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KENTUCKY JOURNAL OF MATHEMATICS TEACHER EDUCATION

President's Message

COLLABORATION: the action of working with someone to produce or create something.

Oxford Languages

This edition of the Kentucky Journal of Mathematics Teacher Education is a case study in collaboration. Fifteen math teacher educators from eight Kentucky institutions worked together to describe a problem of practice (declining enrollments and completion in teacher preparation) as well as strategies being employed at those institutions to address the issue.

For the past several years, Kentucky schools have opened with at least 2000 classrooms staffed by a long-term substitute or a teacher not yet certified in the subject they are teaching. This is an issue with both short-term and long-term consequences, and it is imperative for Kentucky students and schools that we give this the focus it deserves.

The Stronger as a Group: Kentucky Universities' Recruitment and Retention of Prospective Mathematics Teachers article highlights what individual institutions are doing to attract and retain mathematics education students but with the end goal of addressing the issue collectively. What can we do collaboratively to have more highly qualified mathematics teachers in classrooms all across the Commonwealth?

What's Inside...

A Message from the Editors	iii
AMTE Announcements	iv
Review for KJMTE	iv
KAMTE Board members	v
Upcoming Events	vii
Call for Manuscripts	vii
Stronger as a Group: Kentucky Universities' Recruitment and Retention of Prospective Mathematics Teachers Fortune, et al.	1

I encourage you to share the article with colleagues and discuss the strategies shared by the various institutions. Share your thoughts and other suggestions with the editors or with me- we really are in listen-and-learn-from-each-other mode.

As an organization, KAMTE is invested in providing opportunities for members to- in fact- grow **stronger as a group**. Some ideas we have for this include a gathering where authors present their school's strategies for recruitment and retention. We would love to facilitate a discussion about exchanging successes and brainstorming ways we can capitalize on each other's strengths, becoming stronger as a group and affecting positive change in mathematics education. We are also interested in your thoughts and ideas on this issue. What are other areas where collaboration might make us stronger advocates for our individual teacher preparation programs while improving the state of mathematics education across the Commonwealth? We want to meet this moment with all the viewpoints and resources we can pull together.

KAMTE Save the Dates:

We are pleased to be offering KTMTE Article Roundtables each month this semester as opportunities to learn together. You can see a list of all upcoming roundtables and register for the next one on Thursday, April 17, where Dr. Kristy Litster will discuss her article *Exploring the Purposes of Interdisciplinary Connections in Pre-Service Elementary Teachers' Mathematics Lessons.*

We also hope you will join us for our Spring Preservice Teacher Virtual Conference, scheduled for the morning of Friday, April 11th. Our annual Spring KAMTE Membership Retreat will be Monday, May 19th at the Northern Kentucky Grant County Center. Look for more details about both of these events on the KAMTE website soon.

I look forward to seeing you at many of these events. Please reach out with questions, and especially with ideas for collaboration.

KAMTE Website: https://kcm.nku.edu/KAMTE/

KAMTE Membership Form: https://forms.office.com/r/C3jMa4bir4

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A Message from the Editors

Dear KJMTE Readers,

We are excited to publish a collaborative article in this issue of the *Kentucky Journal for Mathematics Teacher Education* (KJMTE). Kentucky mathematics teacher educators are well aware of declines in teacher preparation programs and to address these declines, their institutions implement programs and events to attract and retain students. For this issue of the KJMTE, we invited mathematics educators from eight different universities in the commonwealth of Kentucky to share their institutions' strategies aimed at recruiting and retaining mathematics teacher education students at all grade levels.

From on-campus events like STEM days and camps for high school students to hosting Educator's Rising conferences to promoting the AMTE Get the Facts Out initiative, Kentucky institutions have committed time and resources to try to attract talented students to the field of mathematics education. It is common for the universities' retention efforts to focus on faculty/student relationships. In this article, you will read details from each of the eight institutions about the recruitment and retention strategies being implemented across the state.

The article ends with a call to action for Kentucky mathematics educators to come together as a group to address the issues and challenges related to recruiting and retaining students in teacher education programs. The authors conclude that we are stronger as a group and as a group we can address the mathematics teacher shortage. What does this collaboration look like? KAMTE is well-positioned to be a vehicle for collaboration and difference-making. We invite all of our readers to learn from other Kentucky institutions and attend KAMTE events in an effort to grow more outstanding and ambitious mathematics teachers in Kentucky.

You may have heard that the KJMTE is hosting monthly article roundtable discussions. At these virtual meetings, authors of articles published in KJMTE facilitate a discussion about ideas presented in their article. This is a meaningful way for our readers to engage with authors and each other about ideas presented in the journal. You can find future article round table dates and registration links on the KAMTE Upcoming Events page.

The KJMTE provides an open forum for both academic and informal discussions on various issues related to mathematics teacher education. Articles will be on the preparation of future mathematics teachers and the professional development of current mathematics teachers. The journal will publish work that appeals to mathematics teacher educators – this includes mathematics educators, mathematicians, teacher leaders, school district mathematics experts, and others. We hope to serve the mathematics teacher education community, and we wish to encourage the development and sustenance of an equitable and welcoming environment for all individuals interested in mathematics education.

We hope that you not only read this and future issues, but that you also submit and review manuscripts for publication. But mostly, we hope that you are inspired to collaborate in the community of Kentucky mathematics teacher educators. We think you will be.

Bethany Noblitt, Ph.D. and Nicholas Fortune, Ph.D.
Co-Editors, KJMTE

AMTE Announcements

The 2026 AMTE Annual Conference will be held in Portland, Oregon on February 5-7, 2026. The call for proposals will be available soon. Check AMTE.net for more details soon. The affiliate breakfast is a fun time for KAMTE members and supporters to meet and enjoy each other. Please plan on joining the KAMTE table if you attend the conference!

The AMTE Connections Newsletter for spring 2025 is available. The newsletter includes highlights from the AMTE 2025 Annual Conference as well as an examination of the use of 5 Practices in methods courses.

Review for KJMTE

The journal's aim is to provide a space for the exchange of ideas to advance mathematics teacher educator practice. The journal welcomes manuscripts that support this aim.

Interested in reviewing for KJMTE? Find out more at KJMTE.org.

Questions about KJMTE? Contact the KJMTE Editorial Team at editors@kjmte.org.

KAMTE Board Members

KAMTE would like to announce changes in the board. First, we extend a warm welcome to Dr. Daniel Clark who joins the KAMTE board as the new President-Elect. Dr. Dee Crescitelli, who has served most recently as the President-Elect, is now the new KAMTE president. Dr. Jonathan Thomas will continue to offer leadership as the Past-President.

Dee Crescitelli, President

Dr. Dee Crescitelli is a Director at the Kentucky Center for Mathematics and teaches as adjunct at Georgetown College and the University of Louisville. She also serves as a Professional Learning Coach for Kentucky Adult Education. She is working to improve mathematics education from pre-K through college. Her teaching experience ranges from elementary through graduate school, adult education, and teacher preparation - threading real numeracy through all those levels.

Daniel Clark, President-Elect

Dr. Dan Clark is a mathematics educator in the Department of Mathematics at Western Kentucky University (WKU) where he works with preservice K-12 teachers as well as practicing secondary mathematics teachers and aspiring elementary mathematics specialists. He started working at WKU in 2016 after earning his Ph.D. in Mathematics Education from Michigan State University. His research interests include preservice teacher education, teaching and learning mathematics for social justice, and how teacher preparation programs structure mathematical experiences for preservice teachers.

