Kentucky Department of EDUCATION

Kentucky Academic Standards (KAS) for Mathematics

Resources to Support Implementation

I want to ensure the instruction within my classroom/school/district is grounded in the *KAS for Mathematics.* What resources are essential to developing clarity around the grade-level expectations within the *KAS for Mathematics*?

Getting to Know the KAS for Mathematics Module

The Getting to Know the *KAS for Mathematics* module starts with familiarizing educators with the architecture of the standards before taking a deeper look at:

- Section 1C: A Closer Look at the Standards for Mathematical Practice
- Section 1D: A Closer Look at the Standards for Mathematical Content
- Section 1E: A Closer Look at the Coherence/Vertical Alignment

Included are a Facilitator's Guide that provides suggestions for structuring each learning session, recommended Discovery Tasks to prompt meaningful investigation of the *KAS for Mathematics* and guidance on talking points to use with the provided PowerPoint. The module has been updated to include resources developed since the initial release and virtual alternatives for many of the Discovery Tasks.

Teacher Testimonial: "I find the KAS document very helpful. Each time I read over a standard and read all the information provided with the clarification section and the Mathematical Practices attached to each standard I learn new information and gain a deeper understanding of what I need to teach in order to help my students learn at a deeper level."

~Teacher, McCracken County

Breaking Down a Standard Resource

Designed to mirror the architecture of the *KAS for Mathematics,* the Breaking Down a Mathematics Standard resource supports clarity by guiding educators to look deeply at:

- the components of the architecture of the standards, contributing to a holistic understanding of the *KAS for Mathematics*
- the instructional implications resulting from that exploration, including the impact on student learning.

Annotated samples are made available for each grade level (K-8) and each conceptual category at the high school level.

Teacher Testimonial: "Diving deep into the standards is a valuable experience that even veteran teachers should utilize. The Breaking Down the Standard protocol makes you really think about how you deliver instruction to meet all components of a standard. Understanding the target of the standard can have huge effect on how you teach the standard. Educators need to be very comfortable with their standards as well as the coherence to previous/future grades."

~Lesli Patten, Casey County

Engaging the SMPs: Look Fors & Questions Stems

As a supplement to the *KAS for Mathematics*, the Engaging the SMPs resource provides guidance on ways teachers can design instruction to allow students to engage in the standards for mathematical practices. Engaging the SMPs resource includes Student Look-fors, Teacher Look-fors and potential Question Stems for each of the eight mathematical practices. This resource is included in Section 1C: A Closer Look at the Standards for Mathematical Practice (mentioned above in the Getting to Know the *KAS for Mathematics* module) for those interested in a deeper exploration of the SMPs.

Teacher Testimonial: "A resource I found most helpful was the Engaging the SMPs. I immediately shared it with my administrators because I had never looked at those in depth before. It broke down each one as far as what to look for and questions to possibly ask. Very helpful document that I believe I and my colleagues will benefit from."

~Patrick Campbell, Marion County

I want to ensure the instructional resources utilized within my classroom/school/district are aligned to the *KAS for Mathematics.* What supports can guide educators through the process of reviewing instructional resources to ensure students have access to grade-level standards, considering how to modify or supplement existing instructional resources when needed?

Mathematics Assignment Review Protocol

A protocol intended to help teachers, leaders, and other stakeholders answer the question, "Does this task give students the opportunity to meaningfully engage in worthwhile grade-appropriate content?" **Note:** This protocol is designed to guide participants through the process of reviewing a **single task/assignment** by examining the alignment with the Mathematical Content alignment, engagement in the Mathematical Practices, attention to Relevance and analyzing Student Performance.

Teacher Testimonial: "This learning was so helpful to me as a classroom math teacher and helpful as I work with supporting other educators in my building. It made me think differently about the assignments I give students and how those relate to the standards and how they push students to higher level thinking. This is an area that we need to be constantly reflecting in as we create and pick assignments for our students. We sometimes see a disconnect to our student's grades and how well they do on other things, but it may be that we are not picking assignments that align with the standards and teaching students what they need to know, or those assignments aren't rigorous enough. This is something I want to do better with in my own classroom."

