



Professional Development Institute

Flex Course Syllabus

Teaching Primary Grade Math Problem-Solving Skills (K-2)

PDI Course Number: 55T02

ACE Course Number: LE5756

UCSD Course Number: EDUC41609

If you would like information about receiving credit for completing this course, [please click here](#).

Course Timeline

Participants have one year to complete the course. Participants must spend a minimum of three weeks in this course.

Course Description

Do you have students who excel at math computation but get lost when it is time to problem solve with word problems? Mathematical standards have shifted the focus from simply teaching problem solving to teaching *via* problem solving. This online course is designed for teachers in grades K-2 who want to help their students become critical and logical mathematical thinkers. Specific strategies are introduced to improve the way students approach math problems. Teachers will learn specific and effective strategies and techniques for teaching students how to problem solve including using manipulatives, grouping strategies, student-centered teaching, and using quality literature. Problem solving in the following areas of math are included: place value, number sense, geometry, measurement, and data. Differentiation techniques to address the problem-solving skill levels of all your students are shared. Appropriate assessment techniques specific to the problem-solving process are provided. By the end of this course, teachers will more fully understand how to best help students apply their logic and reasoning to

real-world mathematical examples, and they will have gained a multitude of valuable classroom ideas.

Educational Outcomes

1. Teachers will learn about the characteristics of good problem solvers.
2. Teachers will understand the basics of the Common Core State Standards for Mathematics and NCTM Standards.
3. Teachers will learn about the nine habits which support numerate thinking.
4. Teachers will learn how to incorporate higher-order thinking skills into their mathematical instruction.
5. Teachers will learn the four steps to the problem-solving process and specific strategies to record the same.
6. Teachers will learn how to use various mathematical models in order to help their students organize their thinking within the context of problem solving.
7. Teachers will learn about the five components of number sense and will be taught specific strategies for incorporating them into their lessons.
8. Teachers will learn specific strategies for the teaching of place value.
9. Teachers will learn about the types of problems students are expected to solve at the K-2 level and will be taught how to incorporate them into their math lessons.
10. Teachers will learn how to incorporate various addition and subtraction strategies into their daily math lessons.
11. Teachers will learn specific strategies of how to incorporate geometry into the problem-solving process.
12. Teachers will learn specific strategies of how to incorporate estimation, measurement, data analysis, and probability into the problem-solving process.
13. Teachers will learn about the various components of the math workshop model, as well as the necessary tools which need to be in place before implementation.
14. Teachers will learn about the different types of groups and be provided with valuable strategies for grouping students for math.
15. Teachers will learn how to use problems as a teaching tool.
16. Teachers will be introduced to the types of differentiation and will learn specific instructional strategies for incorporating the same into their daily math lessons.
17. Teachers will learn the basic mechanics of math stations, and be introduced to ways in which to incorporate them into their differentiated lessons.
18. Teachers will learn specific strategies to incorporate manipulatives into their mathematics instruction in order to challenge their students' problem-solving abilities.
19. Teachers will learn how to use math manipulatives to link concrete ideas with abstract concepts.
20. Teachers will learn how to create problems that result in real-world implications in order to make mathematics meaningful for their students.
21. Teachers will learn how to use literature as an example and inspiration for problem solving.
22. Teachers will develop a basic understanding of how formative assessment helps drive further mathematical instruction.

23. Teachers will be able to properly use different types of assessment in order to help guide their math instruction.
24. Teachers will discover appropriate ways to assess the problem-solving process.

Instructional Media

- Online Discussions
- Online Engagement
- Online Collaboration
- Instructor Feedback
- Instructor Interaction
- Online Resources and Websites
- Supplemental Instructional Materials
- Printable Classroom Resources

Evaluation

- Test #1 (5% of final grade)
- Test #2 (5% of final grade)
- Test #3 (5% of final grade)
- Test #4 (5% of final grade)
- Test #5 (5% of final grade)
- Autobiography and Goals for the Course (10% of final grade)
- Article/Video Reflection (15% of final grade)
- Course Collaboration/Share Ideas with the Class (10% of final grade)
- Cumulative Assignment/Project: Create real-world mathematical word problems (20% of final grade)
- Culminating Practicum (20% of final grade)

Topical Outline

Unit One

- Children as Problem Solvers
- Introduction to the NCTM Standards and the Common Core Standards for Mathematics
- Working Together: Using Problems as a Teaching Tool
- **Assignment #1**
Write an autobiography including information about yourself, your grade level and what you specifically hope to learn about implementing math problem-solving skills in the primary grade classroom. Your autobiography should be a minimum of three paragraphs.
- **Test #1**

Unit Two

- The Problem-Solving Process
- Models for Thinking
- Constructing Number Sense
- Place Value
- **Assignment #2**

As an educator, it is important to be aware of the research, studies, and professional work done in the field. In the course, you will find an article and video that are relevant to the specific course content. Read the article and then write an essay with your thoughts.