Jonathan Thomas, Past-President

Jonathan Thomas is an Associate Professor of Mathematics Education and Chair of the Department of STEM Education at the University of Kentucky. Prior to his tenure at UK, he was a faculty member at Northern Kentucky University. He holds a B.A. in Elementary Education from the University of Kentucky, an M.Ed. in Educational Leadership and an Ed.D. in Mathematics Education, both from the University of Cincinnati. Dr. Thomas also serves as a faculty associate for the Kentucky Center for Mathematics and facilitates professional learning experiences for teachers across the commonwealth. His research interests include investigating responsive mathematics teaching practices, equity concerns in the elementary mathematics classroom, non-verbal patterns of mathematical interaction, and cognitive progressions of children's mathematical construction.

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Jamie-Marie Miller, Secretary

Jamie-Marie Miller is an Assistant Professor in the Department of Teaching, Learning, and Educational Leadership at the Eastern Kentucky University. She received her Ph.D. from the University of Kentucky in STEM Education. Dr. Miller teaches elementary and middle/secondary mathematics methods courses, geometry for elementary teachers to undergraduates along with graduate courses in elementary mathematics education and intervention strategies for struggling learners. Her research focuses on the progression of algebraic thinking in students, math-specific literacy strategies, assessment, and visible learning practices.

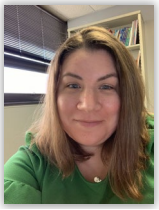
Michele Cudd, At-Large Representative

Michele Cudd is an Assistant Professor in the Department of Early Childhood, Elementary and Special Education at Morehead State University, where she teaches future elementary, middle, and high school teachers. She is interested in supporting novice teachers to develop more student-centered discourse practices. In her free time, she often is hiking on trails with her dog.

Sue Peters, Treasurer

Susan Peters is an Associate Professor in the Department of Middle and Secondary Education at the University of Louisville, where she teaches mathematics methods courses and graduate courses in mathematics education. Her research focuses on statistics education and mathematics teacher knowledge, particularly teacher knowledge and education in statistics. When she's not working with teachers, she enjoys relaxing walks in nature.

Kate Marin, At-Large Representative



Kate Ariemma Marin is an Assistant Professor of Math Education at the University of Louisville. She has taught elementary and middle school and served as a math coordinator in schools across Massachusetts. Prior to the University of Louisville, she was a faculty member at Stonehill College. She teaches mathematics education courses and supports the development of pre-service and in-service teachers. Her research interest is in teachers' development of Mathematical Knowledge for Teaching and generational differences in teachers. She is committed to supporting teachers and promoting the knowledge that they bring to the profession.

KENTUCKY JOURNAL OF MATHEMATICS TEACHER EDUCATION

KAMTE Membership

Membership to the Kentucky Association of Mathematics Teacher Educators (KAMTE) is always open for any faculty member that works with preparing pre-service and in-service teachers at any level. To join, contact Treasurer Sue Peters at s.peters@louisville.edu.

Upcoming Events

April 11, 2025	*KAMTE Pre-Service Teacher Conference	Virtual
April 17, May 12, 2025	KJMTE Article Roundtables	Virtual
May 19, 2025	*KAMTE Retreat	Grant County, KY
February 5-7, 2026	Annual AMTE Conference	Portland, OR

*Visit the KAMTE website for more information to be posted soon.

Call for Manuscripts

The editors of KJMTE are soliciting manuscripts for publication in the next issue of *the Kentucky Journal of Mathematics Teacher Education* that builds on the theme of the first issue: "The Next Generation of Mathematics Teachers."

Specifically, we ask authors to consider the following: What are the next generation of mathematics teachers? What are their needs? What role do mathematics teacher educators have in meeting those needs? How can mathematics teacher educators best prepare the next generation of mathematics teachers for their work?

The journal's aim is to provide a space for the exchange of ideas to advance mathematics teacher educator practice. The journal welcomes manuscripts that support this aim. Of particular interest are manuscripts that address an issue in mathematics teacher education and the methods/intervention/tools that were used to investigate the issue along with the means by

which results were determined and the impacts on practice. Manuscripts should fall into one of the following categories:

Manuscripts that describe effective ways of influencing teachers' knowledge, practice, or beliefs. This might include a description of activities, tasks, or materials that are used by a teacher educator to influence teachers in some way. These manuscripts would include a rationale for the intervention, a careful description of the intervention, discussion of the impact of the intervention, and how it might be used by others.

Manuscripts that describe the use of broadly applicable tools and frameworks in mathematics teacher education. This might include a classroom observation protocol, a task analysis framework, assessment tasks, or a framework for a teacher education program. These manuscripts would include a careful description of the tool or framework, what it is designed to capture, its use, and a discussion of the outcomes. The manuscript should include an explanation of how to interpret the results of the data captured by the tool. The tool should be made available for other professionals to use, modify, enhance, and study.

If you are interested in writing a manuscript for an issue of KJMTE, please visit the KJMTE Current Call for Manuscripts for the Author Toolkit where you can find formatting guidelines and information for preparing and submitting a manuscript to KJMTE.

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Stronger as a Group: Kentucky Universities' Recruitment and Retention of Prospective Mathematics Teachers

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and
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[1]Asbury University, [2]Eastern Kentucky University, [3]Morehead State University, [4]Murray State University, [5]Northern Kentucky University, [6]University of Kentucky, [7]University of Louisville, [8]Western Kentucky University

Abstract

The Co-Editors of the *Kentucky Journal of Mathematics Teacher Education* partnered with Kentucky mathematics teacher educators from eight Kentucky universities that prepare future mathematics teachers. Each team of mathematics educators from these universities wrote a brief description of how their university recruits and retains mathematics teachers. We believe it is valuable to learn from each other as we all are trying to address the issue of teacher shortages across the state and nation. We focused on future mathematics teachers specifically at the middle or secondary grades as well as graduate students pursuing a variety of degrees. The commentary summarizes the eight Kentucky universities' recruitment and retention strategies and ends with a description specific to each university. Our conclusion is that **we are stronger as a group**. Individual institutions are limited by the number of faculty and available funds; yet our call to action is based on the belief that combining resources (both human and capital), can positively impact state-level teacher education programs.

Keywords: Recruitment, Retention, Mathematics Teachers

In 2019, The Center for American Progress [CAP] published the report, *What to Make of Declining Enrollment in Teacher Preparation Programs* (Partelow, 2019). This report found that both enrollment in and completion of teacher preparation programs have decreased overall in the United States. Specifically, Partelow reported that between 2010 and 2018, US enrollment in teacher preparation nationwide declined by more than one-third, with the decline in Kentucky exceeding 40%. During the same time period, CAP reported a 27% decline in teacher preparation program completion in the US with the decline in Kentucky exceeding 35%. Specifically, there was a 22.11% decline in the number of people completing teacher preparation programs in the fields of science, technology, education, and mathematics. Reasons for the decline in teacher preparation enrollment and completion may be related to low salaries and difficult working conditions.

Mathematics teacher educators at institutions across the state of Kentucky have noticed these declines in teacher preparation enrollment and completion rates and have been working with their institutions and colleagues to be proactive and address these declines. This commentary examines the current strategies being employed by Kentucky institutions of higher education to address these declining rates at the middle grades and secondary levels, specifically in mathematics. It synthesizes the reports of eight universities (one private and seven public institutions) which include information about program design and the recruitment and retention of mathematics teacher education students.

To start this process, the *KJMTE* co-editors contacted eight different mathematics educators (who will be referred to as co-authors) at these eight different Kentucky universities to request a

one- to three-page description of their institution's efforts to recruit and retain undergraduate teacher education majors specializing in mathematics. Along with this information, the co-editors requested a description of the middle grades and/or secondary mathematics education undergraduate programs and a brief description of the classes that middle grades and/or secondary mathematics majors take as part of the program. The co-authors were also asked, if applicable, to discuss their institution's graduate programs and efforts to recruit graduate students. Our hope with this commentary is that the effective and promising strategies already in place can be made more public and Kentucky institutions can share resources to improve mathematics teacher education programs.

