Title

Count on It: Number Sense for Grades K-5

Target Audience

This course is intended for pre-service and in-service grades K-5 teachers.

Prerequisites

To successfully participate in this course, you should be familiar with taking an online course or have gone through the TeacherLine Practice Learning Online Course. You should also be familiar with elementary school mathematics content.

Course Description

This course is designed to help elementary school teachers understand number sense, why it is important for elementary students to develop, and how to effectively assess what type of number sense students possess. Participants will examine lesson plans, Web resources and the National Council of Teachers of Mathematics (NCTM) standards in order to help students develop a deeper understanding of numbers. Through these resources, learners will develop their own lesson plans for enhancing student learning using both traditional and technological manipulatives as well as other forms of technology. Learners will be challenged to design and implement a lesson, using activities and other pedagogical approaches they have developed in this course. Lastly, learners will reflect on student assessments and receive suggestions from other learners as to how to improve their lesson and their classroom practice.

Instructor/Facilitator

See instructor/facilitator sheet

Credits

To be determined by college or university

Objectives

Learners will:

- Understand the standards for numbers and operations in grades K-5, as outlined by the NCTM
- Increase knowledge of how students develop number sense
- Increase understanding of how to assess students' number sense
- Integrate technology, manipulatives, and effective pedagogical strategies to create a lesson that promotes the vision of the NCTM Number and Operations Standard.

Outline of Content and Assignments

The content area contains five Sessions. After learners have previewed the Introduction and Goals, Schedule, Assignments, and Competency Map, they will begin reading Session 1 of the content. Each Session includes assignments and discussion questions for learners to complete. The final project for the course is found in Session 5.

Session 1: Understanding Number Sense (Session 1)

Learners will:

Read
- "Number and Operations"
- "Number and Operations Standard for Grades PreK–2"
- "Number and Operations Standard for Grades 3–5"

Participate in the online discussion

- On the Discussion Board, respond first to the following question: As a new teacher, what advice would you have wanted someone to give you about incorporating number sense into your unit planning?
- Review the current discussion.
  - Identify one specific aspect of the ongoing discussion that reminds you of your own personal experience as a teacher
  - Share that experience in your reply
  - Comment on the connections between your experience and that of your fellow learners

Record in online journal
- Make notes of interesting ideas about how technology can assist teachers in helping students develop number sense

Session 2: Assessing Number Sense

Learners will:

Read
- "The Assessment Principle"
- "Experiential Learning of Mathematics: Using Manipulatives"

Watch video
- “Illuminations: Understanding a Child's Development of Number Sense”

Explore, review, and evaluate Web sites
- Mighty Math: Zoo Zillions
- Guess the Number
- Fraction Pointer
- National Library of Virtual Manipulatives for Interactive Mathematics

Participate in the online discussions

After completing this Session of the course, go to the Discussion Board and post responses to the following activities:

- Based on the Assessment Principle, compare your current use of assessment in the classroom with the ways suggested in this article. Post some suggestions on how to improve student achievement and how to use assessment differently to enhance your own teaching and increase student learning.
- In the video clips, students used manipulative chips to demonstrate their understanding of place value. In addition to watching these clips, learners will visit a few Web sites that can be used in lessons on number sense and respond to the questions below on the Discussion Board.

- Compare Web-based manipulatives to the more traditional handheld manipulatives. What are the pros and cons of each type of manipulative?
- Is one type better than the other? Why or why not?
- Does the role of the teacher differ depending on which type is used?
- What should a teacher consider when choosing the appropriate manipulative to use?

Record in the online journal

- Answer the two question groups located on the Illuminations Web site
- After exploring Web-based electronic manipulatives, make three or more notes on at least two of these tools and suggest ways to use them in the classroom.

Session 3: Review a Number Sense Lesson Plan (Session 3)

Learners will:

Read

- "Number Sense: Rethinking Arithmetic Instruction for Students with Mathematical Disabilities"
- "Guidelines for Evaluating Web Sites"

Review Lesson Plan

- An Apple a Day

Watch video

- “An Apple a Day” (videos 1 & 2)

Review Web sites

- Spreadsheet Tutorial for Microsoft Excel
- Spreadsheet Basics for Clarisworks, Spreadsheet for Macintosh
- Making Scientific Graphs with Microsoft Excel
- Getting Started in Excel
- Collecting and Examining Weather Data
- Representing Data
- Johnny Appleseed Hunt
- Johnny Appleseed Lesson
- “Johnny Appleseed," by John Chapman
- The Story of Johnny Appleseed

