KCM

KENTUCKY CENTER FOR MATHEMATICS

Annual Report 2018

CONTENTS

VISION, MISSION AND GOALS

The KCM (Kentucky Center for Mathematics), established by the Kentucky General Assembly in 2006, supports diverse teacher and student populations across the commonwealth. The KCM envisions a world in which everyone is mathematically enlightened and empowered.

This annual report contains highlights of the KCM's statewide work from July 1, 2017 to June 30, 2018. The mission of the KCM is to advance the knowledge and practice of effective mathematics teaching and learning, encompassing early childhood through adult education. We provide and develop statewide leadership, facilitate professional learning experiences, and cultivate innovation with the goal of improving mathematics education, practice and policy. We promote environments which engage learners to allow them to make sense of mathematics. We are grounded in research, centered on practice and focused on learners.

2017-2018 HIGHLIGHTS

Participant Hours
28,384

Course Days
448

Professional Learning Experiences

Fluency Assessments Administered
6,724

Participants
1,708

Events
192

82,254
webpage views

LETTER

FROM THE EXECUTIVE DIRECTOR

Dear Kentucky Math Education Stakeholders,

While in many ways this is a time of change for education in Kentucky, we at the KCM continue to focus on the foundations of mathematics education that remain fundamental for Kentucky children to realize their dreams. Kentucky can only develop the skilled workforce imperative to compete on the national and global stage by assuring that all of our children achieve these skills.

We maintain the belief that Kentucky children are most likely to succeed when provided a coherent mathematics education where:
All Pre-K through postsecondary mathematics education experiences are characterized by a culture of sense making and student engagement;

- Teachers in earlier grades use their grade level mathematics content as a platform for developing the skills that are needed for success in later grades and in the workforce;
- Teachers in later grades reinforce and build upon skills developed in earlier grades;
- Students receiving extra help via intervention or extra sessions outside of class find the extra help pertinent and impactful to their understanding of content and their classroom experience.

In an ongoing partnership with the KDE, KCM has developed a support program for school transformation that includes (a) professional development for select teachers at the school, (b) on-site support for the use of effective teaching practices, (c) resources and guidance for effective professional learning communities, so teachers can learn from each other, and (d) a platform for the growth of school-based mathematical leadership teams. With schoolwide leadership and commitment to a culture of student engagement and problem solving, this support program is powerfully impacting the experience of thousands of students at almost 100 schools participating in the Mathematics Achievement Fund.

We also continue to believe that an understanding of algebra is vital to Kentucky and its children. For a solid numeracy foundation, students must use algebraic thinking to recognize and generalize the patterns, operations and properties of numbers. Development of algebra skills continues to be the best verifiable tool for developing the critical thinking and problem-solving skills needed for academic and career success. Development of these skills improves the probability of a higher paying job and of both entering and graduating from a four-year university. In response to an evolving fiscal and educational landscape, we are changing how we assist teachers in assuring coherence as students transition from a numeracy to an algebraic focus. New online professional learning experiences provide inexpensive but vital support to help secondary schools and teachers connect algebra with foundational numeracy; a critical connection for many students to succeed as they advance beyond elementary school.

To address transitions from secondary to postsecondary institutions, KCM meets with postsecondary mathematics professors and mathematics-teacher educators several times a year. Through these meetings, we are working towards a coherent statewide vision. This includes a plan for coherent postsecondary mathematics education experiences, with a seamless transition from secondary to postsecondary mathematics.

We are proud and honored to work with Kentucky teachers who we consider the most dedicated in the world. Seeing the way that teachers of Kentucky are stepping up at all levels, from pre-K through postsecondary, we at the KCM firmly believe that together we can realize the vision that every Kentucky child receives the coherent, highly effective mathematics education experience they need to accomplish their dreams!

Daniel McGee, PhD

Executive Director

PRESCHOOL

"My students have really enjoyed the lessons I have taken back to them. I have seen a growth in my math assessments and that is an area that was struggling across the board in my classroom."

Foundations for Early Childhood Mathematics

During the 2017-18 academic year, 101 teachers participated in this course which met over eight half day sessions. Leaders in early childhood education at the Erikson Institute developed innovative material that was used in the Foundations for Early Childhood Mathematics professional learning experience. Seven cohorts of participants in this experience explored ways to inspire children's passion for mathematics through developmental discussion and high-impact, evidence-based strategies.