Programs and Courses

Table 1 below summarizes the degree information for middle and secondary mathematics education for each of the institutions that contributed to this paper. To summarize, five of the institutions offer a Bachelor of Science (BS) degree and four of the institutions offer a Bachelor of Arts (BA) degree for middle grades mathematics preservice teachers. For secondary mathematics education preservice teachers, seven of the institutions offer a BS and three of the institutions offer a BA. Seven of the universities offer a Master's degree that leads to certification, and two universities offer a Master's degree in mathematics (not for initial certification) that can lead to rank change or the option to teach dual-credit.

Table 1. Summary of degrees from Kentucky institutions.

Institution/University	Degree granted to Middle Grades PSTs	Degree granted to Secondary PSTs	Graduate Program(s) for PSTs or ISTs
Asbury University, Wilmore, KY (Private)	BS in Middle School Grades 5-9	BS in Mathematics Grades 8-12	MAT
Eastern Kentucky University (EKU), Richmond, KY (Public)	BS in Middle Grades Education	BS in Mathematics with a concentration in Mathematics Teaching	MAT
Morehead State University (MSU), Morehead, KY (Public)	BA in Middle Grades 5-9 Education	BS in Mathematics with certification	MAT
Murray State University, Murray, KY (Public)	BS/BA in Middle School Education	BA/BS in Mathematics with certification	MA in Mathematics Teaching (not for initial certification), MA in Mathematics (not for initial certification)
Northern Kentucky University (NKU) Highland Heights, KY (Public)	BA in Middle Grades Education	BA in Secondary Education and BS in Mathematics	MAT
University of Kentucky (UK), Lexington, KY (Public)	BA in Middle Level Teacher Education	BS in STEM Education (double major in STEM Education and mathematics)	MAT
University of Louisville (UofL), Louisville, KY (Public)	BS in Middle Grades Education, BS in Middle and Secondary Education	BS in Secondary Education, BS in Middle and Secondary Education	MAT
Western Kentucky University (WKU),	BS in Middle Grades Mathematics, BS in	BA in Mathematics, BS in Science and	MAT, MA in Mathematics (not for initial certification)

Bowling Green, KY (Public)	Science and Mathematics Education	Mathematics Education	

Mathematics course requirements for middle and secondary teacher preparation programs vary across institutions with some similarities. Each of the eight universities require Calculus I, II, and III of their secondary mathematics preservice teachers, with four of the institutions requiring Calculus I for their middle grades mathematics PSTs. All of the institutions require a geometry class for both middle and secondary PSTs. All universities require an algebra course for both middle and secondary (often the secondary students take abstract algebra). Five out of the eight require a probability and/or statistics class for both grade levels, while two require probability/statistics only for the secondary PSTs. In these cases where there are courses for both middle grades and secondary students, they may have their own dedicated course (e.g., Geometry for Secondary Teachers vs Geometry for Middle Grades Teachers) or they may have one course for both. Four institutions require their middle grades PSTs to take mathematics courses designed for middle *and* elementary PSTs. Other courses required of the secondary PSTs include courses on modeling, proof/logic, linear algebra, and analysis. Three of the secondary mathematics education programs require a capstone experience, and one of those requires a capstone experience for both secondary and middle grades PSTs. Other courses required of the middle grades PSTs include courses on problem solving, proof/logic, and courses related to technology. An overall observation here is there is a rigorous amount of mathematics content that is required for both middle grades and secondary mathematics preservice teachers, highlighting the importance that mathematics teacher educators place on mathematics content.

In addition to the mathematics-related degrees that preservice teachers earn in undergraduate studies, programs also entail degrees in education. For example, to name a few, WKU students also earn a BS in Science and Mathematics Education, NKU students earn a BA in Secondary Education, and UK students earn a BS in STEM Education. Regardless of the exact degree, most preservice teachers take similar education courses such as mathematics teaching methods, human development and learning, reading and writing in the curriculum, classroom management, behavior management, differentiation for inclusive classrooms, technology in education, and curriculum and instructional design. Programs that are modeled after the UTeach model (e.g., WKU and Morehead) have more specific education classes such as theory and practice of inquiry-based teaching, inquiry-based lesson design, theories and principles of cognition and learning as they relate to learning math and science, classroom interactions, perspectives on mathematics and science, research methods, and project-based instruction.

Recruitment and Retention

The co-authors of this paper offered many different strategies that their institution use to recruit undergraduate teacher education majors specializing in mathematics. On-campus events designed for potential students were the most common type of recruitment tool mentioned by the co-authors. These events included open houses, orientations, and fairs. Among the on-campus events mentioned are days where high school students come on campus to participate in math and/or STEM related activities. For example, Northern Kentucky University has had a STEM+H Day each year, sponsored by NKU's Center for Integrative Natural Science and Mathematics, during which high school students take part in experiential STEM+H activities. Along with the STEM+H Day, CINSAM sponsored summer camps and academies for grades 2 through 12 students to engage in the TEM subjects. Western Kentucky University has had a similar event, STEM Education Exploration and Development (SEED) recruitment days, hosted by

the SKyTeach program and the University of Kentucky has a summer STEM camp, designed to ignite interest in STEM fields while exposing them to the university environment. Program coordinators and faculty representatives have frequently participated in on-campus events like Tailgating with the President, to engage prospective students. Murray has hosted an annual Math Day where western Kentucky high school students participate in mathematics competitions on campus. At Math Day, high school students have witnessed mathematics being elevated and celebrated on Murray's campus. WKU and NKU have hosted similar events for high school students. In an attempt to retain teacher education students, on-campus events have included "Lunch and Learns" at MSU, a Summer Bridge Program at UofL, and social events like "Donut Days," "Taco Tuesdays," and a faculty soup contest judged by students at WKU.

Educators Rising, the community-based movement designed to feed teacher preparation programs through chapters at middle, secondary, and post-secondary schools, was mentioned by several institutions (Asbury, Murray, NKU, WKU) as a recruitment tool. Educators Rising conferences, hosted at the institution, have specific sessions for those interested in or considering teaching mathematics at the middle or secondary level. Similarly, some institutions (UK, WKU) have partnered with the Association of Mathematics Teacher Educators [AMTE] and their initiative "Get the Facts Out" (https://amte.net/content/get-facts-out) which provides resources for teacher educators to share with students and prospective students with facts about the teaching profession, often dispelling common myths.

Several of the co-authors consider their university's dedication to sustained contact and good communication with school partners as a recruitment strategy. For example, EKU has employed an Executive-in-Residence who attends education cooperative meetings to update school superintendents on efforts to recruit teacher candidates. The Professional Education Services office and the clinical educators stay in contact with EKU's school partners in order to promote a relationship that allows for recruitment possibilities. UofL has used partnerships with local school districts to recruit and retain students of color through the Multicultural Teacher Recruitment Program, which uses strategies such as scholarships, coaching, networking, community partnerships, and job placement support.

The Noyce grant at UK has supported the recruitment of STEM educators. The Noyce grant provides scholarships and mentorship for undergraduate students pursuing STEM teaching careers (https://www.nsfnoyce.org/). In recent years WKU also had a Noyce grant to support recruiting STEM educators. The EKU Advantage corporate partnership agreements have allowed EKU to offer decreased tuition benefits to all teacher candidates in their program. WKU has offered an educator discount for a graduate degree to any current teacher in Kentucky or a border state (https://www.wku.edu/educatordiscount/). Scholarships are cited by multiple institutions as a strategy to recruit and retain students in teacher education programs.