~Jessica Smiley, Science Hill

Grade Level Samples: Breaking Down a Standard and Assignment Review Protocol

This resource library provides guidance on how teachers seeking clarity around a standard might utilize the Breaking Down a Standard resource and the Assignment Review Protocol collectively to deepen understanding of the standard. When assignments and tasks are of poor quality and/or do not match the intended learning outcomes in both content and cognitive level, the lesson will not provide appropriate evidence of student thinking and cannot be used to measure progress towards learning goals. Section 1D: A Closer Look at the Standards for Mathematical Content (Getting to Know the *KAS for Mathematics* module) has been modified to guide educators through using this resource library. **Annotated samples are made available for each grade level (K-8) and each conceptual category at the high school level.**

Teacher Testimonial: "Just working through the samples and doing one on my own has already started me looking at my own assignments and standards. As I make assignments or activities, some of the protocol questions are popping into my head. At first when [the KDE consultants] said we didn't need to do the formal breakdowns on every standard and every assignment I wondered why. But now that I have worked through them, I understand that I am informally doing these reviews already just having focused in on those areas."

~Tonya Hash, Carroll County

Student Assignment Library

The Student Assignment Library provides examples of student tasks that are weakly, partially and strongly aligned to standards. The sample assignments can be used with the Assignment Review Protocol to develop a better understanding of the tool and how it can be applied to a teacher's own work. Section 1D: A Closer Look at the Standards for Mathematical Content (mentioned above in the Getting to Know the *KAS for Mathematics* module) includes a Discovery Task utilizing the Student Assignment Library within the Opportunities for Extended Learning.

Mathematics Instructional Resources Alignment Rubric

The purpose of this resource is to guide districts and schools through the process of reviewing a **comprehensive program**. Utilizing this tool will support schools/districts in identifying any gaps that may exist when trying to align current/potential curriculum to the *KAS for Mathematics*, allowing schools/districts to supplement where necessary.

Teacher Testimonial: "I have always loved math and now I love teaching it. [This learning] has made me see things in a completely different light. It has made me really look into what I am teaching my second graders and make sure that it is even part of the standards. We use a math program that normally I would just go lesson by lesson, but my thoughts have changed. I now look at the lessons, the assignments, the tests and compare them to the standards before even starting the unit with my students. You think that if it's a curriculum everything should align perfectly, but you come to find that really is not always the case."

~Teacher, Glasgow

I want to ensure the instructional practices utilized within my classroom/school/district are grounded in evidence-based instructional practices. What resources promote the use of evidence-based instructional practices by making direct connections to what those practices look like "in practice" when instruction is grounded in the *KAS for Mathematics*?

Roadmap to Implementing High-Quality Mathematics Instruction

The Roadmap to Implementing High-Quality Mathematics Instruction resources take educators on a journey designed to:

- Ground instruction in the *Kentucky Academic Standards (KAS) for Mathematics*, thus reaffirming a commitment to equitable learning opportunities for all students in Kentucky;
- Support intentional integration of evidence-based instructional practices; and
- Expand educators' familiarity with strategies to interweave the development of social-emotional competencies along with mathematics content.

This resource answers the question, "How do we decide which roads to take through this world of mathematics?" It demonstrates how to cultivate vibrant student learning experiences that incorporate evidence-based instructional practices, while valuing educator expertise and autonomy.
A video orientation summarizes all the components available to support educators engaging with the resource. Educators are invited to explore the Roadmap Overview, the Roadmap itself and the grade-level samples developed in collaboration with Kentucky teachers.

Grade-level samples are available for Grades K-8 and High School Algebra, Functions and Statistics and Probability.

Coach Testimonial: "There is something for everyone on the Roadmap, whether you have been teaching for years and want to highlight part of your craft, or if you are brand new and learning the standards, there are elements that can be taken and applied tomorrow."
~Chase Kirkpatrick, Franklin County

Introduction to the Modeling Cycle Mathematics Module

During a student's mathematics education, the word "model" is used in a variety of ways. Modeling with mathematics might include utilizing manipulatives, demonstration, role modeling and conceptual models of mathematics, all valuable tools for teaching and learning; however, these examples are different from participating in the Modeling Cycle. The *Introduction to the Modeling Cycle* resources will support educators in using the *Kentucky Academic Standards for Mathematics* and the Guidelines for Assessment and Instruction in Mathematical Modeling Education (GAIMME) Report to:

- Explore the components of the modeling cycle;
- Engage in a modeling task through the lens of a student and a teacher; and
- Look for opportunities to incorporate components of the modeling cycle within high-quality instructional resources.

