Course Outline of Record

Los Medanos College 2700 East Leland Road Pittsburg CA 94565 (925) 439-2181

Course Title: Science and Math Curriculum for Young Children **Subject Area/Course Number:** CHDEV-035

New Course ☒ OR **Existing Course** ☐

Instructor(s)/Author(s): Pam Perfumo, Doug Rowe

Subject Area/Course No.: CHDEV-035 **Units: 2**
Course Name/Title: Science and Math Curriculum for Young Children
Discipline(s): Child Development/Early Childhood Education, Education

Pre-Requisite(s): None
Co-Requisite(s): None

Advisories: CHDEV-001, Eligibility for ENGL-100

Catalog Description

Survey of the developmental concepts in science, mathematics, and the physical and natural world suitable for teaching young children. Training in material techniques, demonstrations and experiments will enable the teacher to develop a concept-based learning environment. Curriculum is based on understanding of children's cognitive development.

Schedule Description:

Learn about the developmental sequence of concept acquisition young children progress through as they explore mathematical and scientific concepts with hands-on active learning. Then, apply this knowledge to plan and facilitate developmentally appropriate curriculum activities for young children. Practice with different materials, demonstrations, and experiments with natural science, physical science, and basic mathematical concepts like sequencing, seriation, and numeracy will all be explored.

Hrs/Mode of Instruction: Lecture: 36 Scheduled Lab: ____ HBA Lab: ____ Composition: ____ Activity: ____ Total Hours 36
(Total for course)

Credit ☒ Credit Degree Applicable (**DA**)
☐ Credit Non-Degree (**NDA**)
(If Non-Credit desired, contact Dean.)

Grading ☐ Pass/No Pass (P/NP)
☐ Letter (**LR**)
☒ Student Choice (**SC**)

Repeatability ☒ 0
☐ 1
☐ 2
☐ 3

Please apply for:
LMC General Education Requirement and/or Competency & Graduation Requirement(s): None
Transfer to: ☒ CSU ☐ UC ☐ IGETC LDTP **Course is Baccalaureate Level:** ☒ Yes ☐ No

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Signatures:

Department Chair _____ Date _____

Librarian _____ Date _____

Dean/Sr. Dean _____ Date _____

Curriculum Committee Chair _____ Date _____

President/Designee _____ Date _____

CCCCD Approval Date (Board or Chancellor's Office) _____ Date _____

For Curriculum Committee Use only:

STAND ALONE COURSE: YES NO

FOR OFFICE OF INSTRUCTION ONLY. DO NOT WRITE IN THE SECTION BELOW.

Begin in Semester _____
Dept. Code/Name:_____
ESL Class: ____Yes / No_____
Class Code
- ☐ A Liberal Arts & Sciences
- ☐ B Developmental Preparatory
- ☐ C Adult/Secondary Basic Education
- ☐ D Personal Development/Survival
- ☐ E For Substantially Handicapped
- ☐ F Parenting/Family Support
- ☐ G Community/Civic Development
- ☐ H General and Cultural
- ☐ I Career/Technical Education
- ☐ J Workforce Preparation Enhanced
- ☐ K Other non-credit enhanced
- ☐ Not eligible for enhanced

Catalog year 20____/20_____
T.O.P.s Code: _____
DSPS Class: ____Yes / No_____
SAM Code
- ☐ A Apprenticeship
- ☐ B Advanced Occupational
- ☐ C Clearly Occupational
- ☐ D Possibly Occupational
- ☐ E* Non-Occupational
- ☐ F Transfer, Non-Occupational

*Additional criteria needed
- ☐ 1 One level below transfer
- ☐ 2 Two levels below transfer
- ☐ 3 Three levels below transfer

Class Max: _____
Crossover course 1/ 2: _____
Coop Work Exp: ___Yes / No_____
Remediation Level
- ☐ B Basic Skills
- ☐ NBS Not Basic Skills

Course approved by Curriculum Committee as Baccalaureate Level: _Yes / No_

LMC GE or Competency Requirement Approved by the Curriculum Committee: _____

Institutional Student Learning Outcomes

☐ **General Education SLOs (Recommended by GE Committee)**

At the completion of the LMC general education program, a student will:

1. read critically and communicate effectively as a writer and speaker.
2. understand connections among disciplines and apply interdisciplinary approaches to problem solving.
3. think critically and creatively
4. consider the ethical implications inherent in knowledge, decision-making and action.
5. possess a worldview informed by diverse social, multicultural and global perspectives.

