

Middle Level Mathematics Endorsement

1.0 Common Core - Mathematical Problem Solving: <i>Middle level teacher candidates know, understand, and apply the process of mathematical problem solving in each mathematical content area. As a result, candidates:</i>
1.1 Apply and adapt a variety of appropriate strategies to solve problems.
1.2 Solve problems that arise in mathematics and those involving mathematics in other contexts.
1.3 Build new mathematical knowledge through problem solving.
1.4 Monitor and reflect on the process of mathematical problem solving and evaluate reasonableness of solution.
2.0 Common Core - Reasoning and Proof: <i>Middle level teacher candidates reason, construct, evaluate and justify mathematical arguments and interpret and compare mathematical information from a variety of sources in each mathematical content area. As a result, candidates:</i>
2.1 Recognize reasoning and proof as fundamental aspects of mathematics.
2.2 Make and investigate mathematical conjectures.
2.3 Develop and evaluate mathematical arguments and proofs.
2.4 Select and use various types of reasoning (e.g., inductive, deductive, proportional, spatial) and methods of proof.
3.0 Common Core - Mathematical Communication: <i>Middle level teacher candidates communicate their mathematical thinking orally and in writing, using appropriate mathematical language and notation to clearly and effectively express or present ideas and information in each mathematical content area. As a result, candidates:</i>
3.1 Systematically gather mathematical information for a given purpose and clearly communicate their findings to peers, faculty, and others.
3.2 Use the language of mathematics to express ideas precisely.
3.3 Use communication as a means of clarifying and organizing one's own mathematical thinking.
3.4 Engage in inquiry, including mathematical discourse, to develop concepts and identify relationships from their observations, data, and inferences.
3.5 Analyze and evaluate the mathematical thinking and strategies of others.
4.0 Common Core - Mathematical Connections: <i>Middle level teacher candidates recognize, use, and make connections between and among mathematical ideas and in contexts outside mathematics to build mathematical understanding. As a result, candidates:</i>
4.1 Recognize and use connections among mathematical ideas.
4.2 Recognize and apply mathematical ideas to other subject areas and to real-world situations.
4.3 Demonstrate how mathematical ideas interconnect and build on one another to

produce a coherent whole.
5.0 Common Core - Mathematical Representation: <i>Middle level teacher candidates use varied representations (pictorial, verbal, numerical, graphical, symbolic) of mathematical ideas to support and deepen mathematical understanding in each mathematical content area. As a result, candidates:</i>
5.1 Use multiple representations to model and interpret physical, social, and mathematical phenomena.
5.2 Create and use representations to organize, record, and communicate mathematical ideas.
5.3 Select, translate among, and apply mathematical representations to solve problems.
6.0 Common Core - Number and Operation: <i>Middle level teacher candidates demonstrate computational proficiency using various strategies, including a conceptual understanding of numbers, ways of representing number (numbers, tables, graphs, models, words, and symbols), relationships among number and number systems, and meanings of operations with all real numbers. As a result, candidates:</i>
6.1 Analyze and explain the mathematics that underlies the procedures involving operations with real and complex numbers.
6.2 Recognize the meaning and use of place value in representing whole numbers and finite decimals, comparing and ordering numbers, and understanding the relative magnitude of numbers
6.3 Demonstrate proficiency in real number computation using multiple algorithms, mental mathematics, and computational estimation.
6.4 Demonstrate understanding, representation, and use of fractions, decimals, and percents.
6.5 Demonstrate understanding of the meaning of operations on fractions, decimals, and percents.
6.6 Provide equivalent representations of fractions, decimals, and percents.
6.7 Demonstrate understanding and use of proportional reasoning (direct and inverse variation) to solve problems.
6.8 Demonstrate understanding of rates and ratios, and use them to solve problems.
6.9 Demonstrate understanding of the fundamental ideas of number theory (e.g. divisibility, factoring, multiples, prime factorization, prime and composite)
6.10 Demonstrate understanding of and use exponential and scientific notations.
6.11 Compare properties of number systems.
6.12 Represent, use, and apply properties of complex numbers.
6.13 Recognize matrices and vectors as systems that have some of the properties of the real number system.
6.14 Demonstrate understanding of the historical development of number and number systems, including contributions from many cultures.
7.0 Common Core - Algebra: <i>Middle level teacher candidates understand relationships among quantities, functions, ways of representing mathematical</i>