The module slides and facilitator's guide are available now on the Mathematics Professional Learning Modules page.

Mathematics Formative Assessment Lessons

These Formative Assessment Lessons (FALs) were designed by the Kentucky Department of Education and field-tested by Kentucky teachers. These lessons utilize effective instructional practices and strategies based on the work of Dylan Wiliam's 5 Key Strategies for Formative Assessment.

- Concept development lessons are meant to first reveal students' prior knowledge, then develop students' understanding of important mathematical ideas, connecting concepts to other mathematical knowledge.
- Problem-solving lessons are meant to assess, then develop, students' ability to apply their mathematical knowledge and reasoning in flexible ways to non-routine, unstructured problems – within mathematics and with real-world applications. Problem-solving lessons allow for different entry points with multiple strategies and often span several grade levels.

Integrating Social, Emotional and Academic Development (SEAD) within the *KAS for Mathematics*

The focus of *Integrating SEAD within the KAS for Mathematics* is to highlight authentic opportunities for mathematics educators to interweave the development of social emotional competencies with the development of mathematics content. Each grade-level resource includes:

- Connections between the social and emotional competencies established by the Collaborative for Academic, Social and Emotional Learning and the expectations set within the *KAS for Mathematics*
- Design considerations and specific examples of what integrating SEAD might look like within the specific grade level;
- Questions to empower teachers to self-reflect on ways to integrate SEAD within effective mathematics instruction; and
- Questions teachers can use with students to encourage SEAD while also engaging students with the SMPs.
- Guidance to support those engaging in this work at the local level is contained within an overview video providing an orientation to all the components, a facilitation considerations resource and a reflection sheet is provided to support educators in processing new learning and reflecting on instructional implications.

> *Teacher Testimonials: "My students are still re-learning how to "school". I find that I need to examine the standards in a new light and try to make them less esoteric and more hands-on. That means I need to be very clear with expectations and the structure of our activities. This learning is important as I change my focus and approach."*
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> *~Kelly Lindsey, Fayette County*
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> *"I agree. We are not teaching the same type of student anymore. We need to revise how we teach our standards. This work is very important to doing that. Being more intentional with everything we do and teach is key."* *~Ashley Adams, Pikeville*

Evidence-Based Instructional Practices Series

The focus of this professional learning series is to deepen educators' understanding of the six Evidence-Based Instructional Practices and to examine how these strategies can support students in reaching the intended learning outcomes within the *KAS for Mathematics*.

- Establishing the Learning Environment and the *KAS for Mathematics*
- Clarifying and Sharing Clear Learning Goals and the *KAS for Mathematics*
- Explicit Teaching and Modeling and the *KAS for Mathematics*
- Discussion and the *KAS for Mathematics*
- Questioning and the *KAS for Mathematics*
- Meaningful Feedback and the *KAS for Mathematics*

The Facilitation Considerations resource posted alongside each practice contains suggested strategies to engage participants in discussions around the given practice and possible reflection questions facilitators may use to help participants process their learning and begin to think about next steps.

Writing to Learn in Mathematics provides guidance for using writing to engage students in thinking, reflecting and opportunities to apply, extend and develop mathematical skills. Sample tasks are provided for Grade 2 and High School Geometry. This resource is part of the Kentucky Department of Education's Writing Across Disciplines webpage, a page developed by an interdisciplinary team of consultants and home to the foundational document, *Writing Across Disciplines.* *Writing Across Disciplines Foundational Document* contains sample discipline-specific writing tasks in reading and writing, mathematics, social studies, science and visual/performing arts.

Building a Culture of Math Learning [K-12] Professional Learning Experience

Effective teaching of mathematics requires cultivating a culture of math learning within the classroom, encouraging students to take academic risks, to persevere when content becomes challenging, to utilize a myriad of mathematical tools and models to approach new problems, to share their own thinking and to offer feedback on the thinking of others. To cultivate this kind of culture, educators must model the importance of grappling with content to build a deep understanding; they must equip students with the content knowledge and problem solving tools to find multiple pathways to a given solution; and they must facilitate regular opportunities for students to engage in the practices of mathematics. Developed through a partnership between the KDE and Leading Educators, these learning experiences will allow educators to explore instructional moves and connect them directly to the mathematical content and practices within the *KAS for Mathematics*. Each Learning Cycle includes a shared learning session, a planning and practice session and a student progress monitoring session.

