



SCHOOL OF EDUCATION VIRTUAL CAMPUS

Mission: Wayland Baptist University exists to educate students in an academically challenging, learning focused and distinctively Christian environment for professional success, lifelong learning and service to God and humankind.

Course: ECHD 4301 VC01

Title: Math and Science for Young Children

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Term and dates: Summer Term: June 2, 2025 – July 26, 2025

Holidays: Independence Day, July 4, 2025

Online: <https://wbu.blackboard.com/>

Office hours: Email response within 24 hours, usually less. You may leave messages/texts on my cell phone from 8 am to 9 pm CST.

Catalog Description

This course focuses on the integration of math and science with the other important elements of child development for young children. Both math and science are presented from a common conceptual framework, and problem solving is emphasized as the major means of constructing the basic concepts.

Textbook

Student Textbook Charlesworth, R., & Lind, K. *Math & science for young children* (9th ed.). 2025. Florence, KY: Cengage Learning.

ISBN: 978-0-357-63656-5

E book is available

Access to WBU Learning Resources www.wbu.edu/lrc

Course Outline

Part 1. Concept Development in Science, Technology, Engineering, and Mathematics

Chapter 1. Development, Acquisition, Problem Solving, and Assessment

1-1. Concept Development

1-1a. Relationships Between Science, Technology, Engineering, Math, and Art (STEM and STEAM)