"As a first year teacher, this [course] provided me with multiple opportunities to learn new content and methods to bring back to my students."

ELEMENTARY

"I loved this [course]! It was a great opportunity to learn new things and get some AMAZING resources!"

Foundations for Primary- Second and Third Grades

During the 2017-18 academic year, ten cohorts, totaling 125 teachers, participated in this three-and-a-half-day professional learning experience facilitated by experts in early numeracy development. The course was designed to foster second and third grade teachers' understanding of effective ways to differentiate instruction to better accommodate student needs via a learning climate that welcomes questions, opinions and participation of all students. Course content included how to select instructional tasks that encourage mathematical discourse and help students conceptually understand place value, addition/subtraction, multiplication/division and fractions.

"I love all of the resources that were provided and all of the activities that we are able to implement right away. This is my first year at this new school but I was considered a leader at my old school. Going to KCM has helped me establish myself at my new school and I am super grateful for that."

ELEMENTARY

Foundations for Primary Grades Summer Institute

The one-day Foundations for Primary Grades Summer Institute, designed for graduates of the Foundations for Primary Grades, engaged 2 cohorts of participants with cutting edge work on mathematical mindsets. This session, attended by 42 participants, included methods to reduce math anxiety by focusing on turning student errors into constructive learning adventures.

Kentucky Numeracy Project Intensive Course

The KNPI course, built around Add+Vantage Math Recovery, was designed for elementary teachers to understand and utilize assessments and teaching strategies that advance students' foundational numeracy knowledge, including addition/subtraction and multiplication/division. In the 2017-18 academic year, 92 educators participated in this ten-day course.

Comprehensive Course for Primary

The Comprehensive Course for Primary Grades was designed for classroom, special education and mathematics intervention educators, specifically those working with grades K-2. A total of 124 teachers completed the ten-day, course during the 2017-18 academic year. Six cohorts of educators were immersed in diverse pedagogical strategies which enabled them to assess, support and advance students' mathematical analysis and awareness. Topics of this course encompassed counting and cardinality, number and operations, early algebraic reasoning, conceptual place value, measurement and data, and math/literature connections- all parallel with the research-based strategies of KAS (Kentucky Academic Standards). Teachers received materials and activities designed for ease of classroom implementation, as well as ability to identify student need in early numeracy.

ELEMENTARY

Comprehensive Course for Intermediate

Specifically designed for grades 3-5 teachers, 135 teachers in this course utilized strategies and tools in order to expand their students' mathematical mindsets. Also aligned with KAS guidelines, this ten-day course sought to increase understanding of instruction in the areas of number and operations, place value, fractions and fraction operations, algebraic reasoning, and utilization of KCM Fluency Assessments, which enable the identification of student need. The six cohorts of educators who attended this course left with not only new teaching strategies, but also books, activities and instructional materials.

Foundations for Intermediate

Forty-five participants in this learning experience employed manipulatives and number talks to examine ways in which students are able to develop a conceptual understanding of operations and place value. Over the course of four days, two cohorts of teachers explored topics including number, place value, operations (addition, subtraction, multiplication, and division) and early algebraic reasoning. Number lines were used to support students' understanding of quanitity and operations.

Explorations in 3rd Grade Fractions

Seventy-four teachers participated in this one-day, hands-on course designed to foster conceptual understanding of fractions as numbers, considering 3rd grade is a crucial year for students to develop a foundational understanding of fractions. A coherent model was followed as four cohorts of teachers learned to relate their 3rd grade fraction standards directly from foundations in first grade and continuing into middle school. Manipulatives were given to participants, which enabled them to easily implement learned activities with groups of students.

