

George Mason University
College of Education and Human Development
Early Childhood Education

ECED 515.002 Mathematics for Diverse Young Learners
3 Credits, Semester
Thursdays/ 7:20 – 10:00 pm
Thompson L019, Fairfax Campus

Faculty

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Prerequisites/Corequisites

ECED 403 or 503

University Catalog Course Description

Examines ways to foster development of mathematics in preschool to third-grade children. Covers construction of mathematics lessons and hands-on experiences that promote learning in children with diverse abilities and cultural and linguistic backgrounds. Offered by Graduate School of Education. May not be repeated for credit.

Course Delivery Method

This course will be delivered using a lecture and discussion format.

Learner Outcomes or Objectives

This course is designed to enable students to do the following:

1. Discuss the historical, philosophical, and sociological foundations underlying the role of, development, and organization of mathematics in public education.
2. Explain mathematics relevant to the content identified in Virginia's Foundation Blocks for Early Learning: Comprehensive Standards for Four-Year-Olds and the Virginia Standards of Learning and how the standards provide the foundation for teaching mathematics in grades preK through third grade. Experience with practical applications and the use of appropriate technology and manipulatives is used within the following content:
 - a. Number systems and their structure, basic operations, and properties;
 - b. Elementary number theory, ratio, proportion, and percent;
 - c. Algebra: fundamental idea of equality; operations with monomials and polynomials; algebraic fractions; linear and quadratic equations and inequalities and linear systems of equations and inequalities; radicals and exponents; arithmetic and geometric sequences and series; algebraic and trigonometric functions; and transformations among graphical, tabular, and symbolic forms of functions;
 - d. Geometry: geometric figures, their properties, relationships, and the Pythagorean

- Theorem; deductive and inductive reasoning; perimeter, area, and surface area of two-dimensional and three-dimensional figures; coordinate and transformational geometry; and constructions; and
- e. Probability and statistics: permutations and combinations; experimental and theoretical probability; prediction; data collection and graphical representations including box-and-whisker plots; and measures of center, spread of data, variability, range, and normal distribution.
3. Describe the sequential nature of mathematics and vertical progression of mathematical standards.
 4. Explain the multiple representations of mathematical concepts and procedures.
 5. Use the five processes: reasoning mathematically, solving problems, communicating mathematics effectively, making mathematical connections, and using mathematical representations at different levels of complexity.
 6. Identify and use strategies to enable diverse young learners to become mathematically literate, think critically and creatively, and to see the relationships between mathematics and other content areas.
 7. Explain the appropriate use of calculators and technology in the teaching and learning of mathematics, including virtual manipulatives.
 8. Discuss the contributions of different cultures toward the development of mathematics and the role of mathematics in culture and society.
 9. Describe the role of family and community knowledge, experience, and resources in planning and implementing mathematics content in the curriculum.
 10. Develop informal assessment strategies to describe young children's understanding of mathematics concepts.
 11. Reflect on one's own use of inquiry strategies in facilitating children's learning of mathematics concepts.
 12. Design, evaluate, and modify mathematics-rich environments and classroom management and behavior guidance strategies that maintain a positive learning environment; respond to each child's individual strengths and needs; and promote diverse young children's interest and engagement in mathematics.
 13. Plan, implement, and reflect on evidence-based, culturally responsive assessment and instruction that uses knowledge of how standards provide the core for teaching Mathematics to support young children's achievement of the Virginia Standards of Learning in English and Virginia's Foundation Blocks for Early Learning: Comprehensive Standards for Four-Year-Olds.

Professional Standards – Interstate Teacher Assessment and Support Consortium (InTASC), Council of Exceptional Children (CEC), and National Association for the Education of Young Children (NAEYC)

Upon completion of this course, students will have met the following professional standards:
N/A- Students will work toward meeting InTASC, CEC, and NAEYC standards.