- **Test #2**

Unit Three

- Types of Problems
- Computation Strategies
- **Assignment #3**

Online Discussion Board Participation/Engagement: Please post a tip, strategy, or idea that specifically relates to using problem-solving skills to teach math content and will make a difference to other teachers in their own classrooms. Your assignment should be a minimum of three paragraphs and detailed enough for another teacher to easily follow. This is a great opportunity to share and collaborate with other teachers at your grade level around the country. Take time to review and respond to other postings that are relevant to your classroom population in order to gain effective ideas to use immediately in your classroom.

- **Test #3**

Unit Four

- Problem Solving with Geometry
- Problem Solving with Measurement and Data
- Creating a Math Workshop
- **Test #4**

Unit Five

- Grouping Strategies
- Differentiation
- Using Manipulatives to Help Solve Problems
- **Test #5**

Unit Six

- Make it Meaningful – Real-World Problem Solving

- Using Children’s Literature to Teach Problem-Solving Skills
- Assessing Problem Solving
- **Assignment #4**

*Using the Types of Addition and Subtraction Word Problems Cheat Sheet contained in the **Course Guides** folder, write five joining or separating word problems that incorporate real-world scenarios. Be sure to include information that students do not need in order to solve the problem. Write another five word problems that focus on geometry and incorporate real-world scenarios into each. Be sure to include information that students do not need in order to solve the problem. Conclude with an additional five word problems involving measurement that require students to use addition and subtraction within 100 to solve. Incorporate real-world scenarios into each. Be sure to include information that students do not need in order to solve the problem. You should have a total of 15 word problems. Include the written equation for each word problem as part of this assignment. Vary the level of difficulty, the scenarios, and the numbers used in each of the problems. Include a list of the tools and manipulatives students should use to help them solve each word problem. Keep in mind that this assignment is a cumulative project and therefore, you are expected to demonstrate the knowledge you gained from the course and your ability to apply what you have learned in a practical setting.*

- **Assignment #5**
- *The culminating practicum is a three-step process. (1) In the first assignment, you were asked what goals you had and what you hoped to learn from the course. Think back to your original goals for this course. Write a minimum two-paragraph reflection specifically describing how what you learned can be used to help you reach those goal(s). (2) Next, write a minimum three-paragraph plan that specifically describes the ways in which you intend to implement a particular strategy you learned in this course into your own teaching situation. (3) Last, write a minimum two-paragraph reflection describing a student you have or have had in the past. Then, discuss how the strategies you learned in this course will specifically benefit that student as you put your plan into action.*

Bibliography

The Professional Development Institute wishes to thank the NGA Center for Best Practices and the Council of Chief State School Offices for their generous public license of the Common Core State Standards.

Anderson, Kelly M. (2007). “Tips for teaching: Differentiating instruction to include all students.” *Preventing School Failure*, 51(3), 49-54. Print.

Anderson, Richard (1977). “The Notion of Schemata and the Educational Enterprise: General Discussion of the Conference.” In *Schooling and the Acquisition of Knowledge*,

ed. Richard C. Anderson, Rand J. Spiro, and William E. Montague. Hillsdale, NJ: Erlbaum.

BBC News: <http://www.bbc.com/news/business-32608772>

Beers, Kylene (2003). *When kids can't read: What teachers can do*. Portsmouth, NH: Heinemann.

Buhrow, Brad & Anne Upczak Garcia (2005). *Ladybugs, tornadoes, and swirling galaxies: English language learners discover their world through inquiry*. Portland, ME: Stenhouse Publishers.

Burns, Marilyn (1994). *The Greedy Triangle*. New York, NY: Scholastic, Inc.

Burns, Marilyn (2007). *About Teaching Mathematics: A K-8 Resource*. 3rd ed. Sausalito, CA: Math Solutions.

Carpenter, T., E. Fennema, M. Franke, L. Levi, & S. Empson (1999). *Children's Mathematics: Cognitively Guided Instruction*. Portsmouth, NH. Heinemann.

Chapin, Suzanne and A. Johnson (2006). *Math Matters: Understanding the Math You Teach, Grades K-8*. 2nd ed. Sausalito, CA: Math Solutions.

Clements, Douglas (1999). "Subitizing: What is it? Why Teach it?" *Teaching Children Mathematics*, 400-405. Print.