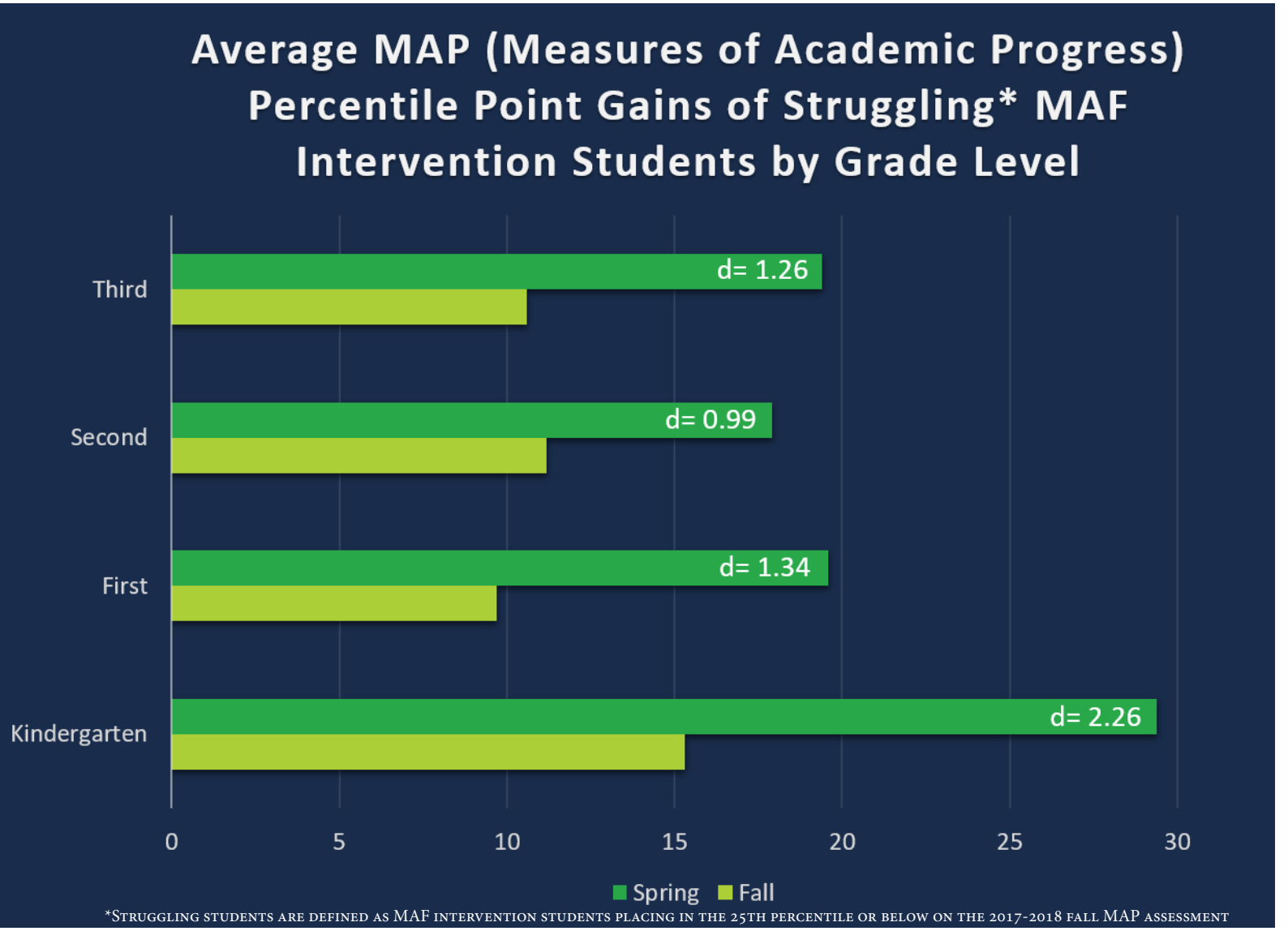
Explorations in Fractions Grades 4 & 5

This course spanned two days in which 49 participants explored the use of manipulatives, fraction models and valuable exercises in ways proven to help students both develop an understanding of fractions as numbers, and make sense of fractional operations. Continuing with a coherent model, two cohorts of teachers participating in this course were able to see how the standards of 4th and 5th grade fractions fit into the continuum from 1st grade to middle school.

MAF

2017-18 Highlights

KCM supports the work of the KDE (Kentucky Department of Education) though MAF (Math Achievement Fund) focused professional learning opportunities, school visits and teacher assistance. Through the MAF grant, schools have access to learning sessions and interventions services for primary students. The MAP (Measure of Academic Progress) assessment was the most common measure of academic progress in MAF schools. At MAF schools, the average growth on MAP from fall to spring semester among students not receiving intervention was 1.4 percentile points. The growth among students that struggle with mathematics* receiving pull-out intervention, however, were 14.1, 9.9, 6.7 and 8.8 for kindergarten, first, second and third graders respectively. The effect sizes of intervention services as measured by Cohen's d were 2.26, 1.34, 0.99 and 1.26 for these grade levels. All of these are very large effect sizes and are indicative of a profound impact as a result of intervention services for students struggling with mathematics. Both the measured percentile growth and the effect sizes, as reflected by MAP data, indicate that the MAF intervention program is highly successful.



