**Cognition and General Knowledge: Science, Math and Logic and Reasoning**

**Competencies**

Courses from the EarlyEdU Alliance are built around a set of course objectives. Objectives describe what students should know and be able to do as a result of participating in the course. Course objectives are aligned with NAEYC Professional Standards and Elements. Most states have their own professional competencies or standards. In this chart, we show how the course objectives align with one state’s (Washington) competencies, both the related competencies and more specific competencies.

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| **Course Objective** | **Related Competency** | **Specific Competency** | **NAEYC Standard** |
| 1. Increase participants’ knowledgeof the development of children’s early logic and reasoning and mathematical and scientific thinking and their relationship to important instructional practices | **9.D Mathematics.**  Candidates possess a deep understanding of children’s development and mathematical and spatial learning. | 9.D.1 Understand the developmental progression of mathematical learning from birth to eight with the infancy skills of number sense and spatial perception to early childhood skills of pre-numeracy, such as recognition of shapes, visual matching, counting, knowledge of numbers, visual recognition of numbers, ordering, sorting, classifying, sequencing, creation of two- and three-dimensional objects, creating and expanding repeated reasoning, and spatial rotation.  9.D.2 Understand and apply the fundamental principles, concepts, and procedures related to mathematical problem solving, exploration, and reasoning, including processes and skills related to using mathematical language to communicate relationships and concepts, adaptive reasoning, strategic competence, procedural fluency, and productive disposition.  9.D.3 Standards for Mathematical Practices: Demonstrate ability to embed CCSS-M Mathematical Practices in the instructional process to deepen conceptual understanding.  9.D.4 Counting and Cardinality / Number and Operations in Base Ten & Fractions: Demonstrate a conceptual understanding of and procedural facility and application of operations, number systems, and properties.  9.D.5 Operations and Algebraic Thinking: Demonstrate a conceptual understanding of and procedural facility with arithmetic properties and their application to algebra concepts.  9.D.6 Measurement and Data: Understand measurement systems and units, concepts related to geometric measurement, and tools and techniques used to solve measurement problems.  9.D.7 Geometry: Demonstrate a conceptual understanding of geometric properties and relationships as they apply to congruence, similarity, and geometric figures.  9.D.8 Modeling and Technology: Connect mathematics with real life problems through the use of mathematical modeling and technology.  9.D.9 Mathematics Instructional Methodology: Candidates possess a deep understanding of how students learn mathematics and of the pedagogical knowledge specific to mathematics teaching and learning | **STANDARD 5. USING CONTENT KNOWLEDGE TO BUILD MEANINGFUL CURRICULUM**  Candidates prepared in early childhood degree programs use their knowledge of academic disciplines to design, implement, and evaluate experiences that promote positive development and learning for each and every young child. Candidates understand the importance of developmental domains and academic (or content) disciplines in early childhood curriculum. They know the essential concepts, inquiry tools, and structure of content areas, including academic subjects, and can identify resources to deepen their understanding. Candidates use their own knowledge and other resources to design, implement, and evaluate meaningful, challenging curriculum that promotes comprehensive developmental and learning outcomes for every young child.  **5a:** Understanding content knowledge and resources in academic disciplines: language and literacy; the arts – music, creative movement, dance, drama, visual arts; mathematics; science, physical activity, physical education, health and safety; and social studies.  **5b:** Knowing and using the central concepts, inquiry tools, and structures of content areas or academic disciplines |