<i>relationships (numbers, tables, graphs, models, words, and symbols), and the analysis of change. As a result, candidates:</i>
7.1 Identify, explore, analyze, predict, and represent patterns, relations, and functions.
7.2 Apply techniques of algebra to linear, quadratic, and exponential functions.
7.3 Demonstrate understanding of the relationships of equations and inequalities; including proportional reasoning.
7.4 Use mathematical models including technological tools to represent and demonstrate understanding of quantitative relationships and functions.
7.5 Analyze the concept of change in various contexts.
7.6 Demonstrate understanding of the historical development of algebra, including contributions from many cultures.
8.0 Common Core - Geometry: <i>Middle level teacher candidates use spatial visualization and geometric modeling to explore and analyze geometric figures, structures, their properties, and ways of representing mathematical relationships (numbers, tables, graphs, models, words, and symbols). As a result, candidates:</i>
8.1 Demonstrate understanding of core concepts and principles of Euclidean and non-Euclidean geometries in two and three dimensions from both formal and informal perspectives.
8.2 Demonstrate understanding of the role of axiomatic systems and proofs in geometry.
8.3 Analyze characteristics and relationships of geometric objects and figures.
8.4 Build and manipulate representations of two- and three- dimensional objects using concrete models, drawings, and dynamic geometry software, and perceive an object from different perspectives.
8.5 Specify locations and describe spatial relationships using coordinate geometry, vectors, and other representational systems.
8.6 Apply transformations and use symmetry, similarity, and congruence in mathematical situations.
8.7 Demonstrate understanding of the historical development of Euclidean and non-Euclidean geometries, including contributions from many cultures.
9.0 Common Core - Data Analysis, Statistics, and Probability: <i>Middle level teacher candidates demonstrate an understanding of concepts and practices related to data analysis, statistics, probability, and ways of representing mathematical relationships (numbers, tables, graphs, models, words, and symbols). As a result, candidates:</i>
9.1 Design investigations, collect data, use a variety of ways to display data, interpret data representations and draw and represent conclusions that may include bivariate data and geometric probability.
9.2 Use appropriate methods such as random sampling or random assignment of treatments to estimate population characteristics, test conjectured relationships among variables, and analyze data.
9.3 Use appropriate statistical methods and technological tools to describe shape and analyze spread and center.
9.4 Apply basic statistics and statistical interpretation to the analysis of data.
9.5 Use statistical inference to draw conclusions from data.