*Struggling students are defined as MAF intervention students placing in the 25th percentile or below on the 2017-2018 fall MAP assessment

COACHING

In 2017-18, 60 educators attended KCM's Elementary Content Coaching professional learning experiences. Participants included instructional coaches, teacher-leaders and administrators from 16 school districts. This unique professional learning experience occurred in schools working with real teachers, real classrooms and most importantly, real students. Participants observed a master coach as she publicly co-planned a lesson with a teacher. Then the participants were able to observe students in a live classroom as the master coach co-taught a mathematics lesson. The observed lessons were analyzed and critiqued by the groups. Participants in all of the cohorts engaged in deep thinking about effective teaching and learning with a lens focused strongly on student impact. The Elementary Content Coaching PLE was funded by the Kentucky Department of Education.

Master Coaching

With funding and support from the Kentucky Department of Education, the KCM was again able to offer a unique professional learning experience focused on the development and growth of mathematics instructional coaches. The goal of the Master Coaching program is to develop Kentucky's capacity for improving the teaching and learning of mathematics through skillful instructional coaching. In 2017-18, a new cohort of 14 KCM elementary master coaches was formed. Participants were selected based on an application process. The master coaching participants met throughout the school year, both in person and online, for a total of 24 hours. Additionally, participants were required to document the work they undertook during the year with a teacher partner. The cohort presented a conference session during the 2018 KCM Conference detailing lessons learned during their yearlong learning experience.

14 Participants attended Elementary Master Coaching.

Coaches served as leaders and were awarded designation of Master Coach. **3**

11 Coaches were awarded designation of Elite Coach.

MIDDLE SCHOOL

Foundations 6 & 7

Foundations 6 & 7 was a six-day professional learning experience targeting 6th and 7th grade teachers. The goal of the PLE was to equip the two cohorts of teachers with a deeper understanding of middle grade mathematics content and pedagogy. 44 participants explored how 6th and 7th grade students learn mathematics, evidence-based intervention strategies for use with students who are struggling, and resources and professional knowledge for identifying and analyzing student misconceptions. On the fourth day of the professional learning, administrators were invited to attend as well. The goal of the administrator involvement was to equip not only the teachers, but the principals with the skills to help them bridge the gaps in mathematics achievement. Participants of these sessions used instructional strategies to improve critical thinking, problem solving, and classroom discourse, and explored evidence-based intervention strategies that can be used to help struggling students. They also analyzed student responses and interpreted evidence of student understanding and skills, made evidence-based instructional decisions for advancing students' abilities to fluently and flexibly deal with rational numbers, and received resources such as ready-made activities, manipulatives and books.

