Memorandum of Agreement
For Phase 2 of the Development of a Collaborative Academic Program
Master of Arts for Teachers in Mathematics

IU East—School of Natural Science and Mathematics
IU Kokomo—School of Sciences
IU Northwest—College of Arts and Sciences
IU South Bend—College of Liberal Arts and Sciences
IU Southeast—School of Natural Sciences

Date: November 20, 2018

With a spirit of respect and partnership, the undersigned campus representatives and university representatives agree to collaborate with each other, the Office of the Executive Vice President for University Academic Affairs, and the Office of Online Education and develop, deliver, and maintain a Collaborative Academic Program for the Master of Arts for Teachers in Mathematics. The details of this collaboration are documented in three Memoranda of Agreement, including this Phase 2 MOA.

Phase 2: Curriculum and Admission Requirements

1. Statement of need and program demand

The Master of Arts for Teachers in Mathematics will provide graduate-level instruction to students interested in obtaining advanced skills and knowledge in this area. M.A.T. coursework will help those students who are teaching or plan to teach college-level introductory Mathematics courses to integrate new concepts and approaches into their teaching, thereby improving the quality of instruction and learning outcomes for their students. The degree will be of particular interest to dual-credit and international baccalaureate instructors teaching college-level Mathematics courses in high schools as well as community college Mathematics instructors.

The proposed M.A.T. was developed as a "stackable" Master's program to serve high school teachers and community college faculty who need to meet Higher Learning Commission faculty qualification standards. The HLC requires instructors in introductory college-level courses to hold at least a Master's degree in the discipline in which they teach, or to hold a Master's degree in a related filed (e.g. M.S.Ed.), and to have at least 18 credit hours of discipline-specific graduate coursework in their area of instruction.

Mathematics is one of the more highly enrolled dual-credit courses offered across Indiana. The Advanced College Project, which coordinates all of IU's dual-credit programs, anticipates that approximately 200 of its current dual-credit instructors will pursue collaborative M.A.T.s in a variety of disciplines to meet HLC standards. In addition, this M.A.T. will appeal to out-of-state teachers and others who wish to further their understanding of Mathematics.

In the three years since the 2015 HLC policy statement on dual-credit instructor qualifications, ACP has collected the following data pertinent to both need and demand:

- Indiana has seen a nearly 25% increase in the overall number of high school students taking dual-credit courses.

- During the 2017-18 academic year, approximately 100,000 Hoosiers enrolled in dual-credit courses and among these students more than 5000 will enroll in dual-credit Finite Mathematics and Calculus courses.
- Approximately 145 ACP affiliated dual-credit teachers will use enrollment in the online Graduate Certificate in Mathematics to meet HLC standards.

The proposed M.A.T. in Mathematics curriculum combines the six courses required for the Graduate Certificate in Mathematics with four additional graduate courses offered by IU's Schools of Education. The four-course Education Component will be a common feature shared between five distinct M.A.T. programs in the following fields: Biology, Chemistry, History, Mathematics, and Political Science.

2. Faculty governance and curriculum approval processes

The MOA must adhere to the following principles:

a. **Curriculum must stay under faculty governance**. Memorandum agreements must recognize that the curriculum belongs to faculty, and that faculty are responsible for curriculum integrity.

b. **Curriculum approvals must use normal operations of university and collaborating campuses**. Because academic program governance occurs at the campus level, the curriculum must be approved by the relevant campus faculty committee(s). Accrediting bodies such as HLC may require documentation that appropriate campus approvals have been obtained.

c. **As a stackable collaborative degree, this M.A.T. will be overseen by two distinct curriculum committees.** The first committee will be composed of campus representatives from the Mathematics programs participating in the collaboration. The second committee will be composed of faculty members from IU's Schools of Education. Details for the administration and oversight of the collaborative M.A.T. Education component are outlined in a separate MOA that is included at the end of this agreement as "Appendix I." This structure ensures that faculty members with disciplinary expertise have oversight for the two components of the degree, and it will allow the Education component to become standard component stacked into five discipline-specific M.A.T.s in Biology, Chemistry, History, Mathematics, and Political Science.

   See Appendix 1 for curriculum details for the Education Component.

3. Curricular framework

a. Program Goals:

The coursework for the M.A.T. in Mathematics will combine the applied skills and theoretical knowledge in the discipline of Mathematics as developed for the Graduate Certificate in Mathematics with the types of pedagogical and instructional focused knowledge provided in Graduate Education coursework to help improve teaching in college-level introductory Mathematics courses.