(Each of the above student learning outcomes for the general education program has a written explanation with illustrations and examples of its application within courses, as well as specific assessment criteria. Consult the GE program information pages.)

Program-Level Student Learning Outcomes (PSLOs)

CHDEV Program-Level Student Learning Outcomes (PSLOs)

At the completion of the program, the student should:

1. Obtain, maintain, and advance in permit licensure and/or prepare for upper division transfer through appropriate academic preparation.
2. Apply critical thinking to research, observe, assess, evaluate, analyze, and synthesize early learning and child development information.
3. Utilize effective written and verbal communication techniques to ensure optimum communication with children, families, and professional colleagues.
4. Select, develop, and/or use educational equipment, curriculum, assessments, materials, technology, and environments that are culturally relevant and developmentally appropriate.
5. Demonstrate the skills and knowledge necessary to obtain employment or advancement in early care and education careers.

Course-Level Student Learning Outcomes (CSLOs):

1. Plan and implement an integrated curriculum that includes developmentally and culturally appropriate math and science experiences that engage young children in scientific inquiry and constructivist thinking (PSLO 3, 4,)
2. Describe and evaluate the indoor and outdoor classroom learning environment that promotes varied opportunities for mathematical and scientific exploration as a natural and regular part of the child's day (PSLO 2, 5)
3. Identify and choose appropriate curriculum learning goals from the California Desired Results Developmental Profile- assessment tool related to science and mathematical concepts to link with curriculum experiences (PSLO 2, 3,)
4. Classify science exploration activities into the appropriate category to assure a balanced introduction to scientific inquiry experiences (PSLO 2, 4, 5)
5. Demonstrate competence in introducing and using specialized equipment and materials in delivering appropriate math and science curriculum (PSLO 2, 4, 5)

ASSESSMENT CRITERIA SECTION

CSLO 1: Plan and implement an integrated curriculum that includes developmentally and culturally appropriate math and science experiences that engage young children in scientific inquiry and constructivist thinking

- Correctly identify children's developmental levels of mathematical concept learning
- Develop and implement meaningful math and science experiences that connect to a unit of study

CSLO 2: Describe and evaluate the indoor and outdoor classroom learning environment that promotes varied opportunities for mathematical and scientific exploration as a natural and regular part of the child's day

- Accurately assess and analyze a learning environment for opportunities to engage in a wide variety of mathematical and scientific inquiry

CSLO 3: Identify and choose appropriate curriculum learning goals from the California Desired Results Developmental Profile- assessment tool related to science and mathematical concepts to link with curriculum experiences

- Incorporate relevant, appropriate and specific DRDP measures into curriculum plans

CSLO 4: Classify science exploration activities into the appropriate category to assure a balanced introduction to scientific inquiry experiences

- Develop a varied collection of science experiences for children that support inquiry in the areas of natural, physical, earth, and space science
- Accurately classify experiences

CSLO 5: Demonstrate competence in introducing and using specialized equipment and materials in delivering appropriate math and science curriculum

- Work with a group to present a unit of experiences (3-4) that utilize specific materials (soil, sand, gas, live creatures, etc) and/or equipment (microscopes, pendulums, scales, measuring devices, etc.)
- Demonstrate appropriate facilitation strategies,(open-ended questioning, broadcasting, extension, comparison, etc)
- Present relevant information about procuring materials or equipment, usage and storage, and potential opportunities and challenges of use.

ASSESSMENTS & METHODS OF EVALUATION:

<u>CSLO 1: Plan and implement an integrated curriculum that includes developmentally and culturally appropriate math and science experiences that engage young children in scientific inquiry and constructivist thinking</u>

Concept of Number progression chart: Students will construct their own developmental chart to represent the progression of concept development in the areas of number sense, quantification, principles of counting, and representing numbers

Activity planning sheets: Students will complete 6 Activity Planning sheets tied to a project topic that involves 3 math inquiry experiences and 3 science inquiry activities. Students will be assessed for the age and cultural appropriateness of the activities, the range and variety of materials and experiences, the open-ended opportunities for the use of materials, and how well the activity plans relate to the topic and support the process of open-ended inquiry.