Required Texts

American Psychological Association. (2010). *Publication manual of the American Psychological Association* (6th ed.). Washington, DC: Author. ISBN: 9781433805615

Copley, J. V. (2010). *The young child and mathematics* (2nd ed.). Washington, DC: National Association for the Education of Young Children. ISBN: 9781928896685

Van de Walle, J., Lovin, L. A., Karp, K., & Bay-Williams, J. (2013). *Teaching student-centered mathematics: Developmentally appropriate instruction for grades pre-k-2* (2nd ed.). New York, NY: Pearson. ISBN: 9780134556437

Required Online Documents

National Council of Teachers of Mathematics. (2000). *Principles and standards for school mathematics*. Reston, VA: Author. <http://www.nctm.org/standards/content.aspx?id=16909>

Virginia Department of Education. (2009). Mathematics standards of learning. http://www.doe.virginia.gov/testing/sol/standards_docs/mathematics/index.shtml

Virginia Department of Education. (2009). Mathematics curriculum framework. http://www.doe.virginia.gov/testing/sol/standards_docs/mathematics/index.shtml

Virginia Department of Education. (2013). Virginia’s Foundation Blocks for Early Learning: Comprehensive Standards for Four-Year-Olds. http://www.doe.virginia.gov/instruction/early_childhood/

Access Blackboard for additional class readings.

Course Performance Evaluation

Students are expected to submit all assignments on time in the manner outlined by the instructor (e.g., Blackboard (Bb), Tk20, hard copy).

Assignments	Due Dates	Points
Attendance and Participation	Ongoing	15
Personal Journal		20
Part 1	Jan 31	
Part 2	May 5	
Mathematics Activity Share	Variable	20
Teaching Math Through Picture Books Poster and Presentation	Feb 21	20
Mathematics Lesson Implementation and Reflection: Illuminations/VDOE Lesson		25
Part 1	Mar 28	
Part 2	Apr 25	
TOTAL		100

- **Assignments and/or Examinations**

NOTE: *With exclusion of the personal journal, each of the major assignments for this course should focus on a different math area: number sense and operations, patterns and algebra, estimation, fractions, measurement, geometry, data analysis, or probability (i.e., no two assignments should focus on the same area).*

Personal Journal (Part 1=10 points; Part 2=10 points)

Part 1: To initiate class experiences, students will write a critical reflection on their personal experiences as a learner of math (2 pages). They will use the following prompts to help guide their reflection process.

- Begin with your earliest memories (give examples) and reflect until the present as a graduate student in a teacher preparation program.
- Reflect on your experiences in school, out of school, in the context of your family, etc.
- How do you see yourself as a math learner?
- Why do you think you feel that way?
- How do you think these experiences will shape you as a teacher of math? In other words, what positive impacts or challenges on your teaching practice do you foresee from your prior experiences or self-conception?

Part 2: In conclusion of the course, students will revisit their initial thoughts in their first journal entry and reflect on how their thoughts and/or self-conception have changed, if at all (2 pages). They will use the following prompts to help guide their reflection process.

- What have you learned in the course?
- Do you view yourself as a math learner differently than you did before?
- Is there a concept you learned in the course that really stuck out for you? (Include references to course readings, as necessary.)
- Is there a particular reading, handout, or material from class that you found particularly helpful or eye-opening? (Include references to course readings, as necessary.)
- Articulate the kind of early childhood mathematics teacher you plan to be. Will something you learned in the course be included in your guiding principles?

Mathematics Activity Share (20 points)

Students will choose a mathematics content area listed on the class schedule on the syllabus during the first class session in which to present an activity. Three students will sign up per content area: one person will focus on preK, one on K-grade 1, and one on grades 2-3. Individual students will prepare a lesson plan using the template provided and lead an informative and interactive center on their mathematics content area to a small group of classmates. During the center, each student will include the following:

- An overview of the topic to include the key ideas or content and the importance of the topic to students' mathematics learning.
- An overview of relevant state and national content standards at the appropriate grade level(s), noting consistencies (or inconsistencies, if the case may be).
- A description of classroom and behavior management strategies that would increase the effectiveness of the implementation of the activity.
- Modeling of how to engage in the activity. The student will then oversee classmates engaging in the activity by assisting and answering questions. Students will bring or borrow from the instructor all appropriate materials for the activity.
- Preparation for how to adapt the center activity for a range of learners should be evident.
- A list of at least three resources related to teaching the topic that could include children's literature, websites, manipulatives or materials, or other teacher resources (at least one

must be a relevant developmentally appropriate picture book and one must be an article from a practitioner journal on the topic).

