. The team is now seeking feedback from various stakeholder groups to revise the work and will begin creating draft standards and a curriculum framework this spring.

The Mathematics Pathways team is working to develop a two-semester Data Science mathematics course along with planning for future development of Mathematical Modeling and Financial Modeling courses. The team is also holding meetings in February to discuss advanced course outcomes in grades 11-12, possible cross-curricular and career cluster connections, and vertical alignment with the grades 8-10 Essential Concepts.

The Communications team has developed a [VMPI webpage](https://www.doe.virginia.gov/instruction/mathematics/vmpi/index.shtml), which includes a [VMPI infographic](https://www.doe.virginia.gov/instruction/mathematics/vmpi/infographic-vmpi-virginia.pdf) (included as Attachment A), a [VMPI informational video](https://youtu.be/Fz7XElC9jx8), and a link to [VMPI regional webinars](https://youtu.be/siS8jlTcUzo) held in November 2020 that provided general information about the initiative. The team has also coordinated stakeholder feedback sessions, and has collected and organized feedback to help inform the work of the initiative.

A VMPI Phased Timeline of Action Steps has been developed and included as Attachment B. The timeline for this initiative occurs over the course of several years and includes future plans for the development of instructional resources to support the fidelity of implementation and professional learning opportunities for educators.

**Summary of engagement with stakeholder groups on proposed changes**

Seeking the feedback of stakeholder groups regarding the changes proposed in the Virginia Mathematics Pathways Initiative is extremely important to the success of the initiative. Unfortunately, the COVID-19 pandemic slowed down some of the progress in seeking feedback during spring and summer 2020. VMPI webinars and meetings were held with various stakeholder groups from September 2020 through January 2021. Stakeholders providing feedback included:

* K-12 division-level representatives from gifted education programs;
* K-12 division-level and school-based administrators;
* K-12 division-level and school-based mathematics leaders;
* K-12 division-level and school-based counselors;
* K-12 division-level and school-based special educators;
* K-12 school-based teachers;
* Special Education and Student Services (SESS) Council;
* Virginia's Training and Technical Assistance Centers (T/TAC) directors and specialists;
* Virginia educators and administrators from institutions of higher education;
* Students – current and graduated;
* Virginia military students and family representatives;
* State and national mathematics organizations; and
* Virginia business and industry representatives.

Feedback was collected informally during webinars and meetings and formally through a feedback survey that was shared with participants. Stakeholders expressed enthusiasm around the proposed pathways and their potential to expand mathematics course options for students which will allow them to explore their mathematical interests. Positive feedback was received regarding the proposal to identify the most critical mathematics content that students should learn and establish standards and curriculum that promotes deeper understanding of that mathematics. A large number of stakeholders were pleased with the initiative’s proposal for mathematics instruction that emphasizes depth of understanding over procedural memorization, in which students are grouped by mixed ability levels as an effort to dismantle inequitable structures that may currently exist. In addition, feedback also positively reflected upon the initiative’s potential for furthering interdisciplinary connections across the grade levels.

Ensuring that the learning needs of all students can be met in future classroom settings of students with mixed ability levels was a stakeholder consideration. Many stakeholders expressed the need to ensure alignment to the expectations of higher education admissions and teacher education programs. Professional learning for teachers to develop deeper content knowledge in mathematics and stronger pedagogy to support the proposed changes was also raised as an area of consideration by some stakeholders. Some stakeholders had questions about how mathematics assessments might be changed to align with the content and pedagogy changes proposed in VMPI.

The Virginia Mathematics Pathways Initiative proposed plan supports all three priorities set forth in the Board of Education Goals from the 2018-2023 Comprehensive Plan.

## Action Requested:

Other. Specify below:

The Board is requested to waive first review and approve the timeline.

**Superintendent’s Recommendation:**
The Superintendent of Public Instruction recommends that the Board of Education waive first review and approve the timeline to move forward with the implementation of the Virginia Mathematics Pathways Initiative.

## Previous Review or Action:

Previous Review or Action:

Date: January 20, 2020

Action: Presentation during Work Session

**Background Information and Statutory Authority:**
Section 22.1-253.13:1-B of the Code of Virginia states… “The Board of Education shall establish a regular schedule, in a manner it deems appropriate, for the review, and revision as may be necessary of the Standards of Learning in all subject areas. Such review of each subject area shall occur at least once every seven years. Nothing in this section shall be construed to prohibit the Board from conducting such review and revision on a more frequent basis…”

The Virginia Mathematics Pathways Initiative seeks to align proposed changes to the *Mathematics Standards of Learning* with the 2023 scheduled revision of the standardsthat were adopted by the Board of Education on September 18, 2016. Future Board of Education action will be sought to initiate this process.