1-1b. Rationale for Standards and Common Core Curriculum Guidelines

1-1c. The Movement Toward National Core State Curriculum Standards

1-1d. National Standards for Professional Preparation

1-1e. Constructivism

1-1f. The Learning Cycle

1-1g. Adapting the Learning Cycle to Early Childhood

1-1h. Multimodal Creative inquiry

1-2. Types of Learning Experiences

1-2a. Naturalistic Experiences

1-2b. Informal Learning Experiences

1-2c. Adult-Guided Learning Experiences

1-2d. Diverse Learning Styles

1-2e. STEM and Equity in the Classroom

1-2f. Helping Children with Special Needs and Non-Typical Development

1-2g. Digital Technology Today

1-3. Six Steps in Instruction/Curriculum Planning Cycle

1-3a. Assessing

1-3b. Reflect and Plan

1-3c. Implement Strategies

1-3d. Reflect on Implementation

1-3e. Problem Solving and Inquiry

1-4. National Assessment Standards

1-4a. Assessment Methods

1-4b. Assessment Tasks

1-4c. Assessment Task File

1-4d. Record Keeping and Reporting

1-4e. Maintaining Equity

Chapter 2. Basics of Science, Technology, and Engineering

2-1. The Framework and Standards for Science Education

2-1a. Science as Inquiry and Engineering Design

2-1b. Processes of Inquiry

2-1c. Science Process Skills Used in Inquiry

2-1d. Developing Scientific Attitudes Used in Inquiry

2-1e. Engineering Design

2-1f. Science Content Knowledge and Learning and the Development of Literacy

2-1g. Appropriate Science Content

2-1h. Important Developmental Factors

2-2. Concept Understanding in Young Children

2-2a. Enhancing Awareness

2-2b. Teacher Magic and Misconceptions

2-2c. Self-Regulation and Concept Attainment

2-2d. Discrepant Events

2-2e. Using the Learning Cycle to Build Concepts

2-2f. Strategies That Encourage Inquiry

2-3. Integrating Science into the Curriculum

2-3a. Children Learn in Different Ways

2-3b. Organizing for Teaching Science

2-3c. Assessment Strategies

2-3d. Evaluating the Investigation Plan

2-3e. Three Basic Types of Science Investigations and Units

Part 2. Fundamental Concepts and Skills

Chapter 3. Prekindergarten and Kindergarten Concepts and Skills

3-1. One-to-One Correspondence

3-1a. Pre-Assessment Observation

3-1b. Activities

3-1c. Supporting Children with Special Learning Needs

3-1d. Support for English Language Learners

3-1e. Informal Post-Evaluation

3-2. Number Sense and Counting Standards and Description

3-2a. Number Sense and Its Relationship to Counting

3-2b. Informal Pre-Assessment

3-2c. Activities

3-2d. Supporting Children with Special Needs

3-2e. Informal Post-Evaluation

3-3. Logic and Classification Standards for Science and Math

3-3a. Informal Pre-Assessment

3-3b. Activities

3-3c. Supporting Children with Special Needs

3-3d. Support for English Language Learners

3-3e. Evaluation

3-4. Comparison Standards and Description

3-4a. The Basic Comparisons

3-4b. Informal Pre-Assessment

3-4c. Comparison Activities

3-4d. Supporting Children with Special Needs

3-4e. Informal Evaluation

3-5. Expectations and Characteristics of Shape

3-5a. Pre-Assessment

3-5b. Shape Activities

3-5c. Supporting Children with Special Needs

3-5d. Support for English Language Learners

3-5e. Informal Post-Evaluation

Chapter 4. Prekindergarten and Kindergarten Concepts and Skills

4-1. Spatial Sense and Spatial Concepts

4-1a. Pre-Assessment

4-1b. Activities

4-1c. Supporting Children with Special Needs

4-1d. Support for English Language Learners

4-1e. Informal Post-Evaluation

4-2. Standards and Part-Whole Relationships

Parts of Wholes

4-2a. Pre-Assessment

4-2b. Part-Whole Activities

4-2c. Supporting Children with Special Needs

4-2d. Support for Cultural Differences

4-2e. Informal Post-Evaluation

4-3. Science and Engineering Standards and Connection to Mathematics

4-3a. Informal Pre-Assessment

4-3b. Science and Engineering Activities

Chapter 5. Pre-K–K: Ordering, Measurement, and Data Collection and Analysis

5-1. Standards and Expectations

5-1a. Pre-Assessment

5-1b. Activities

5-1c. Supporting Children with Special Needs

5-1d. Support for English Language Learners and Cultural Diversity

5-1e. Post-Evaluation

5-2. Measurement Standards and Expectations

5-2a. Stages of Development

5-2b. How the Young Child Thinks About Measurement

5-2c. Pre-Assessment

5-2d. Activities

5-2e. Supporting Children with Special Needs

5-2f. Evaluation

5-3. Time Measurement Standards and Expectations

5-3a. Kinds of Time

5-3b. Language of Time

5-3c. Pre-Assessment

5-3d. Activities

5-3e. Support for English Language Learners and Cultural Diversity

5-3f. Informal Post-Evaluation

5-4. Data and Graphing Standards and Expectations

5-4a. Stages of Development for Making and Understanding Graphs

5-4b. Discussion of a Graph

5-4c. Materials for Making Graphs

5-4d. Topics for Graphs

5-4e. Communicating with Graphs

5-5. Science Standards and Expectations

5-5a. Ordering and Patterning

5-5b. Measurement: Volume, Weight, Length, and Temperature

Part 3. Integrating Steam Across the Curriculum

Chapter 6. Integrating the Curriculum

6-1. Standards and STEM and STEAM

6-1a. Play and Learning

6-1b. Dramatic Role Playing

6-1c. A Thematic Project Example: Food

6-1d. Support for Cultural Diversity

6-1e. Focus on Nature

- 6-2. Language, Literacy, and Concept Formation
 - 6-2a. Concept Words
 - 6-2b. Mathematics, Science, Engineering, and Literacy
 - 6-2c. Literature, Reading and Writing, and STEM
 - 6-2d. Supporting Children with Special Needs
 - 6-2e. Support for English Language Learners and Cultural Diversity
 - 6-2f. Integrating STEM Across the Curriculum