9.6 Identify misuses of statistics and invalid conclusions from probability.
9.7 Draw conclusions involving uncertainty by using hands-on and technology-based simulation for estimating probabilities and gathering data to make inferences and decisions.
9.8 Demonstrate understanding of the historical development of statistics and probability, including contributions from many cultures.
10.0 Common Core - Measurement: <i>Middle level teacher candidates apply and use measurement concepts and tools and ways of representing mathematical relationships (numbers, tables, graphs, models, words, and symbols). As a result, candidates:</i>
10.1 Demonstrate understanding of the common representations and uses of measurement and choose tools and units for measuring length, surface area, volume, mass, weight, angle, elapsed time, rate, and temperature.
10.2 Identify the attributes to be measured and apply appropriate techniques, tools, and formulas to determine measurements and their application in a variety of contexts.
10.3 Demonstrate an understanding of the distinction between precision and accuracy of measurements.
10.4 Use estimation as a way of understanding measurement units and processes.
10.5 Demonstrate understanding of international (metric) and customary (U.S.) units of measure and apply unit conversions within each measurement system.
10.6 Demonstrate understanding of the historical development of measurement including contributions from many cultures.
11.0 Common Core - Calculus: <i>Middle level teacher candidates demonstrate a conceptual understanding of and procedural facility with fundamental single variable calculus and ways of representing calculus (numbers, tables, graphs, models, words, and symbols). As a result, candidates:</i>
11.1 Demonstrate a conceptual and procedural understanding of fundamental elements of calculus including: limit, continuity, differentiation, and integration and a general background in the techniques and application of calculus.
11.2 Use technological tools to explore and represent fundamental concepts of calculus.
11.3 Demonstrate understanding of the historical development of calculus, including contributions from many cultures.
12.0 Common Core - Discrete Mathematics: <i>Middle level teacher candidates apply the fundamental ideas of discrete mathematics in the formulation and solution of problems and ways of representing discrete mathematics (numbers, tables, graphs, models, words, and symbols). As a result, candidates:</i>
12.1 Demonstrate understanding of fundamentals of discrete mathematics including elements of recurrence relations, finite difference approaches, logic, graph theory (e.g. simple circuits, graphs, trees, and critical path scheduling), linear programming (e.g. basic optimization with small sets of linear functions), and combinatorics (e.g. simple combinations and permutations).
12.2 Apply the fundamental ideas of discrete mathematics in the formulation and solution of problems arising from real-world situations.
12.3 Use technological tools to solve problems involving the use of discrete structures and

the application of algorithms.
12.4 Demonstrate understanding of the historical development of discrete mathematics, including contributions from many cultures.
13.0 Common Core – Integrating Technology with Mathematics: <i>Middle level teacher candidates embrace technology as an essential tool for teaching and learning mathematics. As a result, candidates:</i>
13.1 Understand the appropriate use of technology to experiment, visualize, and make/explore conjectures.
13.2 Demonstrate an ability to use instructional support strategies to promote academic achievement for those students with significant gaps in their mathematical knowledge.
13.3 Use technological tools, including but not limited to computer technology, to access resources, collect and process data, and facilitate learning.
13.4 Use appropriate technology to help students acquire concepts and skills.
14.0 Common Core - Mathematics Instructional Methodology: <i>Middle level teacher candidates possess a deep understanding of how students learn mathematics and of the pedagogical knowledge specific to mathematics teaching and learning. As a result, candidates:</i>
14.1. Use content knowledge to make interdisciplinary connections.
14.2 Integrate literacy skills into the teaching of mathematics.
14.3 Select, use, and determine suitability of the wide variety of available mathematics curricula and teaching materials for all students including those with special needs such as the gifted, challenged and speakers of other languages.
14.4 Select and use appropriate concrete materials for learning mathematics.
14.5 Use multiple strategies, including listening to and understanding the ways students think about mathematics, to assess students' mathematical knowledge and provide appropriate interventions.
14.6 Demonstrate understanding of research results in the teaching and learning of mathematics, and use print and online resources of professional mathematics organizations.
14.7 Demonstrate ability to present mathematical concepts using multiple representations (e.g., numerical, graphical, analytical, contextual) to address the multiple learning styles of students
14.8 Demonstrate the ability to use student discourse to lead classes in mathematical problem solving and develop in-depth conceptual understanding to help students develop and test generalizations.
14.9 Select and use appropriate technological tools such as but not limited to spreadsheets, dynamic graphing tools, computer algebra systems, dynamic statistical packages, graphing calculators, data-collection devices, and presentation software.
15.0 Common Core – Middle Level Development: <i>Middle level teacher candidates understand the major concepts, principles, theories, and research related to middle level development, and they provide opportunities that support student development and learning. As a result, candidates:</i>

