Title

Understanding Probability in Grades 4-6

Target Audience

This course is intended for pre-service and in-service grades 4-6 teachers.

Course Description

This course explores the concepts of probability, the intuition and problem-solving skills needed to calculate probability, and the importance of being able to analyze statistics used in the media. Learners will focus on the distinction between theoretical and experimental probability; the use of numeric, visual, and graphical representations of probability; the 'law of large numbers;' and the use of probability in solving problems. By examining student work, learners appreciate how students in grades 4-6 understand probability and will be equipped to address common misconceptions about probability. Learners will use probability experiments to help students better understand the concepts of probability. As a final task, learners will develop appropriate probability activities and assessments for use in their own classrooms.

Requirements

Learners will need at least three students in any one of grades 4, 5, or 6 to work with in Sessions 2 and 5.

Instructor/Facilitator

See instructor/facilitator sheet

Credits

To be determined by college or university

Objectives

Learners will:

- Understand the underlying principles of probability, including the distinction between theoretical and experimental probability; the use of numeric, visual, and graphical representations of probability; the Law of Large Numbers; and the use of probability in solving problems.
- Address probability-related misconceptions commonly experienced by students in grades 4-6.
- Use probability experiments to help students develop their understandings of probability.
- Apply what they have learned in the course to develop activities and assessments for students in their own classrooms.

Outline of Content and Assignments

The content area contains six parts. After learners have previewed the Introduction and Goals, Schedule, Assignments, and Competency Map, they will begin reading Part 1 of the content. Each part or session

includes assignments and discussion questions for learners to complete. The final project for the course is found in Part/Session 6.

Part 1: Introduction to Probabilistic Thinking

Learners will:

Read
- "Probability Introduction"

This reading is a review of key probability concepts.

Record in Online Journal
- Respond to questions related to the "Probability Introduction" reading.

Complete Math Activities
- Play the game "Is It Odd or Even?" and analyze the results.

Participate in the online discussion
- Upon completion of all readings and activities, learners will go to the Discussion Board and share their thoughts as to the importance of students in grades 4-6 to explore probabilistic situations.

Looking Ahead
- Learners recruit at least two students for probability-related activities in future sessions.

Part 2: Predict, Experiment, and Analyze

Learners will:

Read
- " Data Analysis and Probability Standard for Grades 3-5 from PSSM 2000"
- " Data Analysis and Probability Standard for Grades 6-8 from PSSM 2000"
- "The Law of Large Numbers"

Complete Math Activities
- "A Roll of the Die" activity
- "Prediction Practice" activity
- "Rolling Two Dice, Part 1" activity
- "Two-Dice Combinations-Finding the Theoretical Probabilities" activity

Online Applet
- "Dice Sums" Interactive
  Provides simulation of rolling 1,2,3,4; and dice up to 1000 times and displays results via bar graphs and numerical percentages.

Watch videos
- "Rolling One Die" -- showing fifth grade students working on concept of theoretical and experimental probability.
- "Rolling Two Dice, Part 1" -- showing a fifth grade class engaged in a predict, experiment, and analyze activity.
- "Rolling Two Dice, Part 2" -- showing fifth grade students solving the "Rolling Two Dice" problem.

Record in Online Journal
- Write answers to the "Theoretical probability" exercises.

Participate in the online discussion

- Upon completion of all the activities and readings, learners will go to the Discussion Board and reflect on students' mathematical understandings as portrayed in the videos and suggest any changes that would make sense for the students.

Part 3: How Many Ways Can It Happen?

Learners will:

Read and Complete Math Activities

- "Combinatorics: The Science of Counting" is a combined reading and activity that introduces a new set of probability concepts.
- "Probability Puzzlers" are a set of challenges for the learner

Record in Online Journal

- After completing the combined readings and math activities, learners will record responses to the "Probability Puzzlers".

Participate in an online discussion

- After completing the combined readings and math activities, learners will go to the Discussion Board and reflect on the differences in the two situations described in the readings/activities.

Part 4: Intuition and Probability

Learner will:

Read and Complete Math Activities

- "Happy Birthday to Whom?" is a more complex probability puzzler.
- "Would You Trade It for What's Behind Door #2?" is a popular Monty Hall paradox problem.

Participate in the online discussion

- After completing all the combined readings and activities, learners will go to the Discussion Board and discuss different reasons for the difficulty people face with probability when their intuition does not match the evidence.

Part 5: Examining Probability Misconceptions

Learners will:

Read

- "Misconceptions about Probability"
- "Intuitive Thinking and Probability"

Complete Math Activities

- "Examining Misconceptions"

Watch video

- "Student Thinking" -- where students articulate their understandings and misunderstandings of probability related concepts.

Record in Online Journal

- Write about the students' mathematical misconceptions observed in the video and how they relate to those described in the reading.

Participate in the Online Discussion

- After completing all readings, activities and viewing the video, learners will go to the Discussion Board and describe a unit on probability that would decrease the occurrence of students' misconceptions.

Part 6: Final Project

Learners will:

Complete Math Activity

- Solve related sample state assessment problems.

Participate in the Online Discussion

- After completing all readings and activities, learners will go to the Discussion Board and make a convincing argument for studying probability in grades 3-5 mathematics.

Final Project

- Learners will develop a lesson or series of lessons to help students build probabilistic intuition and conceptual understanding, specifically addressing some of the conceptual difficulties exhibited by students with whom they worked with during the course.

Record in Online Journal

- Respond to the following question: What one or two ideas from this course will be of most use to you in your classroom and why?

Schedule

This course is scheduled to take approximately 25-30 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

Evaluation

Pass/fail upon satisfactory completion of assignments and discussion board participation

Materials (hardware, software, plug-ins)

Technical Requirements

- Word processor
- Internet service provider

- E-mail

Academic Dishonesty Policy

To be inserted by university institution only