I want to ensure my instructional planning considers how to organize and sequence all grade-level expectations within the *KAS for Mathematics*. What resources can support reviewing specific course standards with a focus on organizing standards together in a way that can anchor student learning?

Section 1E: A Closer Look at the Coherence/Vertical Alignment (mentioned above in the Getting to Know the *KAS for Mathematics* module) includes the Discovery Task: Coherence Card Sort can be a great resource for individuals/schools/districts to utilize as they engage in the work of organizing and sequencing local curricula.

Teacher Testimonial: "The coherence section stood out to me. It is important to know what students' prior knowledge should have been to be able to activate their prior learning before the new learning. As well as where learning is intended to move after the lesson. I think vertical planning is crucial in the success of students and helping to close the gaps."

~Whitney Cox, Corbin Independent Schools

Mathematics Course Code Standards documents

Once individuals/schools/districts have reviewed instructional resources for alignment to the *KAS for Mathematics*, including identifying any gaps that might exist or any content listed off grade level, the organization of the mathematics courses, particularly at the high school level, may require revision to fully meet the expectations of the *KAS for Mathematics*. These documents provide information on the available mathematics course codes offered by the KDE.

High School Mathematics Matrix Standards by Course 19-20 and Beyond

The purpose of this document is to provide guidance for educators working to align high school courses to the *KAS for Mathematics*. There is no guidance provided in this document for local curriculum decision-making on how the "Additional Required Standards" will be addressed.

I want to ensure I engage families as partners in the learning within my classroom/school/district. What resources can help encourage families to join in learning mathematics alongside students, empowering them as advocates and inviting them to engage in the mathematics around them every day?

Standards Family Guides

The *KAS Family Guides* (available in English and Spanish) have been developed to help families familiarize themselves with the content of each grade level's standards. Each guide contains a standards overview for Reading & Writing, Mathematics, Science and Social Studies, along with sections devoted to Examples of Your Child's Work at School, How to Help Your Child at Home, Questions You Can Ask Your Child and Questions You Can Ask Your Child's Teacher for each of the content areas. **Written for families,** educators might consider sharing this resource prior to family engagement events to equip families as partners in offering to help students move learning forward.

Coach Testimonial: "We give these to families when they come to our school. The great thing about this resource is that it builds communications between school and home, leading to deeper discussions between families and teachers about what students are capable of rather than families coming in and just receiving a paper copy of a progress report. Families are able to know what questions to ask teachers and students to better support learning at home.

~Jamie Reagan, Wayne County

A Family's Guide to Understanding Student Assessment

This guide was made to help families understand how assessment can support student learning. You will find information about different types of assessment your student might engage in and how each can help your student meet learning goals. This guide includes questions that you can ask your student and their teacher to help you support learning at home. When teachers and families work together, students can develop the skills they will need for life after graduation. **Written for families,** educators might consider sharing this resource prior to family engagement events to equip families as partners in offering to help students move learning forward.

Coach Testimonial: "One reason we find this resource so valuable is because it gives families a tool to understand what an assessment is and why we give assessments at each grade level. We really like that it provides intentional questions for families ask teachers and ask their child about the assessment, rather than asking questions that only get yes or no responses. In addition to improving communication between our school and our community, when teachers know families will be asking these questions it pushes our teachers to take a deeper dive into student data before families come in." *~Jamie Reagan, Wayne County*

Kentucky Family Math Night Resources

The Kentucky Family Math Night Resources have been developed through a partnership among the Kentucky Department of Education (KDE), Regional Educational Laboratory (REL) Appalachia, the Kentucky Center for Mathematics (KCM) and the Kentucky Collaborative for Families and Schools. The resource includes guidance on talking to families about mathematics and includes activities designed to engage a community in learning mathematics.

Parent Testimonial: "I loved the multiple stations that hit all the learning styles. Students were engaged and having fun. It also gave parents and students a ways to collaborate with the school to get everyone on the same page, which helps with the success of students!"

~Kentucky Parent

Summer Support: Kentucky Family Math Games

The Kentucky Family Math Games webpage is a collection of simple, yet engaging games families can play over and over again at home to build mathematical thinking. To help families know which games may be more appropriate for their aged child, they are organized by grade level bands.