Part 4. Symbols and Higher-Level Concepts and Activities

Chapter 7. Transitioning from Preschool to Kindergarten to Primary

- 7-1. Number Symbols and Concepts: Standards and Explanations
 - 7-1a. The Number Symbol Skills
 - 7-1b. Pre-Assessment
 - 7-1c. Activities
 - 7-1d. Support for English Language Learners
 - 7-1e. Post-Evaluation
- 7-2. Groups and Symbols: Standards and Explanations
 - 7-2a. Informal Pre-Assessment
 - 7-2b. Activities
 - 7-2c. Supporting with Children with Special Needs
 - 7-2d. Informal Post-Evaluation
- 7-3. Standards and Explanations of Higher-Level Concepts
 - 7-3a. Informal Pre-Assessment
 - 7-3b. Activities, Skills, and Concepts
 - 7-3c. Support for English Language Learners
- 7-4. End-of-Kindergarten Science Standards and Expectations
 - 7-4a. Design Technology/Engineering and Robotics
 - 7-4b. Concepts That Crosscut Science and Engineering Content Areas
 - 7-4c. NGSS Performance Expectations in Kindergarten
 - 7-4d. Activities
 - 7-4e. Technology
- 7-5. Common Artifacts as Tools to Support the Transition From Pre-Operational to Concrete Operational
 - 7-5a. Picture Books
 - 7-5b. Toys and Games
 - 7-5c. Superheroes

Part 5. Mathematics Concepts and Operations for the Primary Grades

Chapter 8. Whole Number Operations, Patterns, and Fractions

- 8-1. Background and Basics of Primary Grade Mathematics
 - 8-1a. Basic Combinations (Facts) and Algorithms
 - 8-1b. Computational Fluency
 - 8-1c. Action and Relational Symbols
 - 8-1d. Instructional Strategies
 - 8-1e. Algebraic Thinking
 - 8-1f. Addition

- 8-1g. Subtraction
- 8-1h. Multiplication
- 8-1i. Division
- 8-1j. Integration with Other Content Areas
- 8-1k Technology
- 8-1l. Support for English Language Learners
- 8-1m. Supporting Children with Special Needs
- 8-1n Post-Evaluation
- 8-2. Description and Explanation of Patterning
 - 8-2a. Informal Pre-Assessment
 - 8-2b. Activities
 - 8-2c. Supporting Children with Special Needs
 - 8-2d. Informal Evaluation
- 8-3. Standards and Descriptions of Fractions
 - 8-3a. Informal Pre-Assessment
 - 8-3b. Activities
 - 8-3c. Supporting Children with Special Needs
 - 8-3d. Informal Evaluation
- Chapter 9. Place Value, Geometry, Data Analysis, and Measurement
 - 9-1. Standards and Description of Place Value and Numbers Above 10
 - 9-1a. Informal Pre-Assessment
 - 9-1b. Activities
 - 9-1c. Discourse Approach
 - 9-1d. Calculators
 - 9-1e. Supporting Children with Special Needs
 - 9-1f. Support for English Language Learners and Cultural Diversity
 - 9-1g. Post-Evaluation
 - 9-2. Standards and Descriptions of Geometry, Robotics Programming, and Data Analysis and Graphs
 - 9-2a. First Grade
 - 9-2b. Second Grade
 - 9-2c. Third Grade
 - 9-2d. Informal Pre-Assessment
 - 9-2e. Activities
 - 9-2f. Support for English Cultural Diversity
 - 9-2g. Supporting Children with Special Needs
 - 9-2h. Informal Post-Evaluation
 - 9-3. Standards and Description of Measurement
 - 9-3a. Informal Pre-Assessment
 - 9-3b. Instruction
 - 9-3c. Measurement Activities
 - 9-3d. Support for Children with Special Needs
 - 9-3e. Evaluation

Part 6. Science, Technology, and Engineering for the Primary Grades

- Chapter 10. Overview of Primary Science: Life Science, and Physical Science
 - 10-1. Next Generation Standards and Guidelines for Primary Grade Science
 - 10-1a. Translating NGSS for Classroom Instruction