Some of the co-authors reported course experiences that serve as recruiting events. The dual credit programs at UofL and NKU offer the opportunity for high school students not only to earn college credit, but to engage with university faculty and meet other dual credit students. At UK, students can take a Gaming in STEM Education course that is designed to attract early career STEM students by integrating the high-interest topic of gaming with education. PSTs at Asbury pass through a series of "gates" designed to provide them with continual feedback on their progress through the program in an effort to retain them in the program.

Faculty and advisor relationships are important retention tools for all universities. For example, at UofL and Asbury faculty mentor assignments help students make decisions about courses and career choices, and at WKU, advisors and faculty mentors work closely with students to make decisions and monitor their progress during their time in the program using a cohort modeling system.

Seven of the eight institutions offer graduate degrees in the form of a Masters of Arts in Teaching (MAT) degree. Additionally, Murray State University and WKU offer a Master's degree in mathematics (not for initial certification) that can lead to rank change or the option to teach dual-credit. The MAT degrees differ in terms of admission requirements. For example, Asbury, EKU, and UK all explicitly require a mathematics degree or equivalent coursework, while Morehead, NKU, and UofL require a necessary background in mathematics often defined as 30 hours. WKU does not require a degree specifically in mathematics but indicates a degree in an approved certification area. All programs do have GPA thresholds for admission. UK and WKU allow the content PRAXIS to be taken while enrolled (and require eventually passing it), whereas the other five institutions require it as a prerequisite for admission.

While it seems that most recruitment and retention efforts are concentrated at the undergraduate level, outreach through career fairs and personal contact from program coordinators and specialists were cited as recruitment strategies for graduate programs in teacher education.

Summary and Call to Action

Kentucky institutions of higher learning currently face the real challenge of recruiting and retaining students for teacher education programs. In this cooperative effort to share recruitment and retention strategies, we have learned what eight different Kentucky universities are doing to attract and keep students in the field of mathematics teacher education. It is our hope that readers will get ideas and be inspired to employ some of the strategies shared here.

Beyond that, we have a larger hope and call to action. **How do we collaborate and address this together as a state rather than solely within our local institutions?** We conjecture that if we address this at the state-level the institutions themselves will benefit. We all want Kentucky to get more highly qualified mathematics teachers and retain them (in their teacher education programs and careers). While our current processes typically address the teacher shortage from the perspective of our own universities, ***we are, in fact, stronger as a group***. As we saw from these strategies, success related to recruitment and retention is heavily dependent on the service of faculty and a considerable amount of disposable funds. Individual institutions are therefore limited by the number of faculty and available funds; yet our call to action is based on the belief that combining resources (both human and capital), can positively impact state-level (and by extension institution-level) teacher education programs. For roughly a decade, the Kentucky Association of Mathematics Teacher Educators (KAMTE) has had in-person organizing meetings of Kentucky mathematics educators and they remain well-positioned to bring our various institutions together. As KAMTE continues to offer opportunities for collaboration, we implore mathematics educators in the commonwealth to attend, engage, and learn from each other, becoming ***stronger as a group***, one conversation at a time.

Asbury University

Cheryll Crowe Johnson

Degree Programs

Asbury University offers a B.S. in Middle School Grades 5-9 with a concentration in mathematics and B.S. in Mathematics Grades 8-12. Some students in the secondary major choose to also complete middle school mathematics, receiving a certificate for teaching mathematics in grades 5-12. The sole graduate program related to mathematics education is the M.A.T. in Mathematics Grades 8-12, an alternative certification program.

Program Structure and Classes

Undergraduate programs are considered four-year degrees with student teaching as the culmination of the major. Math education content courses are taught in the Department of Mathematics and Computer Science. In addition to Calculus I, both middle and high school pre-service teachers (PSTs) take the same series of classes: Algebraic Structures, Geometry, and Probability & Statistics (one course is offered every fall). A capstone course (Topics in HS Mathematics or Topics in Elem/MS Mathematics) is generally taken as close to student teaching as possible. Students also complete a mathematical modeling/coding class where they are introduced to the programming language, Python. The secondary major also includes Calculus II (with the option to take Calculus III), an introduction to proofs/logic course, and Linear Algebra.

In the School of Education, PSTs complete a variety of courses intended to support their growth as an educator. Classes include technology for education, human growth/development, reading/writing across the curriculum, classroom management, intervention/differentiation, and learning/performance assessment. Clinical placements are embedded throughout the curriculum and part of their methods class.

Recruiting and Retaining PSTs

The School of Education works diligently to recruit PSTs. One new effort includes hosting the Educators Rising conference each fall. Endeavors to recruit students for the M.A.T graduate program have not been as focused compared to the undergraduate level. At Asbury, PSTs move through a series of “gates” which helps to retain teachers by providing continual feedback and assessment on their progress throughout the program.

Eastern Kentucky University

Jamie-Marie Miller

Degree Programs

Eastern Kentucky University (EKU) and the College of Education and Applied Human Sciences (CEAHS) in conjunction with the Department of Teaching, Learning, and Educational Leadership (TLEL) provides three undergraduate Bachelor of Science (BS) programs that lead to certification in middle grades mathematics. The traditional BS in Middle Grades Education leads to initial licensure with two areas of subject-level concentrations including mathematics.

Two additional programs that dual certify teacher candidates with a mathematics concentration and a concentration in special education. First is the Special Education/Teaching BS with a concentration in Learning, Behavior Disorders (LBD) which allows teacher candidates to have initial certification for both Mathematics and special education (grades 5-9). Second is the Education of Deaf and Hard of Hearing (DHH) BS which leads to initial certification for both mathematics (grades 5-9) and DHH (grades P-12). The DHH program is the only one in the Commonwealth of Kentucky.

Secondary teaching mathematics majors complete the Mathematics BS with a Concentration in Mathematics Teaching through the College of Science, Technology, Engineering, and Mathematics (STEM).

Regardless of program, all MG/Secondary majors complete common programmatic requirements. Professional Core includes Educational Foundations, Human Development, Differentiation in Inclusive Classrooms, Curriculum and Instructional Design, Assessment in Education, and Classroom and Behavior Management. All Professional Core classes are taught

by the TLEL faculty from CEAHS. Additional supporting courses that are required include Emerging Instructional Technology, Disciplinary Literacy, and Culturally Responsive Perspectives.

Courses in the Professional Core are joined with a clinical observation course. The Professional Core experience is capped with the Math Methods course that is taken the semester before student teaching. The state of Kentucky requires 200 observation hours stipulated by EPSB are distributed throughout all four programs so that EKU teacher candidates are in the classroom observing and working from their first education course. For example, students taking the first education course, Educational Foundations, are required to observe 10 hours. However, by the end of the Professional Core, math methods teacher candidates are required to obtain 80 hours. Clinical placements are often at the Model Laboratory School which is located on EKU's campus. Model Lab is the only laboratory school on a university campus in Kentucky and serves PreK-Grade 12.

Math methods is a final education course that MG/Secondary mathematics teacher candidates take at EKU. Due to low numbers, all MG/Secondary mathematics teacher candidates take the same math methods course. Additionally, the MAT math education students take this math methods course as well. The math methods course is taught by TLEL faculty. Undergraduate MG/Secondary teacher candidates attend in person, while MAT students attend synchronously online. Although the teacher candidates attending class via different modalities in one course can be challenging, with the use of zoom, shared google docs, OWL™ camera, and document cameras, there is interaction. Collaboration on class activities, vertical conversations on mathematical topics, and MAT students sharing their current experiences in their first classrooms are a part of the methods course.

All teacher candidates are required to complete key assessments that are a part of the curricular requirements of many of the Professional Core courses. The key assessments are aligned with specific program objectives and are required to pass the course.

