Course: Develop Cardinality and Number Sense with Whole-to-Part Icons of Quantity

1 **Graduate Credit**

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Course Format: In-person (only) on July 17-18, 2023

CSU-Pueblo partners with Landmark School in extending graduate credit through distance learning continuing education courses. This course will appear on your CSU-Pueblo transcript as an ED 501 (Special Topic Course).

Course Description

A student with dyslexia who is confused by typical math instruction can excel when instructed in a way that always shows the big picture first, uses visual-spatial images, and examines directly how the parts are connected to the whole. This program is quite different from how most of us were taught math, and it is different from most modern curriculum approaches, as well. Number sense is developed by establishing a robust understanding of quantities so that their values may be compared. The methodology to be presented enables such comparison by limiting demands on language processing, working memory, and executive function skills. Learning and memory research tells us that multisensory integration is absolutely vital for children who have learning difficulties, as well as the best way to teach all students. Experiential, gross-motor activities provide a powerful approach to interact with recognizable whole-to-part visual models. Students develop language skills necessary to describe math concepts and relationships as they perceive and process them. Simply put, students take patterns apart, then reassemble them while describing the process. Various games and activities involving both fine and gross motor skills will be demonstrated, and supported with free online materials.

The projected outcome of this course is to provide classroom teachers with the knowledge, understanding, and methodologies needed to:

- Access and download online materials from the WoodinMath website for classroom use: https://www.woodinmath.com/
- Demonstrate how to prompt a student to produce oral addition and subtraction facts using a visual, or tactile-kinesthetic prompt
- Demonstrate how to prompt a student to perform a regrouping step using patterns of base ten manipulatives
- Assess whether a student is functionally fluent within a given addition fact family

Learning Objectives

STUDENT LEARNING OUTCOMES (SLOs):
This course addresses the following student learning outcomes to the degree shown in the table. Degree Addressed is rated according to the following scale:

1=Basic, 2=Developing, 3=Proficient, 4=Advanced

Student Learning Outcome	Degree Addressed
1. Demonstrate growth in content knowledge related to teaching assignment and the application of content knowledge to classroom instruction and assessment.	3
2. Understand scientifically-based practices in teaching and learning, including strategies in literacy education, instructional technology, differentiation of instruction, and apply them to raise student achievement.	3
3. Demonstrate multiple means of assessing and evaluating student learning and use them to change teaching and learning.	2
4. Locate, interpret, synthesize, and apply educational research in best practices in teaching.	2
5. Understand models for professional change, including teacher collaboration, professional learning communities, strategies for mentoring and coaching to facilitate change, and effective professional development.	1
6. Demonstrate understanding of reflective practice that results in improved classroom teaching and learning, including teacher reflection, use of technology in self-assessment, collaboration for change, and self-management of change.	2
7. Demonstrate understanding of system and organizational change in education, including models for school change and current research and trends in school change.	1
8. Demonstrate responsibility for student learning at high levels.	3
9. Demonstrate responsibility for school reform and leadership in school change.	1

Credit Limit and other Registration Requirements

Students must hold a baccalaureate degree and may not schedule more than 18 semester credits for fall, spring or summer term. It is recommended that you receive board or district approval before registering with Landmark School Outreach Program.

Text/Reading/Resources

Demystifying Math Struggles & Identifying Strategies to Help. Online Interactive article: http://dyslexia.yale.edu/resources/educators/instruction/math-introduction/ Retrieved June 17, 2021 Website: The Yale Center for Dyslexia and Creativity: http://dyslexia.yale.edu/

•Skagenholt M, Träff U, Västfjäll D, Skagerlund K. Examining the Triple Code Model in numerical cognition: An fMRI study. PLoS One. 2018 Jun 28;13(6):e0199247. doi: 10.1371/journal.pone.0199247. PMID: 29953456; PMCID: PMC6023115. Retrieved 3.1.2023

Woodin, C. L., Ed.M. (2020, March 4). The WoodinMath Number System Retrieved May, 2021, from https://docs.google.com/document/d/1Y2xmkQxBV8diqwhYVVWU0YxJBj65GoIsu2OM9XiPFmY/edit?usp=sharing

Woodin, C. L., Ed.M. (2018, January 3). Develop Cardinality and Number Sense with Whole-to-Part Icons of Quantity. Retrieved May, 2021, from https://docs.google.com/document/d/1nm_psZiO2eQt1GUYxQh46hQGFROSe9Lnbhtbib3u2Bo/edit?usp=sharing

Woodin, C. L. (2014). *Multiplication and Division Facts for the Whole-to-Part, Visual Learner* (First Edition). Landmark School Outreach Program.