- 10-1b. Conventional Science Instruction
- 10-1c. Practices and Design
- 10-1d. Managing the Classroom Environment and Experiences
- 10-1e. Investigation Prompts
- 10-2. Conventional and Next Generation Life Science Instruction
 - 10-2a. NGSS Life Science Performance Expectations
 - 10-2b. Next Generation Instructional Plans
 - 10-2c. Conventional Life Science Instruction
 - 10-2d. Planning and Teaching a Seed Project
 - 10-2e. Additional Plant Activities Based on Science Concepts
 - 10-2f. Animals in the Classroom
 - 10-2g. A Trip to the Zoo
 - 10-2h. Strategies for Teaching About the Human Body
- 10-3. Physical Science for the Next Generation and Conventional Physical Science Instruction
 - 10-3a. NGSS Performance Expectations
 - 10-3b. Examples of Instructional Progressions
 - 10-3c. Conventional Physical Science Instruction
 - 10-3d. Planning and Teaching About Air: Bubbles
 - 10-3e. Concept: Air Can Move Things and Slow Things Down
 - 10-3f. Exploring Vibrating Air: Sound
 - 10-3g. Properties of Matter
 - 10-3h. Exploring Light
 - 10-3i. Assessment Strategies
- Chapter 11. Earth and Space Sciences, Environmental Awareness, Engineering, Technology, and Science Applications
 - 11-1. Standards and Guidelines for Earth and Space Sciences
 - 11-1a. NGSS ESS Performance Expectations
 - 11-1b. The Constructivist Approach to the Next Generation Science Standards in Primary Earth and Space Science
 - 11-1c. Conventional Earth and Space Science Instruction
 - 11-1d. Planning and Teaching a Unit on Rocks
 - 11-1e. How Rocks Are Formed
 - 11-1f. Fossils
 - 11-1g. Soil Samples
 - 11-1h. Weather
 - 11-1i. Water
 - 11-1j. Space Science
 - 11-2. Standards and Guidelines for Environmental Awareness
 - 11-2a. Next Generation Environmental Awareness Instructional Plans
 - 11-2b. The Constructivist Approach to the Next Generation Science Standards in Primary Grades Environmental Awareness
 - 11-2c. Conventional Environmental Awareness Instruction
 - 11-2d. Water
 - 11-2e. Trash and Litter
 - 11-3. Description and Standards for Engineering Design, Technology, and Applications of Science

- 11-3a. Engineering
- 11-3b. Links Among Engineering, Technology, Science, and Society
- 11-3c. Next Generation Instructional Plans

Part 7. The STEM Environment

Chapter 12. Materials and Resources for Supporting STEM in the Classroom and the Home

- 12-1. Overview of Materials and Environment
 - 12-1a. Basic STEM Materials
 - 12-1b. Powerful Math Learning Spaces
 - 12-1c. Powerful Science Learning Spaces
 - 12-1d. Selecting Math Materials
 - 12-1e. Selecting Science, Technology, and Engineering Materials
 - 12-1f. Digital Technology
- 12-2. Standards and Action Overview
 - 12-2a. Blocks: Science and Engineering in Action
 - 12-2b. Woodworking
 - 12-2c. Math Games
 - 12-2d. Math in Action: Outdoors
 - 12-2e. Science in Action: Outdoors
 - 12-2f. Culturally Relevant STEM
- 12-3. Family Involvement in STEM
 - 12-3a. Getting Families Involved
 - 12-3b. Guidelines for Families as Teachers
 - 12-3c. STEM in the Home, Yard, Neighborhood, and Park
 - 12-3d. Family STEM Outdoors

Course Requirements

Students will attend class, read all assigned materials, participate in discussion boards, prepare written assignments, and complete exams and a research project. Students will respond in a professional manner.