Curriculum Implementation: Students work with a group of children to implement the activity plans, incorporating effective facilitation techniques. Samples or photographs of the children's work for each activity will be collected

Curriculum project written report: Students will write a report where they detail the process of the curriculum project, discuss the decisions that they made, identify what they learned from this project and reflect on changes that they would make if they were to do this project again. They will be assessed for the detail and thoughtfulness of their responses. Samples or photographs of the children's work for each activity should be presented.

Final Exam: Students will be asked to discuss the role of mathematical concept development in the planning of developmentally appropriate math curriculum

A-level work is characterized by an accurate and well-detailed progression chart, activity plans which are completely and thoughtfully filled out, successful implementation that shows complete preparation and effective facilitation, and a written report which is well organized, thoughtful and detailed and clearly delineates the process of the curriculum project, discusses the decisions that the student made, identifies what the student learned from this project and reflect on changes that the student would make if they were to do this project again. Final Exam response should be a thoughtful and detailed discussion that describes at least 5 important considerations when developing math curriculum for young children.

C-level work is characterized by a progression chart which may include a few inaccuracies or lacks detailed description, activity plans which are not well planned or prepared for, facilitation that does not incorporate open-ended questioning, a written report that lacks detail, reflection, and/or documentation. Final exam response is partially inaccurate of includes only 2-3 considerations in the discussion.

CSLO 2: Describe and evaluate the indoor and outdoor classroom learning environment that promotes varied opportunities for mathematical and scientific exploration as a natural and regular part of the child's day

Environment report: Students will evaluate an early childhood classroom for the organization of space and materials and for how the environment supports children's opportunities for science and math inquiry. The report will also include and analysis of the strengths and weaknesses of the environment along with suggestions for improvement. Students will be assessed for the comprehensiveness and thoughtfulness of the report.

Final Exam: Students will be asked to identify and explain the key components of a classroom that supports scientific and mathematical inquiry as a natural part of a child's day.

A-level work is characterized by a report that is detailed and comprehensive, clearly evaluates the strengths and weaknesses of the environment, and includes a feasible and detailed improvement plan for the classroom. Final Exam responses should be a thoughtful and detailed explanation that clearly explains at least 5 dimensions of a classroom environment that supports mathematical and scientific inquiry through play and exploration.

C-level work is characterized by a report which only contains general features of the environment and/or lacks evaluation of the environment or recommendations for improvement. Final exam includes only 2-3 dimensions or cannot clearly articulate the role of the environment in promoting natural inquiry.

CSLO 3: Identify and choose appropriate curriculum learning goals from the California Desired Results Developmental Profile- assessment tool related to science and mathematical concepts to link with curriculum experiences .

Activity planning sheets: Students will identify an appropriate curriculum learning goal from the DRDP to inform the design and implementation of each of the 6 activities they will plan for their project. Opportunities to promote growth in the specific learning area through exploration and facilitation will be designed into the curriculum activity plan.

Final Exam: Students will be asked to select one mathematical measure and one science measure and describe the 3 levels of learning acquisition for each measure with examples.

A-level work is characterized by appropriate linking of a DRDP measure to each of 6 learning activities, with facilitation decisions and activity structure designed to promote learning in the specified area. Final exam response accurately defines measures and learning levels with clear and appropriate examples

C-level work is characterized by 2-3 mis-matches between learning measures and curriculum plans, and/or where facilitation decisions do not clearly support the learning goals. Final exam response may include minor inaccuracies in describing measures and examples of learning levels may be missing or inaccurate.

CSLO 4: Classify science and math exploration activities into the appropriate category to assure a balanced introduction to scientific inquiry experiences

Card collection of activity ideas: Based on group presentations, students develop an organized collection of math and science experiences designed to address specific learning goals and promote child-centered exploration and learning. Activities are sorted and organized based on subcategories of scientific study or mathematical concept.

Final Exam: When presented with examples of learning experiences, students can accurately identify which sub-category of inquiry they support.

A-level work is characterized by a collection of at least 25 different activities which are appropriately categorized and sorted by concept and learning goals. Final exam response includes accurate identification of learning activities with at least 90% accuracy.

C-level work is characterized by a smaller collection of examples, and/or some incorrectly categorized activities. Final exam response includes accuracy at 70-80%

CSLO 5: Demonstrate competence in introducing and using specialized equipment and materials in delivering appropriate math and science curriculum

Group project-Unit Presentation: Students work together to develop a unit that utilizes specific materials and/or equipment which students will demonstrate to the class and provide hands-on practice. Demonstration will include a discussion of possible routes for acquisition, proper usage/storage, and potential opportunities and challenges, Students will model how to effectively facilitate exploration and discovery as class engages in hand-on experience.