**Important considerations in response to stakeholder feedback**

The stakeholder feedback received thus far has provided additional insight into many important considerations as the Virginia Mathematics Pathways Initiative continues. Five major considerations were identified that will require additional focus during planning and implementation.

*Shifting from Acceleration to Deeper Learning through Differentiation of Instruction*

The first consideration centers on the examination of current mathematics acceleration practices across the Commonwealth. The purpose and efficacy of existing acceleration practices will need to be analyzed through the lens of equity. Critical conversations will need to occur in order to determine how effective differentiation of mathematics instruction might be used to meet the needs of all students with varied readiness and ability levels. The proposed shift from moving through mathematics content faster to learning more deeply about mathematical ideas and authentic applications will require an explicit course of action. “Mathematics should be taught deeply and in a balanced way, with equal attention paid to procedural fluency, conceptual understanding, reasoning and problem solving and the development of a positive mathematics identity” (Larson, 2017). Beliefs (historical, cultural, and social) about children’s mathematical abilities that might contribute to inequitable practices in mathematics grouping and acceleration will need close examination. Stakeholders who embrace acceleration-based mathematics course options as the sole means of providing differentiated instruction to students may need to be presented with research that informs the long-term efficacy of building deeper mathematics understanding and the need for more equitable practices. The VMPI team will ensure that mathematics learning opportunities for all students focus on essential content that is comprehensive and cohesive and makes connections across the concepts needed for future mathematics learning, without creating gaps in knowledge by skipping or rushing through material.

*Supporting Access to Rigorous Coursework*

A second consideration focuses on providing opportunities to support student access to multiple mathematics pathways. The VMPI emphasizes access to rigorous mathematics opportunities for all students to support their varied post-secondary aspirations. Stakeholder feedback has expressed some specific concerns regarding how the changes would impact students preparing to study in mathematics intensive fields. VMPI leadership teams will ensure that the mathematics course options being proposed provide a pathway to Precalculus and Calculus-level work, while also paving the way for other just as rigorous options that focus on data analysis, mathematical modeling, computer science, or other rigorous mathematics. Creating a balance between the extended mathematics content needed for STEM readiness and ensuring equity and access for all students is a significant focus of the VMPI Team.

It is important to note that post-secondary instruction is undergoing change that is moving it away from stereotypical instruction dominated by lecture and summative exams and carrying it toward more active learning approaches (Catalyzing Change in High School Mathematics, NCTM, 2018). The Mathematical Association of America (MAA), the American Mathematical Association of Two-Year Colleges (AMATYC), the American Mathematical Society (AMS), the American Statistical Association (ASA), and the Society for Industrial and Applied Mathematics (SIAM) have collectively declared that the status quo with respect to undergraduate mathematics education is “unacceptable” and must change significantly (Saxe and Braddy 2015).

*Providing Equity in Readiness and Access*

A third consideration revealed through examining stakeholder feedback further addresses concerns about equity. Equity in instructional settings includes giving students what they need academically when they need it. The VDOE recognizes that all students may not be ready to learn grade level content at the same time and some may need additional support to strengthen and deepen mathematical learning in order to ensure readiness. The identification of students who possess unfinished learning in mathematics and would benefit from such opportunities is currently not consistent across the state or even within school divisions. The VDOE will collaborate with school divisions to promote practices that are working to build classroom and school cultures that have challenged deficit-based beliefs about students’ intellectual abilities and promote the competence and capability of every student. Dismantling inequitable structures that challenge spaces of marginality and privilege are needed to ensure that every student is well prepared with the mathematical literacy they require and deserve for both their future personal and professional lives (*Catalyzing Change in Middle School Mathematics*, NCTM, 2020).