- All share materials (lesson plan, resources) will be posted on Blackboard under Discussion Board before the presentation.

Teaching Math Through Pictures Books Poster and Presentation (20 points)

Students will choose a picture book focused on a math concept. They will make a poster (either paper or an electronic version) that includes the following information: title, author, possible math concepts explored within the text, appropriate age/grade level, relevant standards, a meaningful quote, instructions and diagram(s) for a relevant interactive activity for children, and a rationale (no more than one double-spaced page) for decisions made, including citations of at least two course readings. Students should have materials for the activity available to engage classmates during presentation. Students will present their posters to classmates during an in-class poster session. Upload an electronic copy of the poster to Blackboard.

Mathematics Lesson Implementation and Reflection (25 points)

In two-person partnerships, students will choose a developmentally appropriate math lesson from either the VA Department of Education or Math Innovations websites or course textbooks. They will implement the lesson at the Mason Child Development Center (CDC) to multiple groups of preschool children, making necessary modifications and taking reflective notes. Students and their partners will sign up to go one of the days during a TBD week in April between 10:30-11:30 am (Monday-Friday). Students will bring any necessary materials for the lesson. Students will take turns teaching. One partner will teach the lesson while the other partner takes anecdotal notes, and then partners will switch roles. Students will submit a written reflection in two parts. If none of the prearranged days at the CDC work for a student partnership, they can see the instructor about joining a different section of ECED 515 or arrange their own implementation of the lesson. If a student arranges his/her own lesson implementation, he/she should teach the prepared lesson to age-appropriate children they know personally (friend's children, neighbors, students at the school where you teach). Videotaping the lesson will be necessary so partners can review the videotaped lesson and provide observational feedback.

- Planning the Lesson (15 points). The first part of the reflection will be due before the experience and will include how the lesson was selected and how the student prepared to implement the lesson. Students will provide linkages to course readings to provide a rationale for the decisions made. *Since rationales are included in the narrative, it is not necessary to include them in the lesson plan template.* Preparation of all of the necessary materials for the lesson so the student was prepared to implement the lesson upon arrival at the CDC on the assigned day will be assessed in this part. A copy of the lesson or url should be included, if the lesson is used as is. If substantive modifications are made, the student should write up the lesson plan using the GMU lesson plan template (1-2 pages, see rubric).
- Reflecting on the Lesson (10 points). The second part will be due after the experience and will include how the lesson went (what went well, what could have been done differently/better for next time), key learnings, and “aha” moments. Students will reflect on both teacher learning (themselves) and student learning during the lesson. Students

will provide specific linkages to course readings to provide a literature-based lens for their reflections Partners will submit reflections independently (2 pages, see rubric).

- **Other Requirements**

Attendance and Participation (15 points)

Because active participation and engagement are imperative for optimal learning, preparation for and participation in in-class activities will be evaluated based on the following criteria:

- Students attend class, arrive on time, and stay for the entire class period.
- Students use laptops and personal devices for instructional purposes only.
- Students complete readings and prepare for class activities prior to class as evidenced by their ability to discuss and write about the concepts presented and examined in the texts as well as participate fully in related activities.
- Students are actively involved in in-class and online learning experiences as evidenced by (a) participating in all activities, (b) engaging in small- and large-group discussions, (c) completing written work related to the activities, and (d) supporting the participation and learning of classmates.
- Students show evidence of critical reflective thinking through in-class and online discussions, activities, and written reflections.
- Students display professional dispositions at all times while interacting with the instructor and other students.
- Students complete participation activities across the semester that complement the scheduled course topic. Instructors will periodically collect artifacts from the activities. Students in attendance and who actively engage in the learning experience will receive credit for their efforts. Graded participation activities are not announced and are implemented at the discretion of the instructor.