Courses

All MG mathematics teacher candidates (including dual certification (either LBD or DHH)) are required to take the following: Problem Solving and Technology, Geometry for 7-12 Teachers, Math Models and Applications, and Probability and Statistics for Middle Grades Teachers. They are also required to take a series of three math courses (known as Mathematical Concepts for P-9 I-III) that focus on whole number operations, rational numbers/statistics, and geometry/measurement/probability respectively. MG teacher candidates have the unique opportunity to take mathematics courses with our elementary and secondary teacher candidates which allows them to see the vertical progression of mathematical concepts.

Secondary mathematics teaching concentration takes math major requirements of Calculus I-III, Linear Algebra and Matrices, Logic and Set Theory, Modern Algebra I, and Introduction to Analysis. Teaching concentration requirements include: Math Models and Applications, Problem-Solving and Technology, and Geometry for 7-12 Teachers. Additionally, teacher candidates must take two courses that are either a math course(s) 300 or above and/or stats course(s) 300 or above.

Recruitment and Retention

Recruiting events are handled by Admissions. STEM and TLEL faculty man tables at these events. STEM faculty also participate in other events that recruit students: The Women in STEM (WISE) Workshop for AP Stats students; various outreach events to Model students, girl scout events, STEM Goes Red, and the EKU Major Expo each Fall.

EKU works closely with the Professional Education Services (PES) Office, which is under the umbrella of TLEL. The PES Office and our Clinical Educators stay in constant contact with our school partners. EKU uses the Executive-in-Residence position who attends education cooperative meetings to constantly update school superintendents on our efforts to recruit teacher candidates and communicate the decreased tuition benefits of our EKU Advantage corporate partnership agreements. EKU has grown our dual credit Teaching & Learning Pathway by more than 400% in two years. For recruitment of graduate students, the PES Office works with in-service teachers on the Proficiency Route to certify for either middle or secondary mathematics.

Morehead University

Michele Cudd and Will Tidwell

Morehead State University's service area includes 22 Eastern Kentucky counties, most of which are in the Appalachian region of Eastern Kentucky. The university's main campus is located in Morehead, Kentucky, with additional regional campuses in Ashland, Mount Sterling, and Prestonsburg.

Programs and Courses

At Morehead State University (MSU), the Volgenau College of Education is home to both the middle grades mathematics program and the secondary mathematics program. In the middle grades program, upon completion, teacher candidates receive a B.A. in Middle Grades 5-9 Education. Students pursuing 5-9 certification choose two content specializations, one of which may be mathematics. If mathematics is selected, students complete 21 credit hours of mathematics coursework. The alternative specialization options—social studies, English language arts, or science—each require 18 credit hours of coursework specific to their respective content areas. The secondary program (MSUTeach) utilizes the UTeach model, developed by the University of Texas at Austin, to prepare students focusing on STEM disciplines for secondary teaching certification. Through the MSUTeach program, secondary mathematics teacher candidates earn a B.S. in mathematics along with a secondary education teaching certificate. The program includes nine MSUTeach-specific courses that complement the requirements for the mathematics undergraduate degree. Both programs require a minimum of 33 credit hours in general education and include 200 hours of field experience, integrated directly into their coursework.

Recruitment

At MSU, recruitment typically occurs at the program level, with no efforts dedicated solely to mathematics education. Recruitment for the two programs often overlaps, as both are housed within the Volgenau College of Education. Program coordinators and faculty representatives frequently participate in Open House events, held four to five times annually, as well as other occasions aimed at engaging prospective students, such as Tailgating with the President and the College Fair. Another recruitment strategy involves enlisting current students in our programs to serve as ambassadors and participate in outreach events. Recently, a special teacher education recruitment event was held at US23 Country Music Highway Museum in Paintsville, KY, where local high schools were invited to attend. MSU student ambassadors from both the middle grades and secondary programs represented their respective areas, engaging with attendees and

answering questions at designated tables. In the secondary program, students designated as STEM ambassadors serve as general advocates for STEM and visit introductory mathematics and science courses to promote the MSUTeach program. Additionally, it is hoped that MSU's active presence in local schools will inspire students to consider pursuing an education pathway at the university.

Retention

At MSU, student retention efforts are closely tied to the intimate structure of our programs, fostering strong relationships with both our field schools and students. We maintain deep partnerships for our field experiences. In the middle grades program, each semester block is partnered with a specific school, while the secondary program maintains a strong partnership with the local county high school. In both programs, the professor of record accompanies students into the field, ensuring continuity of support. The same professor who meets with students in class each week also guides their development during their field placements in K-12 classrooms. MSU boasts a 14:1 student-faculty ratio, which is often even smaller in the middle grades and secondary programs. While students are not officially placed in cohorts, the small class sizes encourage strong connections among them. Faculty are accessible both inside and outside of the classroom – some hold office hours in convenient locations like the campus Starbucks, and several faculty members live within walking distance of campus. Both programs offer students two advisors. In the middle grades program, students are paired with an advisor who supports education majors, as well as a program-specific advisor. In the MSUTeach program, teacher candidates have an advisor for their content area as well as a separate advisor within the MSUTeach program. The MSUTeach program hosts several recurring events that nurture a sense of community, including Lunch & Learns, guest speakers, and a semester-end showcase featuring presentations from various MSUTeach courses. These events allow students at different stages of their academic journey to interact and learn from one another. Recently, the opportunity to work as a long-term substitute while completing student teaching has also served as a valuable retention tool. We are an intimate, small community that works to grow the relationships with our students and community.

Murray University

Eric Batts and Molly Williams

Middle and Secondary Education Programs

The middle school education program offers a Bachelor of Science/Bachelor of Arts in Middle School Education (Grades 5-9). Students have the option to either choose one concentration area or two (e.g., mathematics only; mathematics/social studies). Secondary education students major in a Bachelor of Science/Bachelor of Arts in Mathematics with secondary education certification (Grades 8-12). Students majoring in middle school education are advised by middle school faculty in the education department, while students pursuing secondary mathematics are co-advised by faculty secondary education and mathematics department. The co-advising model is in its early stages, but the goal is for students to have a dedicated resource in each department. This additional support could also prove beneficial in retaining math education majors.

Course Descriptions

Both middle and secondary programs are structured similarly in terms of how students take courses in education and mathematics. Students take the majority of education and math

courses in their respective departments, with secondary students taking additional math courses in preparation for teaching high school curriculum. Two of the math courses for secondary are pedagogically focused. The middle school program offers additional middle school pedagogy courses in place of the additional math content in the secondary program. Middle school majors take two of the same classes required of elementary education majors, but then also take two more pedagogically focused content courses: one that investigates the middle school level math content and one that has them focus on proof-writing and reading proofs.

Recruitment

Summer Orientation

Murray State University hosts several summer orientation sessions for potential incoming freshmen. Every incoming freshman is required to attend a Summer Orientation session. In addition to the normal college orientation events, students have a dedicated time to visit with professors in their major of interest and tour the department classrooms. Secondary math students meet directly with at least one math professor who explicitly helps them enroll in their first semester of courses.

Teacher Ambassadors

Murray State University's College of Education and Human Services established a teacher ambassador program two years ago and serves as a collaborative effort between MSU and area school districts. The program allows MSU educator preparation program faculty to serve as teacher ambassadors for local high schools. The goal is for teacher ambassadors to visit their school once a semester to speak with students about teaching careers. Many ambassadors work with the faculty club sponsor for Educators Rising if the club is offered. An important part of this initiative is the opportunity to build positive relationships between high school students and MSU ambassadors. Students share their content interests (e.g., math) with their ambassadors during the first visit, which allows the ambassador to provide resources and contacts specific to each student's needs.

Educators Rising Conference

Murray State University hosts a fall regional Educators Rising Conference that brings 200-300 high school students to campus for education competitions and breakout sessions led by MSU faculty. A future STEM educator session allows high school students another opportunity to discuss with faculty about career opportunities in math education.