Final Exam: When presented with specific materials/equipment examples, students can accurately describe the challenges and opportunities they present when used in the curriculum with examples.

A-level work is characterized by documented active participation in group work, effective and accurate demonstration of materials/equipment, and appropriate modeling of facilitation. Final exam response includes accurate and detailed discussion of pros and cons of using particular materials/equipment with appropriate examples to demonstrate application of the concepts.

C-level work is characterized by less documentation of involvement or evidence of passive participation. Demonstration may lack detail, clarity, or accuracy and/or may lack appropriate facilitation modeling. Final exam response offers a perfunctory response to pros and cons or may be missing examples to demonstrate application.

GRADING

Possible Grading Structure:

Environment Report	40 Points
Concept of Number Progression chart	30 Points
Curriculum planning sheets	60 Points
Curriculum Activity collection	40 Points
Math/Science Unit presentation	100 Points
Integrated Project curriculum implementation report	50 Points
In-class participation and reflections	30 Points
Final	50 Points
Total	400

A = 90% - 100%
B = 80% - 89.9%
C = 70% - 79.9%
D = 60% -69.9%
F = below 60%

CSLOs are Weighted:
CSLO 1 25%
CSLO 2 20%
CSLO 3 20%
CSLO 4 15%
CSLO 5 20%

Course Content:

Importance of Mathematical and Scientific Knowledge in the life of a young child

- Natural curiosity
- Constructivist learning

Processes of Curriculum Planning

- Webbing
- Activity Planning
- Project/unit planning with integrated curriculum

Defining Mathematical Concepts and stages of development

- Concept of number and number sense
  - One-to-one correspondence and quantification
  - Counting
  - representing number,
- Concepts of arithmetic operations
  - Addition
  - Subtraction
- Concepts of algebraic reasoning
  - patterns and relationships,
  - classification
  - analyzing change
- Geometry concepts
  - Shape and form of 2 dimensional and 3 dimensional objects
  - Specifying location and spatial relationships (under, beside, inside, etc)
  - Recognizing and creating symmetry
  - Spatial reasoning
- Measurement concepts
  - Length, volume, mass, area
  - Measurement tools

Defining Scientific Concepts and stages of development

- Skills for scientific inquiry
  - Asking questions
  - Acting on objects and noticing what happens
  - Describe, compare, sort, classify
  - Make close and careful observations
  - Predicting and interpreting data
  - Record/represent observations and ideas
- Life science
  - Physical characteristics
  - Basic needs of living things
  - Simple behaviors
  - Life cycles
  - Habitat
- Physical Science
  - Properties of objects and materials
    - Solids
    - liquids

- Position of objects and relationships in space
  - Construction, balance, weight
- Motion of objects and relationships of position and speed
- Characteristics of sound, light, and shadow

- Earth and Space Science
  - Weather and climate
  - Properties of earth materials (soil, sand, rock, water)
  - Patterns of movement and change of the sun and moon

Mathematical and Scientific Measures in the Desired Results Developmental Profile(DRDP) assessment tool

- Understanding the measures
- A look at the different stages of knowledge acquisition

Facilitation Techniques

- Exploring different facilitation techniques and their uses
- Math talk, large group/small group/individual activities, questioning strategies, broadcasting, modeling/demonstrating, observation, representation
- Open-ended versus closed-ended facilitation

The Environment and its Role in promoting math and science learning

- Space and availability
- Time and routines
- Materials and equipment
  - Tools for mathematic inquiry
  - Tools for scientific inquiry

Instructional Methods:

☒ Lecture
☐ Lab
☐ Activity
☒ Problem-based Learning/Case Studies
☒ Collaborative Learning/Peer Review
☒ Demonstration/Modeling
☒ Role-Playing
☒ Discussion
☐ Computer Assisted Instruction
☐ Other (explain) _____

Textbooks:

Teaching Mathematics in Early Childhood, by Sally Moomaw. 2011, Brookes Publishing; Baltimore, MD

Worms, Shadows, and Whirlpools: Science in the Early Childhood Classroom, by Karen Worth and Sharon Grollman.(2010) Heineman; Portsmouth, NH