Note: Participation points will be deducted due to an excessive number of absences. It is students' responsibility to attend all class sessions. They are held accountable for all information from each class session, whether they are present or not. A make-up assignment will be required in the case of an absence. Reasons for any absence must be reported to the instructor in writing.

Written Assignments

Assignments are due on the assigned day. Extensions for assignments must be requested in writing *before* the assignment is due. Extensions only will be granted for extenuating circumstances. Grade point deductions will be taken for every additional day an assignment is late. All formal written assignments will be evaluated for content and presentation. The American Psychological Association, Sixth Edition (APA) style will be followed for all written work. All written work unless otherwise noted must be completed on a word processor and should be proofread carefully. (Use spell check!) If students are not confident of their own ability to catch errors, they should have another person proofread their work. When in doubt, they should check the APA manual. Portions of the APA manual appear at the Style Manuals link on the Mason library website at <http://infoguides.gmu.edu/content.php?pid=39979>. Students may consult the Writing Center for additional writing support.

Students will do the following:

1. Present ideas in a clear, concise, and organized manner. (Avoid wordiness and redundancy.)
2. Develop points coherently, definitively, and thoroughly.
3. Refer to appropriate authorities, studies, and examples to document where appropriate. (Avoid meaningless generalizations, unwarranted assumptions, and unsupported opinions.)
4. Use correct capitalization, punctuation, spelling, and grammar.
5. Type the paper with double spacing, indented paragraphs, 1-inch margins all around, and 12-point Times New Roman font.

- **Grading**

A = 95-100 A- = 90-94 B+ = 87-89 B = 80-86 C = 70-79 F = <70

Incomplete (IN): This grade may be given to students who are passing a course but who may be unable to complete scheduled coursework for a cause beyond reasonable control.


All CEHD undergraduate and graduate students are held to the university grading policies as described in the Academic Policies section of the current catalog, which can be accessed at <http://catalog.gmu.edu>. Those students enrolled in a CEHD Licensure Graduate Certificate program, however, must earn a B- or better in all licensure coursework. A degree-seeking graduate student will be dismissed after accumulating grades of F in two courses or 9 credits of unsatisfactory grades (C or F) in graduate courses. A 3.0 grade point average is required for completion of the graduate degree.

Professional Dispositions

Students are expected to exhibit professional behaviors and dispositions at all times. See <https://cehd.gmu.edu/students/policies-procedures/>.

Class Schedule

Date	Topics	Readings & Assignments Due
Jan 24	Introduction & understandings Constructivist environments to support mathematics learning Relevant learning theories/theorists <i>Piaget Information</i> <i>Vygotsky Information</i> <i>Bloom Information</i> <i>Multiple Intelligences</i>	Van de Walle et al., Chapter 1 Copley, Chapter 1 <u>On Blackboard:</u> <i>Adding it Up: Helping Children Learn Mathematics – Executive Summary (NAP)</i> Due – Sign up on Google Doc for Poster Presentation at Mason CDC Professional Develop Day (3//23) Optional, but Encouraged
Jan 31	Teaching through problem solving Math instruction to develop the five processes of mathematical understanding	Van de Walle et al., Chapter 2 Copley, Chapter 3 <u>On Blackboard:</u> <i>Why Do Americans Stink at Math?</i>

