COURSE SYLLABUS

MED 513: Topics of Probability and Statistics for Elementary and Middle School Teachers

Course Credit: 2 sem. hr.

Instructor Biography:
I completed a Bachelor of Science Degree in Mathematics and Science at Kent State University in northeastern Ohio and a Master of Science, also from Kent State University, in Mathematics and Education. In 1984, I received a Ph.D. in Mathematics Education from the University of Colorado at Boulder. My professional experience includes ten years of teaching in public schools teaching basic mathematics through calculus, two years of teaching mathematics education at the University of Colorado at Boulder as a graduate student, three years of teaching mathematics education at the University of Texas at Austin, and fourteen years of teaching mathematics and mathematics education courses at the University of Northern Colorado.

I have taught nearly all the course in the Department of Mathematical Sciences required of students preparing to teach at the elementary or middle school level. I have also conducted several workshops and inservice programs in mathematics for elementary and middle school teachers.

Course Description

We will address Standard 3 of the Colorado Model Content Standards for Mathematics for grades K-8. To address this standard emphasis will be placed on solving problems by systematically collecting, organizing, describing, and analyzing data using surveys, tables, charts, and graphs; making valid inferences, decisions and arguments based on the data; and using counting techniques, experimental probability, or theoretical probability, as appropriate, to represent and solve problems involving uncertainty.

Student Involvement and Course Format

Students are expected and required to be "active participates" in the topic discussions and paper presentations within the Discussion Board of Blackboard. They are also required to participate actively in the Whole Class and Small Group "Chats" that will occur every other week.

Course Prerequisites

None

Required Textbook(s)


Course Goals and Objectives

The primary goal of this online course is to become familiar and experienced with topics of probability and statistics that are recommended by the National Council of Teachers of Mathematics in their 2000 document *Principles and Standards of School Mathematics* and those recommended in the Colorado Model Content Standards for grades K-8. The particular course objectives are to:

1. Provide opportunities to explore data and make conjectures that include relationships and patterns.
2. Provide both content and pedagogical content so that participating teachers not only learn new content but are able to use appropriate tools and instructional methods in teaching similar topics to their students.
3. Increase an awareness of probability and statistics that includes not only a process of solving specific quantitative problems but also as a method of teaching mathematics to their students.
4. Update skills and knowledge of elementary and middle school teachers in teaching mathematical concepts that involve probability and/or statistics.
5. To enhance profession knowledge and instructional skill in standards-based mathematics at the k-8 level.
6. Increase an awareness of probability and statistics as they occur in society and in student's daily lives.

Course Content

The following content and methods will address Data Analysis and Probability Standards as they relate to the elementary or middle school mathematics curricula. In particular, a focus will be for students to:

- Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them. Additionally, we will address methods for providing a standards-based instruction so that students in grades:

  K-2 can pose questions and gather data about themselves and their surroundings; sort and classifying objects to their attributes and organize data about the objects; and represent data using concrete objects, pictures, and graphs.
3-5 can design investigations to address a question and consider how data-collection methods affect the nature of the data set; collect data using observations, surveys, and experiments; represent data using tables and graphs such as line plots, bar graphs, and line graphs; and recognize the differences in representing categorical and numerical data.

6-8 can formulate questions, design studies, and collect data about a characteristic shared by two populations or different characteristics within one population; select, create and use appropriate graphical representations of data, including histograms, box plots, and scatterplots.

- Select and use appropriate statistical methods to analyze data. Additionally, we will address methods for providing a standards-based instruction so that students in grades:
  
  K-2 can describe parts of the data and the set of data as a whole to determine what the data show.

  3-5 can describe the shape and important features of a set of data and compare related data sets, with an emphasis on how the data are distributed; use measures of center, focusing on the median, and understanding what each does and does not indicate about the data set; and compare different representations of the same data and evaluate how well each representation shows important aspects of the data.

  6-8 can find, use, and interpret measures of center and spread, including mean and interquartile range; discuss and understand the correspondence between data sets and their graphical representations, especially histograms, stem-and-leaf plots, box plots, and scatterplots.

- Develop and evaluate inferences and predictions that are based on data. Additionally, we will address methods for providing a standards-based instruction so that students in grades:
  
  K-2 can discuss events related to students' experiences as likely or unlikely.

  3-5 can propose and justify conclusions and predictions that are based on data and design studies to further investigate the conclusions or predictions.

  6-8 can use observations about differences between two or more samples to make conjectures about populations from which the samples were taken; make conjectures about possible relationships between two characteristics of a sample on the basis of scatterplots of the data and approximate lines of fit; use conjectures to formulate new questions and plan new studies to answer them.

- Understand and apply basic concepts of probability. Additionally, we will address methods for providing a standards-based instruction so that students in grades:
3-5 can describe events as likely or unlikely and discuss the degree of likelihood using such words as *certain*, *equally likely*, and *impossible*; predict the probability of outcomes of simple experiments and test the predictions; and understand that the measure of the likelihood of an event can be represented by a number from 0 to 1.

6-8 can understand and use appropriate terminology to describe complementary and mutually exclusively events; use proportionality and a basic understanding of probability to make and test conjectures about the results of experiments and simulations; and compute probabilities for simple compound events, using such methods as organized lists, tree diagrams, and area models.

**Rationale for Graduate Credit**
This course is designed for those who are presently teaching and hold bachelors degrees. Projects of graduate level quality and Discussion Board written entries of graduate level quality is required in the course.

**Grading Method**
A grade will be assigned based on the following:

1. Weekly Discussion Board entries on assigned readings and/or problems (quality and quantity) - 30% of course grade.
2. Chat Room entries on assigned readings and problems (quality and quantity) - 15% of course grade.
3. One Individual Project - 25% of course grade.
4. Online presentation (abstract) of Individual Project - 10% of course grade.
5. Two online tests/quizzes - 20% of course grade.

**Evaluation Technique**
A grade of S will be assigned based on a performance level of 70% or above on the total of accumulated and weighted points.

**Additional References/Resources**