Course Competencies

Students will understand and apply the following six principles, or “themes” of mathematics instruction as outlined by NCTM.

Equity: high expectations and support for all children

Curriculum: more than a collection of activities: coherent, focused on important mathematics and integration across developmental levels.

Teaching: understanding what children already know and used to learn, and challenging and supporting them to learn it well

Learning: children must learn with understanding, building new mathematical knowledge from experience and prior knowledge

Assessment: should support the learning important mathematics and give useful information to teachers and children

Technology: is essential in teaching and learning mathematics; a tool to enhance learning

Students are able to articulate priorities for high-quality; meaningful science experiences in early childhood, across a developmental continuum. Depending on children's ages and other characteristics, those experiences should help children to, for example:

- Raise questions about objects and events around them
- Explore materials, objects, and events by acting upon them and noticing what happens
- Make careful observations of objects, organisms and events using all their senses
- Describe, compare, sort, classify and order in terms of observable characteristics and properties
- Use a variety of simple tools to extend their observations (e.g., hand lens, measuring tools, eye dropper)
- Engage in simple investigations including making predictions, gathering and interpreting data, recognizing simple patterns, and drawing conclusions
- Record observations, explanations, and ideas through multiple forms of representation
- Work collaboratively with others, share and discuss ideas, and listen to new perspectives

Learning Outcomes

Upon successful completion of this course, the student will be able to:

- Identify and discuss the learning cycle and discovery approach to teaching/ learning science and math.
- Discuss and explain major concepts in math and science to for appropriate inclusion in the early childhood program
- Develop, plan and implement exploration activities in science and math.
- Describe and develop an operation plan for the coordination of field trips and special events to community resources
- Describe how the science, math, and social studies skills acquired in early childhood are the foundation for the skills taught in the elementary grades.
- Demonstrate how children naturally learn science and math through an integrated approach by questioning, probing, investigating, problem solving and exploring.
- Report on various approaches or methods of teaching math and science in other countries.

Means for Assessments of Learning Outcomes

- Completion of chapter review questions. Due on Mondays, midnight CST.
- Completion of 2 tests that will be administered on Blackboard. Tests will be open book and timed and not proctored.
- Design lesson plans using the required lesson plan template.
- Develop guidelines for field trips to community resources.
- Participation in Discussion Board topics posted in the discussion board. Students are expected to post significant, substantive responses that indicate research, reflective thinking and practical experiences on textbook content and related topics. Original response is due on Fridays, midnight; Responses to others due on Mondays, midnight, CST. Refer to Discussion Board Success Tips for details.

Attendance Policy

Online Students - Students are expected to participate in all required instructional activities in their courses. Online courses are no different in this regard; however, participation must be defined in a different manner.

1. Student "attendance" in an online course is defined as active participation in the course as described in the course syllabus. Instructors in online courses are responsible for providing students with clear instructions for how they are required to participate in the course. Additionally, instructors are responsible for incorporating specific instructional activities within their course and will, at a minimum, have weekly mechanisms for documenting student participation. These mechanisms may include, but are not limited to, participating in a weekly discussion board, submitting/completing assignments in Blackboard, or communicating with the instructor.
2. Students aware of necessary absences must inform the professor with as much advance notice as possible in order to make appropriate arrangements.
3. Any student absent 25 percent or more of the online course, i.e., non-participatory during 3 or more weeks of an 11 - week term, may receive an F for that course. Instructors may also file a Report of Unsatisfactory Progress for students with excessive non-participation.
4. Any student who has not actively participated in an online class prior to the census date for any given term is considered a "no-show" and will be administratively withdrawn from the class without record. To be counted as actively participating, it is not sufficient to log in and view the course. The student must be submitting work as described in the course syllabus.
5. Additional attendance and participation policies for each course, as defined by the instructor in the course syllabus, are considered a part of the university's attendance policy.