	Inquiry-based instruction and the 5E Model	Due – Personal Journal-Part 1
Feb 7	Introduction to mathematics content standards, including the Virginia Standards of Learning Assessing for learning	Van de Walle et al., Chapter 3 Copley, Chapter 2 <u>On Blackboard:</u> <i>Faster Isn't Smarter (Seeley, 2009) – Messages, 1-4, 6</i>
Feb 14 	Planning, teaching, and assessing children with diverse abilities	Van de Walle et al., Chapters 4, 5, & 6 <u>On Blackboard:</u> <i>Implementing Portfolio Assessment</i>
Feb 21	Collaborating with families and communities Understanding contributions of different cultures in the development of mathematics and its role in society	Van de Walle et al., Chapter 7 <u>On Blackboard:</u> <i>Multicultural Mathematics Instruction</i> Due – Teaching Math Through Picture Books Poster and Presentation
Feb 28	Early number concepts and number sense Place value Mathematics Activity Share EXAMPLE – Number Sense & Place Value (Instructor Led)	Van de Walle et al., Chapters 8 & 11 <u>On Blackboard:</u> <i>Calendar time for Young Children – Good Intentions Gone Awry</i>
Mar 7	Basic operations and properties Developing fluency with basic facts Mathematics Activity Share – Operations & Computation	Van de Walle et al., Chapters 9 & 10
No Class Mar 14	SPRING BREAK	
Mar 21	Whole number computation Estimation, patterns Mathematics Activity Share – Estimation & Patterns	Van de Walle et al., Chapter 12 Copley, Chapter 4 <u>On Blackboard:</u> <i>What Comes Next? The Mathematics of Pattern in Kindergarten</i> <i>Emerging Understandings of Patterning in 4-Year-Olds</i>
Mar 23 (SATURDAY)	Mason Child Development Center Professional Development Day (share your poster!)	

Mar 28	Algebraic reasoning Mathematics Activity Share – Algebra	Van de Walle et al., Chapter 13 Copley, Chapter 5 Due – Math Lesson Reflection (Part 1)
Apr 4	Early fraction concepts Video: Teach Your Class Fractions with Math Man (on Blackboard)	Van de Walle et al., Chapter 14 <u>On Blackboard:</u> <i>Making Fractions Meaningful</i>
Apr 11	Measurement Mathematics Activity Share – Measurement	Van de Walle et al., Chapter 15 Copley, Chapters 7 <u>On Blackboard:</u> <i>Measurement of Length: How Can We Teach It Better?</i>
Apr 18	Geometry and spatial sense Mathematics Activity Share – Geometry	Van de Walle et al., Chapters 16 Copley, Chapter 6
Apr 25	Probability and statistics Data analysis Field trips and importance of informal learning settings for math Mathematics Activity Share – Data Analysis	Van de Walle et al., Chapter 17 Copley, Chapter 8 <u>On Blackboard:</u> <i>Zoos, Aquariums, and Expanding Students' Data Literacy</i> Due – Math Lesson Reflection (Part 2)
May 2	Technology in early childhood mathematics Filling the role of mathematics teacher for diverse young learners Course wrap-up Mathematics Activity Share – Fractions	<u>On Blackboard:</u> <i>Putting the “T” in STEM for the Youngest Learners</i> Due – Personal Journal-Part 2 by May 5

Note: Faculty reserves the right to alter the schedule as necessary, with notification to students.

Core Values Commitment

The College of Education and Human Development is committed to collaboration, ethical leadership, innovation, research-based practice, and social justice. Students are expected to adhere to these principles: <http://cehd.gmu.edu/values/>.

GMU Policies and Resources for Students

Policies

- Students must adhere to the guidelines of the Mason Honor Code (see <https://catalog.gmu.edu/policies/honor-code-system/>).

- Students must follow the university policy for Responsible Use of Computing (see <http://universitypolicy.gmu.edu/policies/responsible-use-of-computing/>).
- Students are responsible for the content of university communications sent to their Mason email account and are required to activate their account and check it regularly. All communication from the university, college, school, and program will be sent to students **solely** through their Mason email account.
- Students with disabilities who seek accommodations in a course must be registered with George Mason University Disability Services. Approved accommodations will begin at the time the written letter from Disability Services is received by the instructor (see <http://ods.gmu.edu/>).
- Students must follow the university policy stating that all sound emitting devices shall be silenced during class unless otherwise authorized by the instructor.

Campus Resources

- Support for submission of assignments to Tk20 should be directed to tk20help@gmu.edu or <https://cehd.gmu.edu/aero/tk20>. Questions or concerns regarding use of Blackboard should be directed to <http://coursessupport.gmu.edu/>.
- For information on student support resources on campus, see <https://ctfe.gmu.edu/teaching/student-support-resources-on-campus>.

For additional information on the College of Education and Human Development, please visit our website: <https://cehd.gmu.edu/students/>.