Participate in the online discussions

Upon completion of the assignments in this Session, go to the Discussion Board and post responses to the following questions:

- Based on the lesson plan, "An Apple a Day," discuss what type of feedback you would give to students who are having difficulties. Include the following in your response:
  - Discuss what it takes for students to meet the objectives and NCTM standards for this lesson.
  - Provide a possible scenario about how a student may not fully meet the objectives and NCTM standards.
  - Based on this scenario, explain what type of feedback should be provided for this student.
- Using knowledge of your class and the guidelines discussed in this Session of the course, review two of the five Web sites listed in the "Web resources" area of the page.

For each Web site, provide an outline and an analysis of how the site could be used in your classroom. Post both analysis and outlines to the Discussion Board.

Record in the online journal

- After watching the video, “An Apple a Day” (1 & 2), describe what the teacher in the video does to develop students' number sense and increase their estimation skills. Then, identify what the teacher does to increase active participation in her classroom and how this differs from what you currently do in your classroom.
- After reading "Number Sense: Rethinking Arithmetic Instruction for Students with Mathematical Disabilities,” enter three strategies that you can use with a student who has difficulty with this problem.
- After viewing the lesson plan, An Apple a Day, make a chart listing the pros and cons of using calculators in this activity. Upon review of the chart, create a journal entry that states your position on the use of calculators in this activity. Provide criteria for your final decision.

Session 4: Review a Second Number Sense Lesson Plan (Session 4)

Learners will:

Read

- "Developing Mathematical Thinking with Effective Questions"

Review the lesson plan

- Here, There, and Everywhere

View the videos

- “Here, There, and Everywhere” (videos 1 & 2)

Explore, review, and evaluate Web sites

- Online Calculators
- The Annenherg/CPB math Science Learning Project, Patterns in Mathematics
- Frisbie Elementary School: Patterns

Participate in the online discussion

- Upon completion of the readings and assignments, choose a grade level and list on the Discussion Board two or three patterns that they think could help students develop number sense. Support your answers with reasons for your choices.

Record in online journal

- After watching the videos, “Here, There, and Everywhere” (1 & 2), provide a brief analysis of the organization of the learning centers used in the lesson. Include an explanation for the critiques and discuss the accountability that was put into place for the completion of the activities. Provide three new suggestions for improvements.
- After reading "Developing Mathematical Thinking with Effective Questions," reflect upon your current questioning techniques and brainstorm on how to improve these techniques.

Session 5: Final Assignment (Session 5)

Learners will:

Complete the following assignment and submit the project to the facilitator.

- Create a lesson that integrates technology, manipulatives, and effective pedagogical strategies and promotes the vision of the NCTM Number and Operation Standards.

- Create objectives focusing on what students will know and be able to do at the end of the lesson.
- Create pre- and post-assessments for the students.
- Create an activity using manipulatives (either bought or made).
- Implement the activity.
- Write a 2-5 page paper that describes:
    - Activities and pedagogical strategies used in the lesson
    - Successful activities
    - Changes for future teaching of their lessons
    - Which areas were easy and which were difficult, from the students' point of view
    - Student work samples and student comments about their learning experiences
- Copy the paper to the Discussion Board and read other learners' postings, making suggestions for improvements, remediation, and extension activities.

Explore Web sites to find technological enhancements

- Math Forum
- Educate the Children
- Arithmetic
- Shu-Chen Jenny Yen's Montessori Math Album

Participate in the online discussion

After completing the final assignment, post on the Discussion Board the type of gains made by students, as shown by the pre- and post-assessments. Reflect upon what you identified about your students' learning from the activity. Copy your final project and post on the Discussion Board for other participants to see. Then review and provide feedback on projects posted by the other participants.

Schedule

This course is scheduled to take approximately 15 hours to complete readings, activities, video, assignments, reflections and a final project.

Requirements

Learners are expected to:

- Complete all assignments
- Participate regularly in discussion boards

Materials (hardware, software, plug-ins)

Technical Requirements

- Word processor
- Internet service provider
- E-mail

Academic Dishonesty Policy

To be inserted by university institution only

Evaluation Last Update: May 13, 2005

This course can be taken for graduate credit on a pass/fail basis, or for a letter grade and graduate credit. See graduate credit details pertaining to specific graduate credit institutions.