Math Day

Math Day is an annual day focused on mathematics, sponsored by the Mathematics & Statistics Department and held at the start of every spring semester. More than a dozen high schools from the West Kentucky area bring students to participate in two different kinds of competition: an individual exam and a timed team activity competition. There is an upper and lower-level exam, And, the team competition has at least 5 different hands-on activities (which are also differentiated into three levels of difficulty). Awards are given to the top five students on each level exam, the top three teams from the team competition, and the top performing school overall. This event also includes a midday talk from math alumni, with an opportunity to ask questions afterward. Math Day is one of the most significant ways the content of mathematics is elevated and celebrated at Murray State University. This naturally draws the attention of students who want to continue studying or teaching it.

Alternative Certification

The College of Education and Human Services offers the state-approved university-based alternative route to teacher certification (Option VI), allowing individuals who have earned a bachelor's or master's degree in a non-teaching major to pursue a teaching certification. The alternative certification coordinator plays a pivotal role in program recruitment, retention, and collaboration with local school districts since Option VI requires participants to enroll in the program while concurrently teaching in a Kentucky school district. This long-standing collaboration and word of mouth has helped area schools fill open math positions that may have otherwise been difficult to fill.

Northern Kentucky University

Sarah Kasten

Programs and Courses

Northern Kentucky University (NKU) offers degree programs for prospective teachers interested in pursuing certification in either middle or secondary mathematics teaching. Middle grades preservice teachers (PSTs) at NKU earn a BA in Middle Grades Education and they choose two content areas of focus from English and Communication, Mathematics, Science, Social Studies, or Special Education. The Special Education choice requires a second major in Special Education. Secondary PSTs at NKU earn a double major in Secondary Education (BA) and Mathematics (BS) with a secondary education track. Both the middle grades and secondary programs are structured as four-year programs in which the PSTs take general education requirements and content courses in the first two years. At the end of the second year, middle and secondary PSTs take their first education course, Human Growth and Development. In their last two years of the program PSTs typically move through a series of three semesters called Admissions Semester, Professional Semester I, and Professional Semester II culminating in a final Clinical Experience semester.

Middle grades PSTs who are preparing to teach mathematics take 24 credit hours of mathematics content courses. These courses focus on helping the PSTs develop a deeper level of understanding of the content needed for teaching middle grades, horizon knowledge of the content their students may encounter in their future, while also supporting the PSTs in successfully passing the Praxis content exam. The content areas in the required courses include applied calculus, arithmetic structures, algebra, geometry, probability, and statistics. Several of these courses, such Algebra for Middle Grades Teachers, are tailored specifically for PSTs planning to teach middle grades mathematics. PSTs are able to choose a three-credit elective mathematics course to complete their 24 credit hours.

As already mentioned, secondary PSTs earn a double major in Secondary Education and Mathematics. Secondary PSTs take at least 43 credit hours of mathematics courses including core courses taken by all mathematics majors and content courses selected specifically for the secondary education track. These courses include a calculus sequence along with courses in algebra, geometry, analysis, probability, statistics, and programming.

As PSTs move into the third year of their program, they begin taking a block of education courses in an Admissions Semester. These courses include Introduction to Education and other foundational courses in education. After successfully completing the Admissions Semesters, PSTs move into Professional Semesters I and II in which they take one mathematics specific methods course. If they are middle grades PSTs they also take a methods course in their second

content area. In addition to mathematics methods courses, in Professional Semesters I and II PSTs take courses related to the fundamentals of middle or secondary education, reading and writing across the curriculum, instructional planning for inclusive classrooms, classroom management, and assessment. During the Admissions Semester and Professional Semesters I and II, PSTs are also placed in field experience classrooms for a total of at least 200 hours.

Recruitment and Retention

Efforts to recruit and retain undergraduate teacher education students at NKU include those directed at all content areas and some specific to majors specializing in mathematics. To recruit preservice teachers across content areas NKU offers dual credit teaching pathways and engages with the students throughout the school year via school visits by College of Education faculty and staff, campus visits for special events, and shadow experiences. Additional recruitment activities directed specifically at STEM majors include engaging with high school students through NKU's Center for Integrative Natural Science and Mathematics (CINSAM) sponsored events including STEM+H Day, a day for high school students to take part in experiential STEM+H activities on NKU's campus. Additionally, CINSAM sponsors summer camps and academies for 2nd through 12th graders to engage in STEM subjects on NKU's campus. The College of Education at NKU has also hosted regional Educators Rising Conferences with specific sessions for those interested in or considering future middle and/or high school mathematics teaching.

In addition to experiences designed to recruit undergraduate students into the field of mathematics education, NKU also offers a variety of scholarships to help support and retain future middle and secondary mathematics teachers. Several of these scholarships are provided through CINSAM and support both middle and secondary preservice teachers with different opportunities. The Klingenberg Endowed Scholarship is another scholarship opportunity for middle and secondary education majors. This scholarship provides funds for already enrolled PSTs for one year. Since 2015 eight prospective middle or secondary mathematics teachers have benefited from funding from this scholarship.

NKU also has an online Master of Arts in Teaching (MAT) program that includes initial certification for prospective teachers who already have a degree in mathematics or a similar sufficient background. This program is for middle or secondary teachers and does not require middle grades teachers to choose a second content area. Recruitment strategies for this program include extensive outreach throughout the state of Kentucky and local outreach through career fairs and personalized academic advising by the program coordinator and graduate program specialist.

University of Kentucky

Lisa Amick

Programs

The University of Kentucky (UK) offers two undergraduate pathways for initial teaching certification as a secondary (grades 8-12) mathematics teacher. UK also offers a Middle Level Teacher Education program. This program leads to a BA and certification in grades 5-9 in two content areas (English, Math, Social Studies, Science). Students in this program take 25 hours in both of their content areas. UK also offers a BS in STEM Education which is a double major program in STEM Education plus your choice of one focus major (math, physics, chemistry, earth science, biology) leading to a secondary teaching certification in grades 8-12. Students in both programs take 120 hours; the UKCore requirements which include courses across the categories

of intellectual inquiry, communications, quantitative reasoning, and citizenship; professional education courses such as instructional media, classroom management, human development and learning, teaching exceptional learners, and two methods courses for each of their content areas. Both of these programs are traditional four-year degree programs that require in-person attendance on campus. Additionally, UK offers a MAT program that can be completed in one or two years that emphasizes hands-on, inquiry-based teaching methods, equity in education, and integration of real-world applications.

Recruitment and Retention

UK has implemented a multifaceted approach to recruit future mathematics teachers. Recognizing the urgent need to address the nationwide teacher shortage, particularly in STEM fields, UK's efforts are focused on attracting and preparing passionate individuals to join the teaching profession. This section highlights the key initiatives and collaborative efforts utilized by UK to build a sustainable pipeline of future mathematics educators.

One of UK's most significant recruitment strategies involves leveraging its leadership role in the Southeastern Conference Mathematics Education Community (SEC+ MEC). Founded in 2020 with leadership from a UK faculty member, SEC+ MEC is a collaborative network of mathematics educators from all 17 SEC institutions, the plus sign indicating outside institutions are welcome as well. Meeting monthly, members share innovative ideas and best practices focused on recruitment and retention of mathematics teachers. These regular exchanges coupled with one annual in-person meeting foster cross-institutional support and resource-sharing, strengthening efforts to attract and retain teachers across the region. Upcoming efforts include merging student organizations, writing a cross institutional NOYCE Track 1 grant, and continuing to host twice per year online webinars to support current and past students.

In addition, UK actively participates in the Mathematics Teacher Education Partnership (MTE-P), which is a national initiative aimed at enhancing secondary mathematics teacher preparation programs. Within MTE-P, UK engages with multiple subgroups, one of which is solely dedicated to recruitment and retention, benefiting from national insights and research-based strategies to attract prospective teachers.