15.1 Understand that teaching all young adolescents includes students of diverse ethnicity, race, language, religion, socioeconomic status, gender, sexual orientation, regional or geographic origin, and those with exceptional learning needs.
15.2 Understand the major concepts, principles, and theories of young adolescent development – intellectual, physical, social, emotional, and moral- in the context of classrooms, families, peer groups, communities and society.
15.3 Understand the range of individual differences of all young adolescents and the implications of these differences for teaching and learning.
15.4 Understand the importance of mutually respectful relationships with and among all young adolescents that support their intellectual, ethical, and social growth.
16.0 Common Core - Middle Level Philosophy and School Organization: <i>Middle level teacher candidates understand the major concepts, principles, theories, and research underlying the philosophical foundations of developmentally responsive middle level programs and schools, and they work successfully within these organizational components. As a result, candidates:</i>
16.1 Understand the philosophical foundations of developmentally responsive middle level programs and schools.
16.2 Understand the rationale and characteristic components of developmentally responsive middle level schools.
17.0 Common Core - Family and Community Involvement: <i>Middle level teacher candidates understand the major concepts, principles, theories, and research related to working collaboratively with family and community members, and they use that knowledge to maximize the learning of all middle level learners. As a result, candidates:</i>
17.1 Understand how prior learning, differing experiences, and family/language/cultural backgrounds influence middle level learning.
17.2 Understand the challenges that families may encounter in contemporary society, and are knowledgeable about support services and other resources that are available to assist them.
17.3 Understand reciprocal relationships between schools and community organizations.
17.4 Understand the roles of families and community members and strategies to involve them in improving the education of all middle level learners.
18.0 Common Core - Middle Level Professional Roles: <i>Middle level teacher candidates understand the complexity of teaching middle level learners, and they engage in practices and behaviors that develop their competence as professionals. As a result, candidates:</i>
18.1 Understand the interrelationships and interdependencies among various professionals who serve middle level learners (e.g., school counselors, social service workers, home-school coordinators).
18.2 Understand the need for continual reflection on middle level development, the instructional process, and professional and collaborative relationships.
19.0 Common Core - Middle Level Instructional Methodology: <i>Middle level teacher</i>

<i>candidates create environments that enable students to develop and apply essential concepts and skills. As a result, candidates:</i>
19.1 Plan lessons, units and courses that target Washington Essential Academic Learning Requirements (EALRs), Grade-Level Expectations (GLEs), Washington Assessment of Student Learning (WASL) Test and Item Specifications, and additional WASL resources.
19.2 Design, facilitate, and assess differentiated learning experiences that reflect an understanding of the development of all middle level learners.
19.4 Use understanding of students’ cognitive and social development to present concepts in multiple and meaningful ways.
19.5 Select, adapt and implement middle level instructional materials that are relevant, rigorous, challenging, integrative, and exploratory.
19.6 Design and facilitate a positive, productive learning environment where developmental differences are respected and supported, and individual potential is encouraged.
19.6 Create and maintain a psychologically and socially safe and supportive learning environment.
19.7 Use continuous observation, assessment, and reflection on student learning and development to guide instruction.
19.8 Engage middle level learners in activities related to their interpersonal, community, and societal responsibilities.
19.9 Design and implement learning experiences requiring students to locate, acquire, and evaluate information from a variety of sources.
19.10 Use skillful questioning strategies to support student learning and develop critical thinking.
19.11 Know effective, developmentally responsive classroom management techniques.
19.12 Understand a variety of strategies to motivate middle level learners
20.0 Common Core – Middle Level Curriculum: <i>Middle level teacher candidates understand the major concepts, principles, theories, standards, and research related to middle level curriculum and they use this knowledge in their practice. As a result, candidates:</i>
20.1 Understand the interdisciplinary nature of knowledge and how to make connections among subject areas when planning curriculum.
20.2 Facilitate student learning through the use of developmentally responsive materials and resources (e.g., technological resources, manipulative materials).