|  | **9.E Science.**The candidate works with their students to build the interrelationships among science, technology, engineering, mathematics (STEM), and society; by applying fundamental concepts related to Disciplinary Core Ideas (earth and space science, the life sciences, physical sciences, and engineering design); and promotes the scientific abilities of all children ([Appendix D, All Standards, All Students](http://www.nextgenscience.org/sites/ngss/files/Appendix%20D%20Diversity%20and%20Equity%206-14-13.pdf)) from birth through eight as they acquire new knowledge through the use of Crosscutting Concepts and Science and Engineering Practices in the Next Generation Science Standards (NGSS). | 9.E.1 Applies the developmental and social foundations of learning (birth through eight), specifically as they relate to science and engineering practices, mathematical thinking, and language.  9.E.2 Uses the Crosscutting Concepts as an organizational framework for connecting core ideas across the earth and space sciences, the life sciences, physical sciences, and engineering design.  9.E.3 Demonstrates knowledge of and be able to model with grade-/age-appropriate, hands-on experiences the Science and Engineering Practices to help all students (see [Appendix D, All Standards, All Students](http://www.nextgenscience.org/sites/ngss/files/Appendix%20D%20Diversity%20and%20Equity%206-14-13.pdf)) understand the Crosscutting Concepts and Disciplinary Core Ideas of science and the relationship between engineering and science in [Appendix I, Engineering Design](http://www.nextgenscience.org/sites/ngss/files/Appendix%20I%20-%20Engineering%20Design%20in%20NGSS%20-%20FINAL_V2.pdf) in the NGSS.  9.E.4 Engages students in Science and Engineering Practices to facilitate learning the Disciplinary Core Ideas, Science and Engineering Practices, and Crosscutting Concepts.  9.E.5 Engages in instruction that integrates Disciplinary Core Ideas in [Appendix E](http://www.nextgenscience.org/sites/ngss/files/Appendix%20E%20-%20Progressions%20within%20NGSS%20-%20052213.pdf) with Crosscutting Concepts in [Appendix G](http://www.nextgenscience.org/sites/ngss/files/Appendix%20G%20-%20Crosscutting%20Concepts%20FINAL%20edited%204.10.13.pdf) and Science and Engineering Practices in [Appendix F](http://www.nextgenscience.org/sites/ngss/files/Appendix%20F%20%20Science%20and%20Engineering%20Practices%20in%20the%20NGSS%20-%20FINAL%20060513.pdf) in the NGSS.  9.E.6 Designs instruction that targets grade level standards and reflects the learning progressions identified in the NGSS.  9.E.7 Understands and integrates the use of appropriate tools, including technological tools e.g., e-tools and interactive science notebooks.  9.E.8 Develops knowledge of and applies safety precautions and procedures relative to science investigations e.g., student eye protection, safe storage of chemicals, and equipment care and maintenance. Demonstrates responsible use and disposal of live organisms according to Washington State law.  9.E.9 Develops an understanding of how science, technology, engineering, and mathematics (STEM) disciplines are interrelated to each other, society, the workplace, and the environment in[Appendix J, Science, Technology, Society and the Environment](http://www.nextgenscience.org/sites/ngss/files/APPENDIX%20J_0.pdf) of the NGSS; and how they promote equitable learning opportunities for all students in [Appendix D, All Standards, All Students](http://www.nextgenscience.org/sites/ngss/files/Appendix%20D%20Diversity%20and%20Equity%206-14-13.pdf) in the NGSS.  9.E.10 Knows and understands the interactions between culture and science, and the contributions of diverse individuals to the development of science and technology, and how science and technology have affected individuals, cultures, and societies throughout human history in [Appendix H, Nature of Science](http://www.nextgenscience.org/sites/ngss/files/Appendix%20H%20-%20The%20Nature%20of%20Science%20in%20the%20Next%20Generation%20Science%20Standards%204.15.13.pdf) in the NGSS. |  |
| 1. Provide opportunities for participants to **see** teacher-child interactions and specific instructional strategies that elicit children’s logic and reasoning, mathematical, and scientific knowledge and skills; |  |  |  |
| 1. Implement strategies that support and elicit participants’ logic and reasoning, mathematical, and scientific knowledge and skills, taking advantage of informal and formal opportunities to engage in instruction | **9.D Mathematics.** Candidates possess a deep understanding of children’s development and mathematical and spatial learning. | 9.D.2 Understand and apply the fundamental principles, concepts, and procedures related to mathematical problem solving, exploration, and reasoning, including processes and skills related to using mathematical language to communicate relationships and concepts, adaptive reasoning, strategic competence, procedural fluency, and productive disposition.  9.D.4 Counting and Cardinality / Number and Operations in Base Ten & Fractions: Demonstrate a conceptual understanding of and procedural facility and application of operations, number systems, and properties.  9.D.5 Operations and Algebraic Thinking: Demonstrate a conceptual understanding of and procedural facility with arithmetic properties and their application to algebra concepts.  