MIDDLE SCHOOL

Explorations in Middle School Lessons

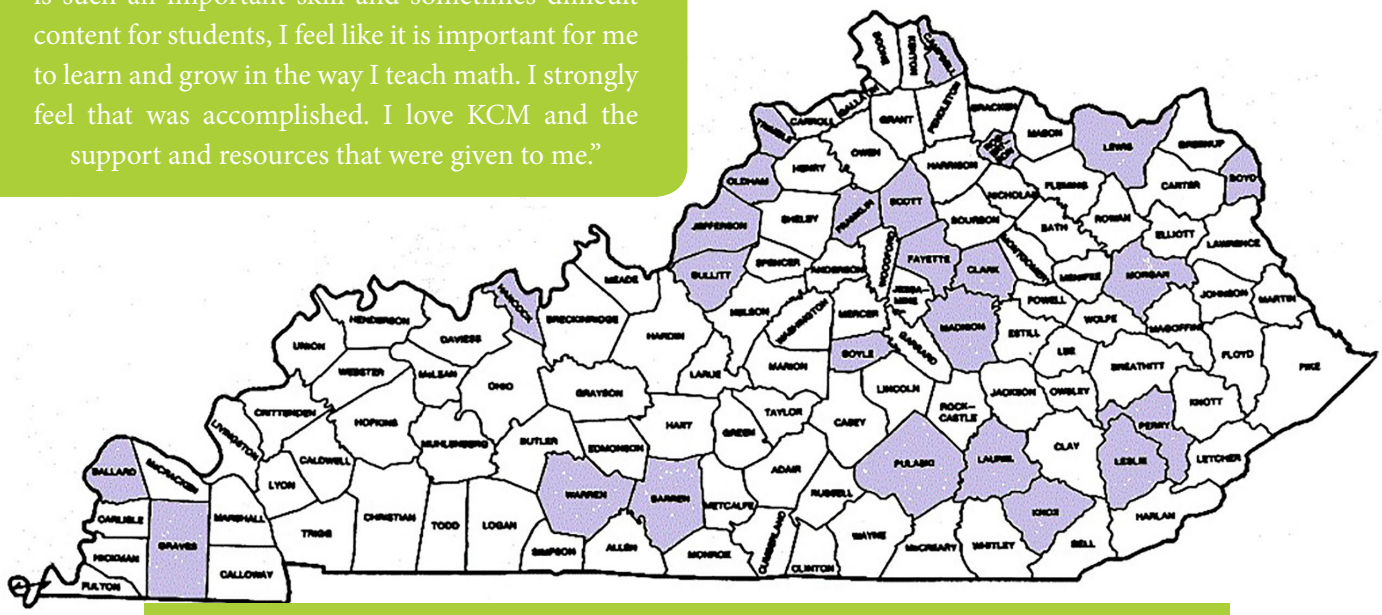
GEOMETRY GRADE 6

ALGEBRA GRADE 8

INTEGERS GRADES 6/7

KCM, with funding from the Kentucky Department of Education, offered three one-day offerings for middle school teachers. These sessions, which were attended by 59 educators, provided opportunities to further explore strategies for supporting students in 6th, 7th and 8th grade mathematics. Targeted sessions, totaling in 5 cohorts, were offered for the exploration of integers, algebra and geometry. In addition to the focus on mathematical content, instructional strategies aimed at critical thinking, problem solving, and classroom discourse were also embedded in these PLEs. At each session, teachers explored how to use visuals and contexts designed to support student understanding of middle school mathematics. Participants received resources such as ready-made activities, manipulatives and books.

"Foundations 6 and 7 has been the most valuable learning experience I have ever attended. Since math is such an important skill and sometimes difficult content for students, I feel like it is important for me to learn and grow in the way I teach math. I strongly feel that was accomplished. I love KCM and the support and resources that were given to me."



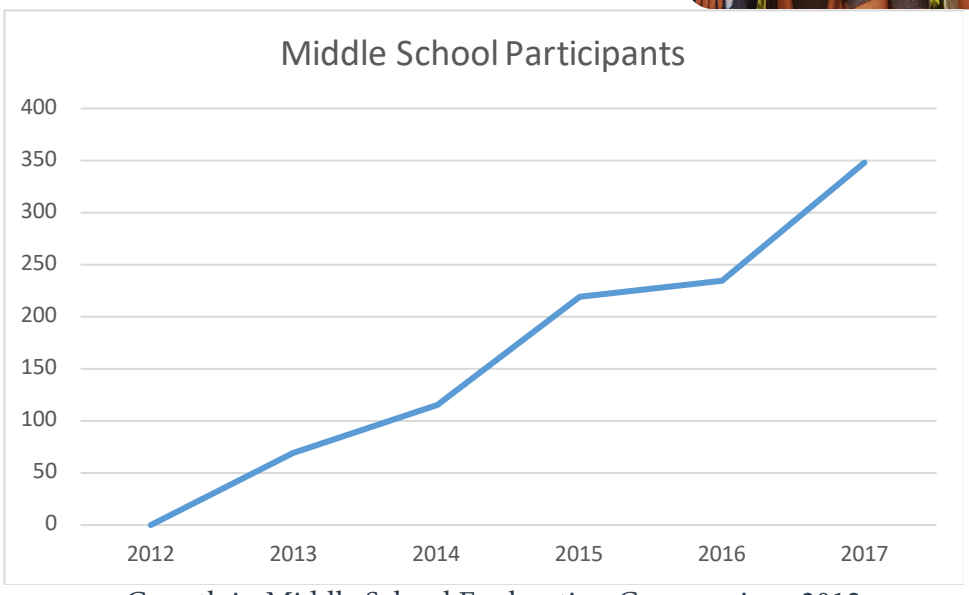
COUNTIES REPRESENTED BY 2017-2018 KCM MIDDLE SCHOOL PARTICIPAN TS

MIDDLE SCHOOL

Explorations in Middle School and Algebra I Lessions

With support from the Kentucky Department of Education, KCM provided two unique professional learning experiences for middle school and algebra I teachers. These PLEs allowed 42 participants to collaboratively plan middle school mathematics and Algebra I lessons. Then, a master teacher taught those lessons in live classrooms as participants observed. After each lesson, the group discussed observations of the lessons with a heavy emphasis on student impact. Additionally, participants deeply explored the mathematics and pedagogical strategies that were addressed during the lessons. The focus of these six days of courses was on developing lessons that allow students to engage in mathematical and algebraic reasoning.