Woodin, C. L., Ed.M. (2021, May 14). Vertical Path and Primary Numeracy Sections, WoodinMath Curriculum Bank Webpage Retrieved May, 2021, from https://www.woodinmath.com/curriculum-materials/curriculum-bank

Woodin, C. (2000). Visual images teach math. How durable images teach number sense Exchange, 18(2), 1-3. [Online] Retrieved March 06, 2021, from https://drive.google.com/file/d/0B9_-t4rbOBsCb19MUHlHRy1KQTA/view

Other resources to consider for more information include:

Massachusetts Department of Elementary and Secondary Education. (1999-2011). *Curriculum frameworks*. Malden, MA: Author. [Online] Retrieved March 06, 2021, from http://www.doe.mass.edu/frameworks/current.html

Format of the Course

The course contains the following modules/components:

Module	Contents and Requirements	Approximate Contact Hours
Overview/Teaching Principles	Overview of Cognitive Metrics Within the Context of Math: Semiotics, Processing and Memory Systems. Dyslexia and Math v.7.23 PDF	

		1.5 hours
Introduction to the WoodinMath Website	Introduction to the WoodinMath Primary Numeracy Horizontal Path Curriculum Bank Make Adapt Materials Reference Materials: Interactive Media, Print Media	1 hour
Stage 0 Horizontal and Vertical Paths	Readiness Skills: Basic Shapes and Icons 1 to 5	.5
Stage 1 Horizontal and Vertical Paths	Quantities 1 to 5: ***Google Form: Stage 1 Analysis*** Cardinality, Numeration, Comparison, Facts, Procedures, Applications	2
Stage 2 Horizontal and Vertical Paths Applying Strategies	Quantities 1 to 10 Cardinality, Numeration, Comparison, Facts, Procedures, Applications *Requirements:* - *Peer Teaching Assignment #1: 25 Points*	2
Stage 3 Horizontal and Vertical Paths	Decades to 100 and Quantities Through the Hundreds Place Cardinality, Numeration, Comparison, Facts, Procedures, Applications	2
Stage 4 Horizontal and Vertical Paths	Sums and Differences Within 20 with Regrouping Numeration, Comparison, Facts, Procedures, Applications	3
Stage 5 Vertical Path	Add and Subtract Within the 100s Place Procedures, Applications *Requirements:* -	2
Applying Strategies	- *Peer Teaching Assignment #2: 25 Points*	1
Accessing and adapting resources	Perform 20 hours of investigative research using the required readings listed above, and the various multimedia resources located on WoodinMath.com - Demystifying Math Struggles (article) - The WoodinMath Number System (article) - Develop Cardinality and Number Sense with Whole-to-Part Icons of Quantity (article) - WoodinMath Curriculum Bank Webpage (searchable resource) - Visual images teach math (article)	 .5 .5 .5 5 1 12.5

	- Multiplication and Division Facts for the Whole-to-Part, Visual Learner (book)	
Applying Strategies	*Requirements:* - *Reading & Reflection Paper: 50 Points*	2.5

Total Points: 100

Total Hours: 37.5 hours

Grading

GRADING BREAKDOWN:

- *Reading & Reflection Paper (1)- 50%*
- *Peer Teaching Assignments (2)- 50%*

Assignment Description

Reading & Reflection Paper (1)- 50%
Each graduate candidate will be responsible for writing one (1) one-page reaction paper that responds to reading assignments. These are not meant to be a paraphrased summary of the articles. The written assignment (reaction paper) will require the graduate candidate to demonstrate accurate knowledge of the material presented in the readings, as well as link the reading assignment to personal background experiences, or material presented in this course. It is expected the readings will take 20 hours to complete.

Assignment Rubric
Rubric - *Reflections*

Reading Reflection Paper				
Criteria	**Ratings**			**Pts**
Critical Thinking	Reflection reflects a great deal of critical thinking, analysis, and synthesis of material. 50.0 pts	Reflection reflects adequate critical thinking, analysis, and synthesis of material. 40.0 pts	Reflection lacked thought and insight. Student did not demonstrate synthesis of material. 30 pts	50.0 pts
				Total Points 50.0 pts

Assignment Description

Peer Teaching Assignments (2)- 50%

Each student will be responsible for teaching two math lessons to a peer, and conversely, role-play to be taught as a student. Each graduate candidate will be required to demonstrate the use of manipulatives and teaching techniques to peers and the instructor. Two peer teaching demonstrations will be performed. Candidates will be graded based on their ability to teach a skill to a peer using effective cueing strategies, appropriate manipulative

selection, appropriate use of methodology, dynamic response to student's needs, appropriate rate and clarity of presentation.

Possible lessons:
a) Teach a student how to add using a non-sequential model. Identify or pre-teach the antecedent skills. Explain the assumed knowledge base of your student population.
b) Using WoodinMath Icons, Teach a student to solve a subtraction problem similar to:
13 - 7. Assume that your students have mastered missing addends to 10 (7+ **3** = 10).
c) Teach a student to diagram and addition or subtraction word problem using a vertical linear diagram.
d) Teach a student to correctly form an Arabic character in the proper orientation.