Instructor's Additional Policies

All assigned work must be submitted when due. Late work may not be accepted unless previous arrangements/notification has been made. If accepted late, point value may be reduced.

Discussion Boards are not accepted late.

Instructor's note: The advantage on online learning is the asynchronous environment. In other words, class time is at the student's convenience. Along with this convenience comes a tremendous responsibility. The student must be organized and self-motivated to stay current in all assignments. The management software on Blackboard allows tracking the times that the students log in and participate. All assignments have deadlines for submission.

Academic Integrity

[Statement on Academic Integrity](#)

Generative AI tools permitted in specific context and with proper citations.

Students are allowed to use, reference, or incorporate generative AI tools into specific assignments for this course. When used, students must properly cite the generative AI tool in their submitted work.

While there is no true substitute for direct help and instruction for your instructor, students may be allowed to use generative AI tools to provide further explanations of course content, readings, and other assignments. Any use of generative AI tools to help further explain or translate content must be properly referenced and cited.

Specific parameters for generative AI usage are provided by the instructor.

Any use of generative AI tools outside of the approved instructor parameters will be considered a form of plagiarism and academic dishonesty

Disability Statement

In compliance with the Americans with Disabilities Act of 1990 (ADA), it is the policy of Wayland Baptist University that no otherwise qualified person with a disability be excluded from participation in, be denied the benefits of, or be subject to discrimination under any educational program or activity in the university. The Disability Services Coordinator and Academic Coach serves as the coordinator of students with disabilities and must be contacted concerning accommodation requests office (806) 291-1057. Documentation of a disability must accompany any request for accommodation.

Evaluation

Course grade will be determined by using the following point system:

Discussion Board (DB) (4)	100 points (25 points each)
Chapter Review Assignments (12)	180 points (15 points each)
Test 1	100 points
Test 2	100 points
Project	120 points

A = 550 -600 points

B = 500 -549 points

C = 450 -499 points

D= 400 - 449 points

F = 399 and below

Grade Appeal Statement

“Students shall have protection through orderly procedures against prejudices or capricious academic evaluation. A student who believes that he or she has not been held to realistic academic standards, just evaluation procedures, or appropriate grading, may appeal the final grade given in the course by using the student grade appeal process described in the Academic Catalog. Appeals may not be made for advanced placement examinations or course bypass examinations. Appeals are limited to the final course grade, which may be upheld, raised, or lowered at any stage of the appeal process. Any recommendation to lower a course grade must be submitted through the Vice President of Academic Affairs/Faculty Assembly Grade Appeals Committee for review and approval. The Faculty Assembly Grade Appeals Committee may instruct that the course grade be upheld, raised, or lowered to a more proper evaluation.”

Course work at a Glance

Week	Date	Assignments to do this Week Discussion Board (DB) Chapter Review Questions (RQ)	Textbook Reading for the Week	Assignments due this Week Mondays, midnight CST Original post on Discussion Board due on Fridays, midnight CST Responses to others due on Mondays, midnight CST
1	6-2-25	Read the Syllabus DB #1 RQ #1, RQ#2, RQ#3	Chapters 1,2,3	Required First Assignment due Wednesday, 6-4-25 for attendance reporting
2	6-9-25	DB #2 RQ #4, RQ#5 RQ#6	Chapters 4,5,6	DB#1, RQ#1 RQ#2, RQ#3
3	6-16-25	RQ#7, RQ #8, RQ#9 Begin Project	Chapters 7,8,9	DB #2, RQ#4, RQ#5, RQ#6
4	6-23-25	Test #1, DB#3 Continue Project		RQ#7, RQ#8
5	6-30-25	RQ#10, RQ#11, RQ#12 Continue Project	Chapters 10, 11,12	Test #1 DB#3
6	7-7-25	Continue Project		RQ#10, RQ#11, RQ#12
7	7-14-25	DB#4 Test #2		Project
8	7-21-25	Smile 😊		DB#4, Test#2