"This has been so powerful to me and has challenged traditional thinking of how a math class should run. I'm excited to see how far my students can go."



Growth in Middle School Exploration Courses since 2012

HIGH SCHOOL

FLIP

Funded by the Kentucky Council on Postsecondary Education and directed by a KCM Faculty Associate, FLIP-EKY is a two-year IEQ (Improving Educator Quality) project. Through video podcasts, educators who participated in this program "flip" at least one unit in at least one science or mathematics classroom. Flipping a unit means that the podcast will be viewed by students as homework, as it will cover course content. Classroom time is then used for discussion, enrichment, exploration and activities that address the Kentucky Academic Standards for Mathematics and Next Generation Science Standards.

"I loved the program as well as all the resources that were given to participants. It makes it much easier for implementation than to just be given the strategies without the materials."

POST-SECONDARY

KCM has created an association of University math department chairs that meet several times a year. The association is currently designing a plan to promote coherence across progressive mathematics courses, transdisciplinary courses where lateral math content connections can be made, as well as fostering productive connections with industry.

KCM also founded the Kentucky Mathematics Education Developers Association which as since evolved into the KY affiliate of the Association of Mathematics Teacher Educators. Through this initiative, a two-year KMET conference has blossomed into an annual workshop.

The Mathematical Teaching Clinical Horizons (MaTCH) was a collaborative effort between KCM, the Council on Post-Secondary Education and NKU. Coordinating with two school districts, Bellevue and Ludlow, KCM provided unique professional learning experiences for in-service and preservice teachers which focused on how to approach grade-level standards in rigorious and engaging ways.

Project TECHNO

Used for online teacher preparation, Project TECHNO (Technology-Centered Mathematical Noticing), encompassed a set of technology-centered learning modules. These modules created a positive correlation between preservice teachers' and their students' mathematical thinking through enabling instructors to attend to, interpret and respond appropriately in areas of numeracy and early algebra. Professional noticing, or responsive teaching, was supported through research as a highly effective way to guide the work of mathematics teachers.

ADULT EDUCATION

"This [course] has been the most useful professional development that has changed the instruction in my classroom!"

Kentucky Skills U

In 2017-18, KCM developed resources to be used by Kentucky Skills U (formerly Kentucky Adult Education) in their on-going professional learning experiences for mathematics teachers. A KCM Regional Consultant designed resources for Kentucky Skills U to use in implementing two full year professional development courses addressing adult numeracy. The materials were designed around the EMPower Everyday Number Sense and Many Points Make a Point curriculum. The focus was on helping teachers of adult learners balance conceptual understanding with procedural knowledge. In the spring of 2018, a Regional Consultant also led a series of in-person and online meetings to introduce the Many Points Make a Point resource.

KCM CONFERENCE

The KCM hosted its tenth annual conference on March 5 & 6, 2018 in Lexington, Kentucky. The theme of the conference, "Ignite: Fueling a Passion for Math," encouraged attendees to build learning cultures that fuel students' passion for mathematical thinking and reasoning.

A record number of 627 attended the conference. They represented preschool through postsecondary institutions, 79 Kentucky school districts and 10 Kentucky postsecondary institutions. In addition, 92 breakout sessions were offered throughout the two-day event.

"The annual KCM conference has always been the best professional development of the year due to the wide range of topics, experiences and grade levels."

KCM ONLINE RESOURCES

KCM has developed an arrangement of online resources and websites for continued support of participating educators. These online resources, which include assessments and research-based activities, are available in a database that can be searched by standard, grade level, fluency benchmark, task group or setting.

KCM Website

The KCM website offers many information resources. The site has an updated calendar and registration links for all KCM courses. Information about the annual conference can be found on the site. Additionally, location and contact information are available for the KCM staff.

