

Standards for the Preparation of Teachers of

Mathematics–Elementary (EX)



Approved by the State Board of Education (2000)

List required courses and provide additional narrative to explain how standards are met. If electives are included, they should be clearly indicated.

1.0 MATHEMATICS PREPARATION

- 1.1 Problem Solving: Submit a narrative that describes how the requirements of your program provide opportunities for your candidates to mature in their problem solving ability. What evidence indicates that this is being accomplished?
- 1.2 Reasoning: Submit a narrative that describes how the requirements of your program provide opportunities for your candidates to make and evaluate mathematical conjectures, arguments, and to validate their own mathematical thinking. What evidence indicates that this is being accomplished?
- 1.3 Communication: Submit a narrative that describes how the requirements of your program provide opportunities for your candidates to use both oral and written discourse between teacher and candidates and among candidates to develop and extend candidates' mathematical understanding. What evidence indicates that this is being accomplished?
- 1.4 Connections:
Submit a narrative that describes how the requirements of your program provide opportunities for your candidates to demonstrate an understanding of mathematical relationships across disciplines and connections within mathematics. What evidence indicates that this is being accomplished?
- 1.5 Programs prepare prospective teachers who can:
 - 1.5.1 demonstrate knowledge of the development, use, and multiple representation of numbers and number systems; apply concepts of number, number theory, and number systems;
 - 1.5.2 demonstrate number sense and knowledge of number systems; apply numerical computation and estimation techniques and extend them to algebraic expressions; model the use of the four basic operations (addition, subtraction, multiplication, and division) in multiple contexts; use a variety of mental computation techniques; apply estimation strategies to quantities, measurements, and computation to determine the reasonableness of results; model, explain, and develop a variety of computational algorithms;
 - 1.5.3 apply the process of measurement to two- and three-dimensional objects using non-standard, customary and metric units;
 - 1.5.4 use geometric concepts and relationships to describe and model mathematical ideas and real-world constructs;
 - 1.5.5 understand the major concepts of Euclidean geometry from a variety of perspectives including coordinate and transformational;
 - 1.5.6 use both descriptive and inferential statistics to analyze data, make predictions, and make decisions; collect, organize, represent, analyze, and interpret data;
 - 1.5.7 apply concepts and interpret probability in real-world situations, construct sample spaces, model and compare experimental probabilities with

- mathematical expectations, use probability to make predictions;
 - 1.5.8 use algebra to describe patterns, relations, and functions, and to model and solve problems;
 - 1.5.9 understand the role of axiomatic systems and proofs in different branches of mathematics, such as algebra and geometry;
 - 1.5.10 understand calculus as modeling dynamic change, including an intuitive understanding of differentiation and integration and apply calculus concepts to real-world settings;
 - 1.5.11 use counting to enumerate and order; use matrices, finite graphs, and trees to model problem situations; describe basic algorithms for accomplishing tasks;
 - 1.5.12 describe and represent mathematical relationships; use mathematical modeling to solve real-world problems;
 - 1.5.13 understand and apply the concepts of proportional reasoning; and
 - 1.5.14 understand and apply concepts of variable and function.
- 1.6 Programs prepare prospective teachers who have a knowledge of historical development in mathematics that includes the contributions of under- represented groups and diverse cultures.

2.0 TEACHING PREPARATION

2.1 Diverse Learners

Submit a narrative that describes how the requirements of your program prepare teachers of mathematics to develop and use their knowledge of student diversity to affirm and support full participation and continued study of mathematics by all students. This diversity includes gender, ethnicity, socioeconomic background, language, special needs, and mathematical learning styles.

2.2 Technology

Submit a narrative that describes how the requirements of your program prepare teachers of mathematics to use appropriate technology to support the learning of mathematics. This technology includes, but is not limited to, computers and computer software, calculators, interactive television, distance learning, electronic information resources, and a variety of relevant multimedia.

2.3 Assessment

Submit a narrative that describes how the requirements of your program prepare teachers of mathematics to use:

- 2.3.1 *Formative and summative methods to determine students' understanding of mathematics and to monitor their own teaching effectiveness. How do you ensure that teacher candidates can carefully align their instructional and assessment practices?*
- 2.3.2 Formative assessment to monitor student learning and to adjust instructional strategies and activities. Formative assessment includes, but is not limited to, questioning strategies, student writing, student products, and student performance.
- 2.3.3 Summative assessment to determine student achievement and to evaluate the mathematics program. Summative assessment includes, but is not limited to,

teacher-designed tests, criterion-referenced tests, norm-referenced tests, portfolios, projects, and other open-ended student products.

- 2.4 Programs prepare prospective teachers who can identify, teach, and model problem solving in grades K-8. How do you ensure that teacher candidates can do this effectively?
- 2.5 Programs prepare prospective teachers who use a variety of physical and visual materials for exploration and development of mathematical concepts in grades K-8, including prenumeration concepts; numbers (whole numbers, fractions, decimals, percents) and their relationships; four basic operations with positive and negative rational numbers; geometric concepts and spatial visualization; measurement concepts and procedures; algebraic concepts; logical conjectures and conclusions using words such as all, some, and none; and concepts of probability and elementary data analysis. See Michigan Curriculum Framework, 1996 and its successor documents). How is this evaluated?
- 2.6 Programs prepare prospective teachers who use a variety of print and electronic resources (e.g. calculators and computers).
- 2.7 Programs prepare prospective teachers who know when and how to use student groupings such as collaborative groups, cooperative learning, and peer teaching.
- 2.8 Programs prepare prospective teachers who use instructional strategies based on current research as well as national, state (i.e. Teaching and Learning Standards from Chapter 4 of Michigan Curriculum Framework, pages 46-62, 1996, and its successor documents), and local standards relating to mathematics instruction.
- 2.9 Programs prepare prospective teachers who can work on an interdisciplinary team and in an interdisciplinary environment.
- 2.10 Programs introduce and involve prospective teachers in the professional community of mathematics educators.
- 2.11 Programs prepare prospective teachers to understand, use, and evaluate district mathematics curricula and to deliver the curriculum to each student.

3.0 FIELD BASED EXPERIENCES

- 3.1 Programs provide prospective teachers with a sequence of planned opportunities prior to student teaching to observe and participate in K-8 mathematics classrooms with qualified teachers. Experiences include observing, tutoring, mini-teaching, and planning mathematics activities and lessons for different mathematics courses and levels.
- 3.2 Programs provide prospective teachers with a full-time student teaching experience in K-8 mathematics that is supervised by a qualified teacher and a university or college supervisor with K-8 teaching experience and is knowledgeable regarding K-8

mathematics.

- 3.3 Programs provide prospective teachers with time to confer with the supervising teacher and to do instructional planning.

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