*Teacher Preparation, Licensure, and Teacher Shortages*

A fourth consideration, echoed through stakeholder feedback, addresses teacher preparation programs, teacher shortages, and licensure requirements. Proposed changes to the K-12 mathematics content and pedagogical focus will bring about the need for changes in how pre-service teachers are prepared to enter the teaching profession, along with how current teachers can become better equipped to pivot to the demands of a changing mathematics education landscape. The changes proposed by the VMPI will support interdisciplinary instruction and the development of cross-curricular units for which pre-service and current teachers will need additional professional development. K-12 and higher education mathematics educators will collaborate to ensure that the needs of current and future teachers will be met. Licensure requirements will also be examined to determine if changes are needed to ensure that endorsed teachers possess the knowledge and skills needed to provide rigorous instruction.

Stakeholder feedback also expressed concern about how requiring students to take four years of mathematics in high school might perpetuate current teacher shortages, particularly in smaller divisions or those located in rural areas. The VMPI team is considering options such as regional partnerships in which teachers might be shared across divisions or promoting more options for virtual or blended learning that might alleviate shortage issues.

*Assessment*

Stakeholder feedback also revealed that consideration will be needed to determine how student assessment will be affected by the proposed changes. Student assessment options that meet federal accountability requirements will require some changes to address proposed revisions to the mathematics standards. In addition, stakeholders expressed feedback that the current format of standardized mathematics assessment in Virginia needs to be supplemented by more authentic forms of assessment that support demonstrating deeper learning, application, and synthesis of mathematics understanding. The VDOE must examine the options that are available to move toward a more balanced approach to assessment that might require scoring scenarios that are not currently in use. Strong collaboration among departments at the VDOE will continue in order to pursue the best options to ensure a structured transition.

**Equity considerations for the VMPI**

The Virginia Mathematics Pathways Initiative is focused through the lens of the Profile of a Virginia Graduate. The implementation of an integrated set of Essential Mathematics Concepts in grades 8-10 aligns with the Profile’s direction to emphasize the development of core skill sets in the early years of high school. VMPI is highly aligned with the Profile in establishing multiple paths toward college and career readiness for students to follow in the later years of high school.

VMPI seeks to provide all students with high quality mathematics learning experiences to ensure that students are prepared with the mathematical literacy required to be productive citizens and to be prepared for postsecondary opportunities. These learning experiences must be equitable and inclusive. Structures must be put in place that position every student to be empowered through mathematics, ensuring that all students see themselves as a “knower and doer” of mathematics. Children need regular opportunities to collaborate on challenging tasks, use varied strategies, and focus on sense making. “Children who are identified as black, Latinx, Indigenous, language learners, poor, or with disabilities, along with other marginalized learners, do not have the same access as their peers to access and learn in mathematically powerful spaces” (*Catalyzing Change in Early Childhood and Elementary Mathematics,* NCTM, 2020).

Many of the structures and practices in today’s mathematics education are very established. A comprehensive review of the policies and practices needed to ensure fidelity in implementing the Virginia Mathematics Pathways Initiative will be needed. Updating regulations, including graduation requirements, that seek to redefine structures and practices will require much thought and collaboration among many stakeholders.

**Timetable for Further Review/Action:**
The Virginia Mathematics Pathways Initiative work calls for additional efforts to seek further stakeholder feedback, preliminary work to establish a draft Standards of Learning and a Curriculum Framework for the Essential Mathematics Concepts in grades 8-10, and work to develop several new advanced mathematics standards for the local course development in grades 11-12. Upcoming Board of Education action will be sought to initiate the revision process of the current *Mathematics Standards of Learning.* Additional review and approval will be needed from the BOE on a periodic basis as the VMPI implementation moves forward.

## Impact on Fiscal and Human Resources:

The agency’s existing resources can absorb the responsibility for supporting the work of the Virginia Mathematics Pathways Initiative through the initial implementation phases. This initiative will be implemented over the course of several years. As the initiative progresses, a further impact on fiscal and human resources is expected.

**References:**

Larson, Matt. 2017. “Mathematics Learning: A Journey, Not a Sprint,” blog post, December 20, 2017, [https://www.nctm.org/News-and-Calendar/Messages-from-the-President/Archive/Matt-Larson/Mathematics-Learning\_-A-Journey,-Not-a-Sprint/](https://www.nctm.org/News-and-Calendar/Messages-from-the-President/Archive/Matt-Larson/Mathematics-Learning_-A-Journey%2C-Not-a-Sprint/).

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Saxe, Karen, and Linda Braddy. *A Common Vision for Undergraduate Mathematical Sciences Programs in 2025.* Washington, D.C.: Mathematical Association of America, 2015.