To engage students early in their academic journey, UK developed the SEM 343: Gaming in STEM Education course. This course is designed to attract freshman and sophomore STEM students by integrating high-interest topics with education. The goal is to pique students' curiosity about the educational field while they explore their passion for gaming. By framing education through the engaging lens of gaming, UK aims to inspire students to consider teaching as a career path while they are still undecided or exploring other academic interests.

To counteract common misconceptions about the teaching profession, UK utilizes the "Get the Facts Out" (GFO) initiative. Developed by national educational organizations, GFO materials provide evidence-based information to address stereotypes that deter individuals from pursuing careers in teaching. These resources highlight data such as high job satisfaction rates and dispel myths about salaries and respect in the profession. UK uses these materials in recruitment campaigns to reshape perceptions about teaching, especially among STEM students, emphasizing the impact and fulfillment of a career in education.

UK has also secured NOYCE Grants from the National Science Foundation, which are critical in supporting the recruitment of STEM educators. These grants provide scholarships for undergraduate students pursuing STEM teaching careers, particularly in high-need schools. By offering financial incentives and mentorship, NOYCE-funded programs at UK support high-caliber students who are committed to making a difference in underserved communities. UK also uses grant funding to leverage the Prime-D framework as a strategic tool to support both current and

early-career teachers. By focusing on structured planning, implementation, and continuous evaluation, the initiative aims to enhance teacher retention through targeted professional development, ultimately fostering long-term success in the teaching profession.

UK's annual summer STEM camp targets traditionally marginalized students in grades 2-6, offering them hands-on, engaging STEM experiences. These camps not only ignite interest in STEM fields but also expose students to the university environment, potentially influencing their future educational choices. Additionally, parents who see their children excited about learning often leave with a positive impression of the university and are more likely to encourage their children to consider teaching as a rewarding career path.

UK's College of Education recruiters employ a diverse range of strategies to attract future educators, including hosting on-campus events, leveraging online marketing and social media, and attending recruitment fairs and conferences. They also collaborate closely with undergraduate advisors to promote education programs, maintain partnerships with community colleges, and foster strong alumni relationships. Notably, recruiters from the 17 SEC institutions have recently joined forces to share and refine recruitment strategies specific to education, meeting to exchange ideas. By combining these efforts, they are building a robust pipeline of qualified, passionate individuals committed to entering the teaching profession.

The University of Kentucky recently revamped its Introduction to STEM Education course (SEM 110) to provide a richer, more immersive experience. The redesign includes a more robust field component, updated readings that reflect current educational research, and co-teaching demonstrations to engage students in active teaching from the early years. Additionally, the course now fosters stronger connections with College of Education faculty, giving students deeper insights into teaching practices and building early relationships with mentors in the field.

Faculty and College of Education recruiters use personal communications to connect with high school students and encourage them to consider teaching careers. This includes personalized email campaigns, phone calls, and one-on-one meetings to address student interests and answer questions. Virtual tours, online info sessions, and social media engagement also provide accessible ways for students to explore the college, interact with recruiters, and get a sense of campus life. Additionally, sending personalized letters or packages helps students feel valued. By using these tailored communication strategies, recruiters build meaningful connections, address individual concerns, and highlight the benefits of pursuing education degrees.

Recognizing the potential of recruiting from local high schools, faculty have taken proactive steps to connect with students interested in teaching. They personally visit schools to engage with those on education tracks and partner with local schools to host collaborative STEM nights, where high school and college students work together to showcase educational pathways. Partnerships with Educators Rising chapters further strengthen the pipeline by linking high school students to teacher preparation programs, supported by state departments and local funders.

The University of Kentucky's multifaceted recruitment strategy leverages national networks, innovative coursework, and evidence-based resources to build a sustainable pipeline of mathematics teachers. By addressing misconceptions about teaching and tackling systemic barriers, UK is making significant strides in addressing the teacher shortage. These comprehensive, collaborative efforts demonstrate UK's commitment to overcoming educational challenges and ensuring a new generation of passionate, well-prepared educators ready to inspire future learners.

University of Louisville

Susan A. Peters, Katherine Ariemma Marin, Jennifer Bay-Williams

Programs and Courses

At the University of Louisville (UofL), undergraduate students seeking middle grades, middle and secondary, or secondary mathematics education certification complete a minimum of 120 credits to obtain a Bachelor of Science (BS) degree. Students seeking middle grades certification in a second area may need to complete up to 124 credits. Currently, students are admitted to the education program (the professional phase) after they have completed 45 credits (pre-professional phase), including core curriculum requirements as well as some mathematics content and general education courses. In the professional phase of the program, students complete most of their mathematics content and education courses as well as Kentucky's requisite 200 hours of field work. Student teaching occurs during the fall semester of senior year. For spring graduates, their final semester includes six hours of education courses and remaining content course requirements. UofL does not offer any alternative pathways to certification at the middle or secondary level at the undergraduate level.

The mathematical preparation for middle grades and secondary teacher candidates differs in terms of both quantity and level. (See Table A.) All middle grades mathematics education candidates complete 23 credit hours of mathematics courses, with two courses offered exclusively for teachers (MATH 350 & MATH 451). Those candidates seeking certification in mathematics only also complete another 12 hours of related and supporting courses, which might include courses in mathematics or the sciences. Secondary mathematics candidates complete 33 credit hours of mathematics courses and nine credit hours of related and supporting courses.

Table A. Middle and secondary mathematics certification content requirements.

Middle Grades Mathematics (1* or 2 Content Areas of Certification)	Middle and Secondary Mathematics AND Secondary Mathematics
MATH 109: Elementary statistics	MATH 205, 206, & 301: Calculus I, II, and III
MATH 151 & MATH 152: Mathematics for Elementary Education I & II	MATH 311: Introduction to Higher Mathematics
MATH 190: Precalculus	MATH 325: Introduction to Linear Algebra
MATH 205: Calculus I	MATH 387: Discrete Mathematics
MATH 350: Geometric Investigations	MATH 521: Modern Algebra
MATH 451: Problem Solving	MATH 550: Advanced Euclidean Geometry
12 hours Related and Supporting Courses*	MATH 561: Probability
	MATH 562: Mathematical Statistics
*Required for single subject certification	9 hours Related and Supporting Courses

UofL offers several pathways to teacher certification for middle and secondary mathematics at the graduate level: a 30-hour traditional Master of Arts in Teaching (MAT) program that includes field work and student teaching; a 30-hour MAT alternative certification program that supplants student teaching with support courses; and a 30-hour Urban Teacher in Residence MAT program that includes courses codesigned in collaboration with local districts. (See Table B for additional details about these programs.) Teacher candidates in these programs enter with most or all of their content course requirements completed; students are admitted with at most six hours of content coursework outstanding.

Table B. Middle and secondary mathematics teacher pathways to certification.