Family Math

Family Math is the newest addition to KNP, containing activities for families based on popular exercises from the Intervention Guide. The Family Math website features online games for students and resources for parents to further mathematical conversations at home.

Fluency Assessments

Upon receiving the appropriate training, teachers can utilize fluency assessments. These assess learning of addition, subtraction, multiplication, division and fractions. Graphs and tables are created to chart the student's learning progression.

CLASSROOM IMPACT

Tina Wartman

Principal, Fort Wright Elementary

As a principal, Tina has seen first hand the impact that teachers receiving KCM professional development can have on students. She has seen notable improvement in students' understanding of mathematics practices and problem solving strategies. These improvements are made clear by Fort Wright's K-PREP scores, as thier math proficiency score is in the top 21% of the state. Tina has observed teachers using real-life tasks to engage students and guide them through collaboration and discussion. Through teacher participation in KCM PD, her teachers are "collaborating and sharing strategies to improve student knowledge and achievement." Tina adds that she is amazed by the reach of programming, noting that, "KCM provides a lot of resources, strategies and interventions that can be used with ALL students. KCM has helped Fort Wright Elementary improve student math proficiency and continues to grow student knowledge every day."

Leslie Morris

1st Grade Teacher, Paris Elementary School

Leslie became involved with the KCM after her school received an intervention teacher through the MAF grant. Her engagement with KCM practices shared by the intervention specialist inspired Leslie to seek out further professional mathematics training. "I am, and will, continue to be a huge supporter of KCM's work because it has forever changed my teaching!" Leslie shares. Through KCM professional training, Leslie learned that effective mathematics teaching lies in reasoning, problem solving strategies and enabling students to have opportunities to make mistakes, and then find a new way to solve a problem. Leslie says that KCM has shown her the importance of teaching students "mathematics, not algorithms." Leslie has noticed increased student engagement in her classroom since incorporated KCM strategies, even noting that the students debate and collaboratively create new solutions to problems. Small group instruction has enabled her to "differentiate instruction, provide the support needed for the curriculum and also incorporate many instructional activities and strategies." Leslie has found math games beneficial in developing fluency during group activities. These strategies have made a huge difference in her classroom, even one of her most reluctant learners recently said, "I love school because I get to do math!"

KCM RESEARCH

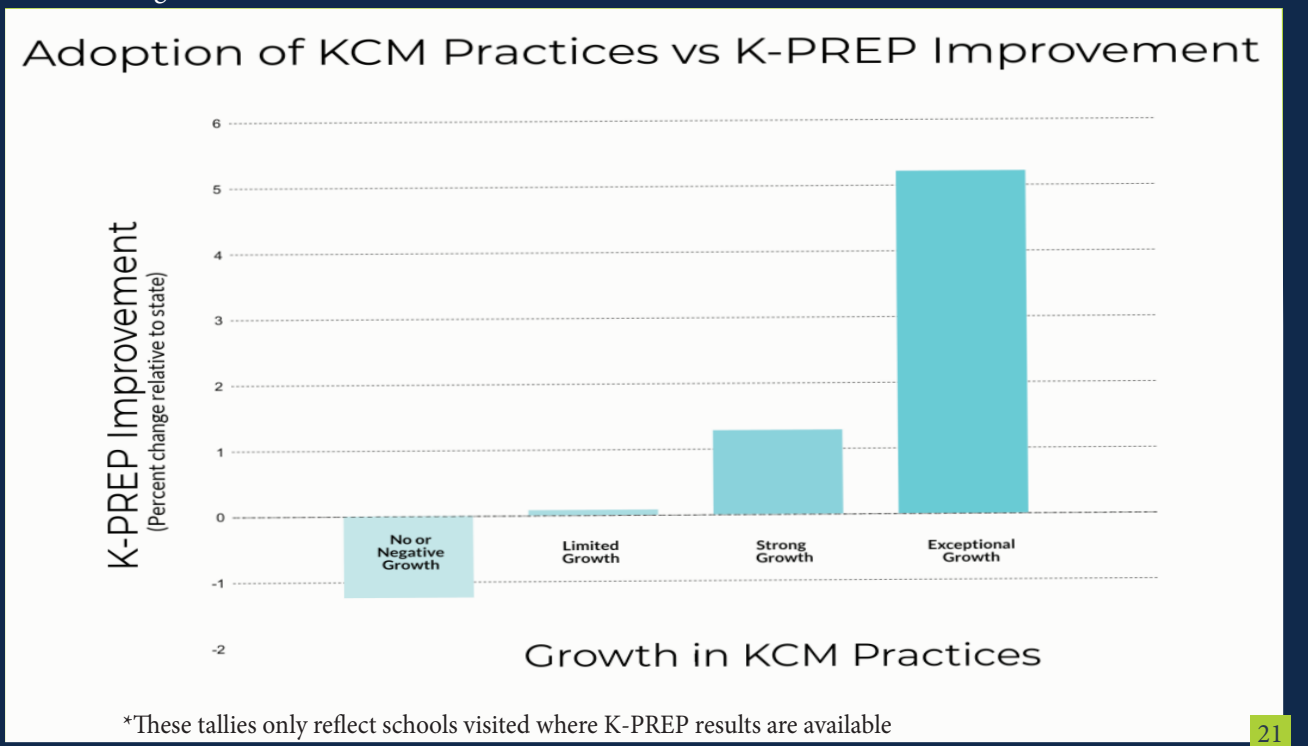
At the KCM, we are hands-on and conduct hundreds of school visits each year. Typically, school visits are performed by KCM Regional Consultants and might include:

- Teaching observation in primary and intermediate grade classrooms
- Teaching observation of pull-out sessions by intervention specialists
- Mentoring sessions with teachers
- School administrator meetings
- Creation and monitoring of goals with school leadership team
- Instructional support and resource-based

In order to monitor growth, school visits include measures to assess commitment and implementation of the research-based practices promoted by KCM professional learning. This measurement reflects:

- Effective teaching practices observed in the classroom
- Promotion of schoolwide change through coaching, co-teaching and/or PD sessions
- Administrative commitment to the school's culture of student engagement and problem solving
- Progression of school and teacher goals

Based on these criteria, each school visit is measured on a five-point scale and school growth is calculated as final school measure less the initial school measure. School growth is categorized as no (or negative) growth (up to 0 point change), limited growth (0 to 1 point), strong growth (1 to 2 points), and exceptional growth (greater than 2 points); in the 2017-18 school year, there were 25 schools with no growth, 26 schools with limited growth, 26 schools with strong growth and 10 schools with exceptional growth.* These results are typical, given that this is the first year of on-site school visits for the current MAF cohort. We expect greater, more consistent growth going forward. The graph below shows how each of the four school growth groups performed relative to the state average (+ = exceeded state average, - = below state average) for the change in the percentage of proficient/distinguished students from 2016-17 to 2017-18. We can easily see that as schools commit to KCM promoted practices, their K-PREP performance grows considerably more than the state average.



*These tallies only reflect schools visited where K-PREP results are available

BUDGET FY 2018

REVENUE	
State Allocation	$1,328,689
Other Revenue Sources (program registration)	$490,622
TOTAL REVENUE	$1,819,311
EXPENDITURES	
KCM Personnel Salary (Full-Time and Part-Time Staff)	$317,635
KCM Personnel Fringe Benefits	$285,789
Faculty (Executive Director, Faculty Associates, Faculty Support for Projects)	$205,222
TOTAL STAFF & FACULTY	$808,646
KCM Student Workers	$62,005
Regional Consultants across the State of Kentucky	$540,003
Other Contracted Personnel (Evaluators, Facilitators)	$115,720
TOTAL OTHER PERSONNEL	$717,728
SUBTOTAL PERSONNEL	$1,526,374
Operating	$334,734
TOTAL EXPENDITURES FY 2017-2018	$1,861,108
Net Operating Loss (funded from previous year funds)	($41,797)

In addition to the above expenditures, the following external projects were entrusted to KCM:

Kentucky Department of Education - Mathematics Content Coach	$45,329
Kentucky Department of Education - Mathematics Master Coaching	$33,903
Kentucky Department of Education - Foundations for Early Childhood	$33,774
Kentucky Department of Education - Foundations for Primary Grades	$82,556
Kentucky Department of Education - Foundations for Middle Grades	$74,586
Kentucky Department of Education - Foundations for Intermediate Grades	$57,997
Kentucky Department of Education - Middle School and Algebra 1	$30,326
National Science Foundation - TECHNO (Technology Centered Mathematical Noticing)*	$16,952
TOTAL GRANT FUNDING RECEIVED FY 2018	$375,423

*previously received awards - funds spent in this fiscal year

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KCM

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