Developing Mathematics Thinking with HOTS
Retrieved from

[http://www.saydel.k12.ia.us/cms_files/resources/Developing%20Mathematics%20Thinking%20with%20HOTS%20Questions%20\(from%20classroom%20observations\)PDF.pdf](http://www.saydel.k12.ia.us/cms_files/resources/Developing%20Mathematics%20Thinking%20with%20HOTS%20Questions%20(from%20classroom%20observations)PDF.pdf)

Fisher, Douglas and Nancy Frey (2014). *Better Learning Through Structured Teaching: A Framework for the Gradual Release of Responsibility*. (2nd ed.). Alexandria, VA: ACSD.

Fosnot, C.T. and M. Dolk (2001). *Young Mathematicians at Work*. Portsmouth, NJ: Heinemann.

Gersten, R. and D. Chard (2001). "Number Sense: Rethinking Arithmetic Instruction for Students with Mathematical Disabilities." *The Journal of Special Education*, 33.1, 18-28. Print.

Goldstone, Bruce (2013). *That's a Possibility! A Book About What Might Happen*. New York, NY: Henry Holt and Company, LLC.

Greene, Rhoda Gowler (1997). *When a Line Bends . . . A Shape Begins*. New York, NY: Houghton Mifflin.

Groves, Susie (2001). "Numeracy across the curriculum: recognizing and responding to the demand and numeracy opportunities inherent in secondary teaching." *Mathematics Teacher Education and Development*, 3, 48-61. Print.

Holtzman, Caren (1997). *No Fair!: A Math Reader*. New York, NY: Scholastic Inc.

Helpteaching.com

<http://www.helpteaching.com/blog/how-to-write-higher-order-math-questions.html>

The Huffington Post

http://www.huffingtonpost.com/roya-r-rad-ma-psyd/problem-solving_b_4302935.html

K-5 Math Teaching Resources

<http://www.k-5mathteachingresources.com/empty-number-line.html>

<http://www.k-5mathteachingresources.com/ten-frames.html>

Moore, Sara. (2013). "Teaching with Manipulatives: Strategies for Effective Instruction." *Colorado Mathematics Teacher*. Fall Issue.

National Council of Supervisors of Mathematics (2013). "Improving Student Achievement in Mathematics by Using Manipulatives with Classroom Instruction." *The National Council of Supervisors of Mathematics Improving Student Achievement Series*, 11. Spring Issue.

National Council of Teachers of Mathematics

<http://www.nctm.org/>

National Council of Teachers of Mathematics, *An Agenda for Action*. (1980). Retrieved from <http://www.nctm.org/flipbooks/standards/agendaforaction/index.html>.

National Council of Teachers of Mathematics (1995). *Assessment Standards for Teaching Mathematics*.

National Council of Teachers of Mathematics (1989). *Curriculum and Evaluation Standards for School Mathematics*.

National Council of Teachers of Mathematics (2000). *Principles and Standards for School Mathematics*. Reston, VA: National Council of Teachers of Mathematics.

National Council of Teachers of Mathematics (2000). *Principles and Standards for School Mathematics*.

National Council of Teachers of Mathematics (1991). *Professional Standards for Teaching Mathematics*.

National Research Council of the National Academies (2009). *Mathematics Learning in Early Childhood: Paths toward Excellence and Equity*, edited by C. Cross, T. Woods, and H. Schweingruber. Washington, D.C.: Academic Press.

Newton, Nicki (2012). *Problem Solving with Math Models: First Grade*. Trumbull, CT: GigggleNook Publications.

Pearse, Margie and K.M. Walton (2011). *Teaching Numeracy: 9 Critical Habits to Ignite Mathematical Thinking*. Thousand Oaks, CA: Corwin.

Pólya, George (1945). *How to Solve It*. Princeton, NJ: Princeton University Press.
Tomlinson, Carol Ann. (August, 2000). *Differentiation of Instruction in the Elementary Grades*. ERIC Digest. ERIC Clearinghouse on Elementary and Early Childhood Education.

TeachHUB.com

<http://www.teachhub.com/30-ways-arrange-students-group-work>

U.S. Department of Education, Institute of Education Sciences (2012). *Improving Mathematical Problem Solving in Grades 4 Through 8* (NCEE 2012-4055). Available online from

<http://www.exemplars.com/assets/files/Problem%20Solving%20What%20Works.pdf>.

Van de Walle, J., Karp, K., and Bay-Williams, J. (2013). *Elementary and Middle School Mathematics: Teaching Developmentally*. Boston, MA: Pearson.

Yale National Initiative

http://teachers.yale.edu/curriculum/viewer/initiative_07.06.01_u

Zwiers, Jeff (2004). *Building reading comprehension habits in Grades 6-12*. Newark, DE: International Reading Association.