Assignment Rubric
Rubric - *Peer Teaching Assignments: Evaluation Form*
Peer Teaching Demonstration #1: Maximum 25 points: 25% of final grade
Peer Teaching Demonstration #2-: Maximum 25 points 25% of final grade
Teaching Demonstrations will be rated individually and objectively.

Peer Teaching Assignments (2)				
Criteria	**Ratings**			**Points**
Employment of Effective cueing strategies	Cued the student with minimal, but effective verbal and/or nonverbal cues. 5.0 pts	Cued with marginally effective or inefficient verbal and/or nonverbal cues. 4 - 3.0 pts	Did not cue the student when necessary. 0 pts	/5
Appropriate selection and use of manipulatives	Selected and presented optimal materials within the CSA continuum. 5.0 pts	Selected appropriate materials within the CSA continuum. 4 - 3.0 pts	Did not complete the exercise. 0 pts	/5
Appropriate use of methodology	Demonstrated methodology efficiently. 5.0 pts	Demonstrated methodology with errors, or with diminished confidence. 4 - 3.0 pts.	Did not complete the exercise. 0 pts	/5
Dynamic response to student's needs	Responded to miscues with accurate prescriptive cue(s). 5.0 pts	Responded to miscues with repetitive or ineffective cue. 4 - 3.0 pts.	Did not complete the exercise. 0 pts	/5
Appropriate rate and clarity of presentation	Presented the lesson with clear, efficient language at an appropriate	Presented the lesson with relatively unclear or inefficient language, or at an inappropriate rate.	Did not complete the exercise. 0 pts	/5

	rate. 5.0 pts	4 - 3.0 pts.		
Total Points 25.0 pts x 2 = 50 Points			TOTAL POINTS:	/25

Also see rubrics within the course for grading criteria. Your Landmark Outreach instructor will process and evaluate your work within 7-10 business days of us receiving it in our office. Grades may be posted sooner than 7 days depending on the time in the term and the volume of work being submitted to the instructor. Once all coursework has been evaluated, final grades will be sent to CSU-Pueblo for processing. After the grades have been entered into the system by the CSU-Pueblo, you can check your grades through your PAWS account. You may also request an official transcript to be sent from your PAWS account. If taking more than one course, it is recommended to wait until all grade reports are received from CSU-Pueblo before requesting transcripts. CSU-Pueblo transcript information can be found at https://www.csupueblo.edu/registrar/transcripts.html If you have a specific deadline, please communicate your necessary completion date and we will try to accommodate requests.

Submitting Coursework

Students may submit coursework via the Canvas learning management platform, following the instructions on the submission page.

Formatting Requirements

Proper formatting is essential. In order to earn full credit on Reading and Reflections and discussion posts, all references must be included and cited using proper APA style and formatting. Submissions should be free of errors in grammar, spelling, punctuation, sentence structure, and capitalization. See individual assignment rubrics for additional formatting requirements.

Coursework Deadlines

All coursework is due 1 week after the final day of the course.

Academic Honesty

Academic dishonesty is any form of cheating which results in students giving or receiving unauthorized assistance in an academic exercise or receiving credit for work which is not their own. Any academic dishonesty is grounds for dismissal. Any student judged to be engaged in cheating may receive a failing grade for the course, or any other penalty, which the instructor finds appropriate. Academic dishonesty is a behavioral issue, not an issue of academic performance. As such, it is considered an act of misconduct and is also subject to the University disciplinary process as defined in the Student Code of Conduct.

Acts of Dishonesty Include:

- Cheating—intentionally using or attempting to use unauthorized materials, information, or study aids in any academic exercise. The term academic exercise includes all forms of work submitted for credit or hours.
- Fabrication—intentional and unauthorized falsification or invention of information or citation in an academic exercise.
- Facilitating Academic Dishonesty—intentionally or knowingly helping or attempting to help another to violate a provision of the institutional code of academic integrity.
- Plagiarism—the deliberate adoption or reproduction of ideas, words, or statements of another person as one's own without acknowledgement.

Unauthorized Collaboration—intentionally sharing information or working together in an academic exercise when the course instructor does not approve such actions. (Source: CSU-Pueblo Catalog)

ADA Statement

Colorado State University-Pueblo abides by the Americans with Disabilities Act and Section 504 of the Rehabilitation Act of 1973, which stipulates that no student shall be denied the benefits of an education "solely by reason of a handicap." If you have a documented disability that may impact your work in this class and for which you may require accommodations, please see the Disability Resource & Support Center as soon as possible to arrange accommodations. In order to receive accommodations, you must be registered with and provide documentation of your disability to the Disability Resource & Support Center, which is located in the Library and Academic Resources Center, Suite 169.

Course Communication

If you have any questions, contact the course instructor at cwoodin@landmarkschool.org, who normally responds to emails within 24 hours.