The M.A.T. in Mathematics will support the reach and quality of Indiana's dual-credit

courses by providing:

- A practical and economical online program of study to highly skilled and motivated teachers who need advanced training in the field of Mathematics;
- A challenging and coherent curriculum that meets the Higher Learning Commission's dual-credit faculty qualifications standards.

b. Program Learning Outcomes:

Upon completion of the Master of Arts for Teachers in Mathematics, student will develop graduate-level knowledge in three of the following five areas of mathematics:

1. **Algebra—**Core applications including Group Theory, Ring Theory, Field Theory, Commutative and Noncommutative Algebra, Number Theory, and other topics in Algebra.
2. **Analysis Applications—**Topics covered in this area include Real Analysis, Complex Analysis, Fourier Analysis, and other topics in Analysis.
3. **Topology/Geometry—**Essential concepts including topics in Euclidean and non-Euclidean Geometry, Point set topology, Differential Topology, Differential Geometry, and other topics in Topology/Geometry.
4. **Differential Equations and Applications—**Including Numerical Methods, Mathematics of Finance, Graph Theory, Mathematical Physics, and other topics.
5. **Probability/Statistics**—Key concepts.

Upon completion of the Education component of the M.A.T. in Mathematics, graduates will be able to—

1. Engage in the development of rigorous curriculum planning and design;
2. Promote college-level studies skills and habits of mind;
3. Use assessment data to inform college-level instructional practices;
4. Prepare dual-credit students for success in college-level assessments;
5. Conduct research to improve dual-credit instruction.

c. Pre-requisite coursework

Bachelor's degree and coursework completed for the IU Collaborative Graduate Certificate in Mathematics.

d. Required courses and time to completion

Working professionals will be able to complete the M.A.T. in Mathematics in 30 to 36 months of consecutive part-time enrollment. Students who can take more than one course at a time may move more quickly.

e. Curriculum map

Master of Arts for Teachers--Mathematics 30 credits overall	
I. Mathematics Component—18 cr	
Requirement 1) Breadth of Knowledge in Mathematical Areas of Finite Mathematics and Calculus (9 cr). Students complete at least one course in three of the following five categories: Algebra, Analysis, Topology/Geometry, Differential Equations and Applications, and Probability and Statistics; all courses are 3 credit hours.	
Requirement 2) Electives in Finite Mathematics and Calculus (9 cr). Students complete three additional courses selected from among the certificate's five categories: Algebra, Analysis, Topology/Geometry, Differential Equations and Applications, and Probability and Statistics; all courses are 3 credit hours.	
1-Algebra	
MATH T601	Topics in Algebra
2-Analysis	
MATH T610	Topics in Analysis
3-Topology/Geometry	
MATH T620	Topics in Topology/Geometry
4-Differential Equations & Applications	
MATH T640	Topics in Differential Equations and Applications
5-Probability/Statistics	
MATH T650	Topics in Probability/Statistics

II. Education Component—12 credits	
1. Instruction/Curriculum (One course-3 cr)	
EDUC-J 500	Instruction in the Context of Curriculum
2. Assessment (One course-3 cr)	
EDUC-P 507	Planning and Assessment
3. Diversity/Inclusive Teaching (One course-3 cr)	
EDUC-H 520	Social Issues in Education
4. Research into Practice (One course-3 cr)	
EDUC-Y 520	Strategies for Educational Inquiry

4. Agreements regarding common use of textbooks, e-texts, and/or other learning resources.

Specify any agreements regarding the use of learning resources in the program:

a. Textbooks and e-texts

Selection and use of textbooks, e-texts, and other learning resources are at the discretion of the faculty member teaching the course, and will be based on the agreed-upon course description and learning outcomes for the course. As per IU policy and practice, a student from one campus who is in a course taught by a faculty member from a different campus will have access to electronic resources from the faculty member's campus library for the duration of the course.

5. Admission and other requirements

a. Admission requirements. *The policies described below will serve the needs of the target audience as reflected in the statement of purpose for the program in MOA 1.*

Successful performance in the Graduate Certificate in Mathematics is a pre-requisite for admission into the M.A.T. in Mathematics. To become eligible for admission to the M.A.T., students must first complete two courses in the certificate and achieve at least a 3.0 GPA.

Admission criteria for the Graduate Certificate in Mathematics will follow the procedures in place at the campus of enrollment with the following certificate specific criteria.

- a completed undergraduate major in mathematics (B.A. or B.S.); **Or**
- a related bachelor's degree in Education with a Math specialization, concentration or outside area; **Or**
- 2 years of secondary teaching experience in dual-credit mathematics.

b. Requirements for transfer, satisfactory progress, and dismissal from the program. *Specify agreements regarding requirements for students transferring to this program from other programs, including on-campus programs. Specify criteria for satisfactory progress in the program, criteria for dismissing students from the program, and any process for permitting dismissed students to re-enroll.*

Because the collaborative online M.A.T. in Mathematics is distinct from related on-campus or online programs, admission to this program does not imply admission to any other program, including face-to-face graduate programs offered by collaborating campuses.