9.D.6 Measurement and Data: Understand measurement systems and units, concepts related to geometric measurement, and tools and techniques used to solve measurement problems. | **STANDARD 5. USING CONTENT KNOWLEDGE TO BUILD MEANINGFUL CURRICULUM**  Candidates prepared in early childhood degree programs use their knowledge of academic disciplines to design, implement, and evaluate experiences that promote positive development and learning for each and every young child. Candidates understand the importance of developmental domains and academic (or content) disciplines in early childhood curriculum. They know the essential concepts, inquiry tools, and structure of content areas, including academic subjects, and can identify resources to deepen their understanding. Candidates use their own knowledge and other resources to design, implement, and evaluate meaningful, challenging curriculum that promotes comprehensive developmental and learning outcomes for every young child.  **5a:** Understanding content knowledge and resources in academic disciplines: language and literacy; the arts – music, creative movement, dance, drama, visual arts; mathematics; science, physical activity, physical education, health and safety; and social studies.  **5b:** Knowing and using the central concepts, inquiry tools, and structures of content areas or academic disciplines |
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| 1. Support **reflection** by inviting participants to analyze and assess their classroom strategies related to logic and reasoning, mathematics, and science and then plan for improvement. | **8.0 Reflective practice.**The candidate, in collaboration with colleagues, regularly analyzes, evaluates, and synthesizes his/her teaching practice to make appropriate changes that more fully serve infants and young children. | 8.A Reflects on practice and continually self-assesses and evaluates the effects of the teacher’s choices and action on young children, parents, and other professionals as a basis for program planning and modification, and continuing professional development.  8.B Considers theory, research, assessment information, and perspectives of others to make informed decisions about instructional strategies and program content. | **STANDARD 5. USING CONTENT KNOWLEDGE TO BUILD MEANINGFUL CURRICULUM**  Candidates prepared in early childhood degree programs use their knowledge of academic disciplines to design, implement, and evaluate experiences that promote positive development and learning for each and every young child. Candidates understand the importance of developmental domains and academic (or content) disciplines in early childhood curriculum. They know the essential concepts, inquiry tools, and structure of content areas, including academic subjects, and can identify resources to deepen their understanding. Candidates use their own knowledge and other resources to design, implement, and evaluate meaningful, challenging curriculum that promotes comprehensive developmental and learning outcomes for every young child.  **5a:** Understanding content knowledge and resources in academic disciplines: language and literacy; the arts – music, creative movement, dance, drama, visual arts; mathematics; science, physical activity, physical education, health and safety; and social studies.  **5b:** Knowing and using the central concepts, inquiry tools, and structures of content areas or academic disciplines  **STANDARD 6. BECOMING A PROFESSIONAL**  Candidates prepared in early childhood degree programs identify and conduct themselves as members of the early childhood profession. They know and use ethical guidelines and other professional standards related to early childhood practice. They are continuous, collaborative learners who demonstrate knowledgeable, reflective and critical perspectives on their work, making informed decisions that integrate knowledge from a variety of sources. They are informed advocates for sound educational practices and policies**.**  **6c:** Engaging in continuous, collaborative learning to inform practice; using technology effectively with young children, with peers, and as a professional resource.  **6d: I**ntegrating knowledgeable, reflective, and critical perspectives on early education  **STANDARD 7. EARLY CHILDHOOD FIELD EXPERIENCES**  Field experiences and clinical practice are planned and sequenced so that candidates develop the knowledge, skills and professional dispositions necessary to promote the development and learning of young children across the entire developmental period of early childhood – in at least two of the three early childhood age groups (birth – age 3, 3 through 5, 5 through 8 years) *and* in the variety of settings that offer early education (early school grades, child care centers and homes, Head Start programs). |