Program	BS – Middle and/or Secondary	"Traditional" MAT	MAT – Alternative Certification	MAT – Urban Teacher in in Residence
Overview/ Description	This is the traditional route to certification that includes 9 credit hours for student teaching and 200 hours of diverse field experiences. Students can choose certification in: o Middle grades mathematics o Middle grades mathematics + another content area or learning and behavior disorders (LBD) o Middle and secondary mathematics o Secondary mathematics	This traditional route to certification includes 21 credit hours of education courses, 200 hours of diverse field experiences, and 9 credit hours of student teaching. Middle grades, middle and secondary, or secondary mathematics candidates complete coursework and then student teach.	This 30-hour route to certification includes the same 21 hours of education courses required of traditional MAT students. Middle grades, middle and secondary, or secondary mathematics candidates do not student teach; instead, they complete 9 credits of practicum and support courses because they are teaching full time and serve as teachers of record while completing their coursework.	This one-year, 30-hour route to certification is a collaborative effort between UofL and local districts to recruit a diverse teacher workforce. Middle grades, middle and secondary, or secondary mathematics candidates work as teacher aids (not as teachers of record) and complete coursework while teaching with master teachers. Some coursework, including a methods course, is shared with the other MAT programs, whereas other courses are co-designed with districts. Residents receive personalized instruction throughout the process.
Length	4 years	3 semesters	2 years	1 year

Recruitment and Retention

UofL employs several strategies to recruit students for teacher education programs at the undergraduate and graduate levels. First, faculty attend various events with prospective students such as campus preview days and events for students (and parents) who receive scholarship offers. Second, in partnership with nearby districts, UofL has a dual credit program in which high school students can complete up to three courses for university credit, and faculty are available for campus visitations with groups of Dual Credit enrollees. Third, UofL partners with local districts to recruit and retain students of color in their journeys to teaching through the Multicultural Teacher Recruitment Program, utilizing strategies such as scholarships, coaching, networking, community partnerships, and job placement support. Last, UofL employs a recruiter to populate nontraditional MAT programs.

A number of initiatives have been developed to support students both before and after their admission to teacher preparation programs. Incoming education majors have had the opportunity to enroll in a Summer Bridge Program designed to build a strong cohort through an initial weeklong summer program and dedicated class sections and meetings throughout students' first year. Other support mechanisms include scholarships, faculty mentor assignments to help undergraduates make decisions about content courses and career choices, intentional faculty touchpoints with undergraduates both prior to and subsequent to admission to the education program, communication of concern and intensive action plan meetings between faculty and students to address potential problems before they become major problems, programmatic support in courses for graduate students, and support from a mental health and wellness coordinator.

UofL faculty and staff are committed to supporting current and future generations of middle and secondary mathematics teachers and to designing solutions for the rapidly changing landscape of teacher education. The BS program currently is undergoing restructuring to better support and retain teacher candidates, and programs addressing new pathways to certification

are currently being developed with districts in the UofL region to meet demands of filling every classroom with well-prepared mathematics teachers.

Western Kentucky University

Hope Marchionda and Martha M. Day

Programs and Courses

The Western Kentucky University program that leads to certification in middle grades or secondary mathematics is a collaboration between Ogden College of Science and Engineering and the College of Education and Behavioral Sciences. The program is SKyTeach which is modeled after the UTeach Institute at University of Texas at Austin. Students seeking certification in middle or secondary mathematics must complete at least two majors. One of their majors is a content major (Middle Grades Mathematics and/or Mathematics) and the other is a major in education (Science and Mathematics Education).

The Middle Grades Mathematics major requires 34 hours of mathematics that includes coursework in calculus, statistics, geometry, advanced mathematics (discrete), algebra & technology, functions & modeling, problem solving, and the conceptual development of number systems, number theory and rational numbers. The mathematics majors seeking secondary mathematics certification take 39 hours of mathematics content. This course work includes three semesters of calculus, real analysis, linear algebra, abstract algebra, discrete mathematics, probability & statistics, problem solving, geometry, and functions & modeling. Both majors require students to complete a capstone project where they engage in mathematics research. The final outcomes of this project are a formal technical paper and presentation. A student seeking secondary mathematics certification only needs to take four additional classes to become certified to teach middle grades mathematics. As such, many of these students choose to do both and they graduate with three majors (Mathematics, Middle Grades Mathematics, and Science and Mathematics Education).

The Science and Mathematics Education (SMED) major requires 34 hours of coursework. This coursework includes six hours of course work in the theory and practice of inquiry-based teaching, inquiry-based lesson design, theories and principles of cognition and learning as they relate to learning math and science, classroom interactions, perspectives on mathematics and science, research methods, and project-based instruction. Throughout the program, students complete 200 clinical field hours and participate in field teaching exercises in their SMED coursework prior to their student teaching semester. This major culminates in a semester of student teaching.

Recruitment and Retention

There are several avenues for recruitment. The SKyTeach program hosts STEM Education Exploration and Development (SEED) recruitment days to encourage rising high school juniors to explore K-12 teaching as a college major. The days consist of panel discussions with Superintendents, Principals, STEM Teachers/Pre-Service Teachers, and STEM Professors along with exploratory activities that help students understand STEM teaching as a profession. These days also include discussions on endowed scholarships for STEM Pre-Service Teachers, programs of study, a day in the life of a SKyTeach student, and career opportunities for STEM Teachers. SEED days offer substantive interaction with SKyTeach Master Teachers and Professors and include follow-up correspondence to prospective students. SKyTeach faculty typically visit 100 and 200 level undergraduate STEM courses to advertise SKyTeach and the

program offers scholarships to individuals that enroll in our introductory STEM pedagogy course, SMED 101-Step 1. SKyTeach offers STEM outreach events such as STEM nights in local elementary schools and STEM enrichment activities for upper elementary, middle grades and high school age groups visiting WKU's campus. These events serve as valuable recruitment opportunities for our programs. The Mathematics Department also hosts a mathematics competition during the spring semester where faculty connect with prospective students who are interested in mathematics. This provides an avenue to begin building relationships with prospective students. Programs are also advertised periodically on social media platforms and there are informal efforts to recruit students who are enrolled in undergraduate mathematics classes at WKU.

When students enroll at WKU, they are assigned an advisor housed in the Advising and Career Development Center (ACDC) as well as faculty mentors who will become their primary advisors when released from the ACDC once they earn enough hours. Students' academic progress is monitored each semester in every 100 and 200-level course. This allows advisors and mentors to monitor academic progress early and often so that academic issues are addressed before the end of the semester. In addition, faculty advisors are chosen based on their track record of building positive relationships with students. This allows students to become closer with faculty so that they feel comfortable reaching out when issues arise. We also pride ourselves on small class sizes so that students receive the attention that is often lacking at larger universities with large class sizes. In addition, the SKyTeach program faculty and staff have implemented several initiatives to retain developing STEM teachers. Each academic year, the program hosts events in our student workroom such as: Donut Days, Taco Tuesdays, Fall Picnic, Final Exam S'mores and Popcorn, Faculty Soup Contest (Judged by students), Cookies with Big Red, Spring Fling, and Graduation Receptions. We work to help our students develop agency with the SKyTeach Program by providing logo embroidered shirts for field experiences, SKyTeach engraved name plates as a rite of passage to student teaching, SKyTeach stoles for our graduates, a comfortable and inviting student work area with computers, a refreshment area, STEM teaching supplies available for checkout, and computers, a copier, and a laminator for student use. In the pedagogy coursework, our Master Teachers and Professors conduct "checkpoint" meetings with students on a regular basis to ensure that students are making adequate progress towards course objectives and to help with the development of their field teach lessons. These activities foster the development of student identity within SKyTeach and help us maintain a high level of student retention.

Graduate students in Western Kentucky University's Option 6 Master of Arts in Teaching program (MAT) leading to initial teacher certification take a 30-hour online master's program while serving as a classroom teacher. Admission requirements are an undergraduate degree and a grade point average of 3.0 or higher on the last 30 hours of undergraduate coursework or a 2.75 cumulative grade point average. To facilitate the Option 6 teacher candidates transition to teaching, individuals are assigned a school district mentor and a university mentor that meets with the candidate on a regular basis throughout the academic year. Students in the Option 6 MAT program are recruited by local school districts and are referred to the WKU graduate admissions coordinator. WKU also offers a Master of Arts in Mathematics (not for initial certification) for current and practicing high school teachers looking to earn a masters for the purposes of rank change or to teach dual credit. Recruitment is mostly done by program faculty reaching out to Kentucky and border state in-service mathematics teachers to share about the program and its potential to advance their careers.

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Author Bios

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