Transfer credit, satisfactory academic progress, and dismissal from the program will follow University Graduate School policy as published in *University Graduate School Bulletin* and *Graduate Handbook*. Current policy is as follows:

> Transfer Credit: With the approval of the appropriate faculty committee and in accordance with pertinent IU policies, students may transfer up to two 3-credit courses in partial satisfaction of M.A.T. requirements. No course may be transferred from another institution unless the grade is a B or higher.
>
> Satisfactory Academic Progress and Dismissal: Grades B (3.0) average or above required. Any semester's work averaging less than B will result in the student being placed on academic

probation. Accumulation of three individual course grades of C (2.0) or lower for graduate credit will result in dismissal of the student from the program. The department evaluates each student's progress toward the degree every year.

Dismissed students must sit out at least one semester. The curriculum committee will read petitions from student seeking re-entry on a rolling basis. The committee will look for evidence that the student has addressed the underlying issues and obstacles to academic success. Petitions must be submitted at least six weeks ahead of the academic term for which the student seeks enrollment. Students should contact their campus of enrollment to determine where to send the petition.

6. Processes for assessment and evaluation.

Articulate agreed upon processes for student assessments and end-of-course evaluations. Develop a schedule for review and revision of courses in the program.

The Steering Committee of the collaborative online Certificate in Graduate Mathematics will supervise the assessment process. Initial quantitative measures to evaluate the success of the program will include:

- the number of students enrolled in the proposed certificate program,
- the number of students who complete the program,
- student GPAs.

A full program review will be completed every five years, as part of the School's cycle of outside review. The decisions of this review will be informed by the collective of evaluation benchmarks described below.

Evaluation Benchmarks for Student Success

A. Acceptance into the Program and Entrance Survey

Candidates submit application materials (as outlined above). These materials are used to determine whether the applicant is ready for graduate study, and help identify the need for remediation. The Steering Committee will take this information into account when it assesses other curricular benchmarks and adjust the admission standards accordingly.

B. Completion of Mathematics Coursework.

1. Proof and Rigor in Mathematics This assessment will be course embedded. In appropriate courses (Analysis, Algebra, Topology), instructors will assess students' ability to understand and apply rigorous definitions, provide suitable examples and counterexamples, and give rigorous proofs of theorems. In these courses, the assessment will also investigate students' ability to judge truth of statements, and to provide a proof or a counterexample, as needed.
2. Mathematical Modeling and Applications This assessment will be course embedded. In appropriate courses (Probability, Statistics, Mathematical Modeling), instructors will assess students' ability to apply the concepts in real-world situations, select suitable solution methods and interpret the answer in the context of the given problem.
3. Assessment strategies for related courses at the graduate and undergraduate level already exist and will be adapted to meet the goals of the collaborative academic program. The programs will use the benchmarks to determine whether a student is in good standing and, if needed, will suspend students who do not meet these criteria. The program will also use the course

assessment to make improvements to individual courses.

C. Exit Survey

An interview will be conducted with all graduate students upon completion of the program. Questions will be designed to evaluate outcomes of student learning along with resources, program content, program administration, and faculty. As part of the exit interview, we will administer the same survey for the students' disposition towards proof and rigor in mathematics as was given upon admission. The progression in attitude towards the principle tenets of mathematics will inform the program's decisions on course design, and possible changes in the program.

For the Graduate Education component of the M.A.T., campus representatives from IU's Schools of Education will develop and oversee assessment criteria for M.A.T. designated sections.

PHASE 2 SIGNATURES:

Young You
Young You (Nov 28, 2018)

Young You, Associate Professor & Coordinator Department of Mathematics,
School of Natural Science and Mathematics, IU East

Amelia Tebbe

Amelia Tebbe, Assistant Professor of Mathematics,
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Iztok Hozo

Iztok Hozo, Professor & Chair, Department of Mathematics
College of Arts and Sciences, IU Northwest

Yi Cheng

Yi Cheng, Professor and Chair, Department of Mathematical Sciences,
College of Liberal Arts and Sciences, IU South Bend

W Christopher Lang

Chris Lang, Professor & Coordinator of the Upper-Level Mathematics Program,
School of Natural Sciences, IU Southeast

Hitesh Kathuria
Hitesh Kathuria (Nov 20, 2018)

Hitesh Kathuria, Assistant Vice President, University Academic Affairs,
Director, Office of Collaborative Academic Programs, Indiana University

Sharon Wavle
Sharon Wavle (Nov 26, 2018)

Documented in OnBase by Sharon Wavle

Education Component
Master of Arts for Teachers

Indiana University Bloomington, School of Education
Indiana University East, School of Education
Indiana University Purdue University Indianapolis, School of Education
Indiana University Kokomo, School of Education
Indiana University Northwest, School of Education
Indiana University South Bend, School of Education
Indiana University South East, School of Education

Date: October 29, 2018

- **Statement of need and program demand**

This agreement addresses the Graduate Education component of five 30-credit hour Master of Arts for Teachers in the following disciplines: Biology, Chemistry, History, Mathematics, and Political Science.

Each of these five "stackable" MAT degrees will consist of 12 credit hours of Graduate Education coursework that will be standard across the individual degrees, as outlined in this document. The second component of the MAT curricula will be the 18 credit hours of discipline-specific coursework that students complete in Graduate Certificates in Biology, Chemistry, History, Mathematics, and Political Science.

- **Faculty governance and curriculum approval processes**

This agreement adheres to the following principles:

  - **Curriculum must stay under faculty governance**. Memorandum agreements must recognize that the curriculum belongs to faculty, and that faculty are responsible for curriculum integrity.

  - **Curriculum approvals must use normal operations of university and collaborating campuses**. Because academic program governance occurs at the campus level, the curriculum must be approved by the relevant campus faculty committee(s). Accrediting bodies such as HLC may require documentation that appropriate campus approvals have been obtained.

- **Curricular framework**
  - **Program goals:** The Education Component for IU's collaborative online M.A.T.s will prepare dual-credit teachers to apply the science and art of teaching to college-level instruction. The program emphasizes research-based pedagogical practices in real world contexts. Each course cultivates college-level study skills and growth mindsets.

  - **Learning outcomes:**
    Upon Completion of the Education Component, candidates will be able to:

    - Teach introductory college-level classes that prepare students for future academic success;
    - Engage in the development of rigorous curriculum planning and design;

- Promote college-level studies skills and habits of mind;
- Use assessment data to inform college-level instructional practices;
- Prepare dual-credit students for success in college-level assessments;
- Conduct research to improve dual-credit instruction.

- **Processes for assessment and evaluation.**
  Campus representatives from IU's Schools of Education will form a standing faculty committee to develop assessment criteria for the MAT designated sections of Graduate Education courses.

- **Curriculum Map and Learning Outcomes with Recent Course Offerings by Campus**

#1-- Instruction/Curriculum--*EDUC-J 500/3cr*

Learning Outcomes-Students in MAT dedicated sections will be able to:

1) Analyze conceptions and definitions of curriculum and instruction and their impact on social contexts;
2) Apply learning theories and schooling practices to deliver high quality introductory college-level courses;
3) Engage in the development of rigorous curriculum planning and design;
4) Promote studies skills and habits of mind that will contribute to academic success in college.

Course	***Course Title***	***BL***	***EA***	***IN***	***KO***	***NW***	***SB***	***SE***
EDUC-J 500	Instruction in the Context of Curriculum	4198	4118	4198	4148	Not Taught	4135	4198

#2-- Assessment--*EDUC-P 507/3cr*

Learning Outcomes-Students in MAT dedicated sections will be able to:

1) Use assessment data to improve instructional practices.
2) Prepare dual-credit students for success in college-level assessments.

Course	***Course Title***	***BL***	***EA***	***IN***	***KO***	***NW***	***SB***	***SE***
EDUC-P 507	Planning and Assessment	4195	4172	4198	4192	4198	4168	4198

#3--Diversity/Inclusive Teaching--*EDUC-H 520/3cr*

Learning Outcomes-Students in MAT dedicated sections will be able to:

1) Identify and deploy research-based strategies to address challenges and seize opportunities for teaching college-level material in pluralistic settings.

Course	***Course Title***	***BL***	***EA***	***IN***	***KO***	***NW***	***SB***	***SE***
EDUC-H 520	Social Issues in Education	4195	Not Taught	4145	4195	4148	4128	4198

#4 Research into Practice--*EDUC-Y 520/3cr*

Learning Outcomes-Students in MAT dedicated sections will be able to:

1) Conduct basic educational research as it occurs in, and is applied to, practical, classroom settings.
2) Complete research projects to improve dual-credit instruction.

Course	***Course Title***	***BL***	***EA***	***IN***	***KO***	***NW***	***SB***	***SE***
EDUC-Y 520	Strategies for Educational Inquiry	4198	Not Taught	4198	4102	4198	Not Taught	Not Taught

Phase 2 Education Faculty Signatures:

Rob Kunzman
Rob Kunzman (Oct 29, 2018)

Rob Kunzman, Professor and Martha Lea and Bill Armstrong Chair for Teacher Education,
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James Barbre, Associate Professor, Director of Graduate Education,
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Julie Reinhardt Saam, Professor,
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Anita Benna (Oct 29, 2018)

Anita Marie Benna, Associate Professor, Educational Psychology,
School of Education, IU Northwest

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Kwadwo A. Okrah (Nov 14, 2018)

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Sharon Wavle
Sharon Wavle (Nov 5, 2018)

Documented in OnBase by Sharon Wavle