

幼兒自然科學與數概念 Concepts of Natural Science and Mathematics for Young Children



Course Description

The course has several basic aims. One is to deepen students' understanding of the mathematics taught at the elementary level, including such topics as place value, base systems, number theory, fractions, decimals, proportions, probability, statistics, algebra, and functions. It is essential that a teacher understand, for example, why we invert and then multiply when dividing by a fraction. A teacher who understands the mathematics he or she is teaching is in a better position to address the questions children inevitably pose such as: "When I multiply fractions like $1/4 \times 1/2$ why does the answer get smaller? I thought things are supposed to get bigger when you multiply." A teacher who understands the subject can better help children to make connections and to construct a more complete and accurate understanding of mathematics.

A second aim is to help students better understand how children's mathematical thinking develops. The course will explore the psychology of mathematical learning. It will examine children's intuitive mathematical knowledge, which serves as the basis for formal, school-taught mathematics. It will focus on common learning difficulties. For example, it explores common misconceptions (e.g., multiplying fractions always makes the answer bigger) and errors (e.g., $1/4 \div 1/2 = 4/1 \times 1/2 = 4/2$).

The third aim is to discuss methods of teaching mathematics. The course will examine different sets of beliefs about elementary mathematics programs and the practices that grow out of these viewpoints. More specifically, it will examine a skill, a conceptual, and a problem-solving approach to mathematics education. The course will review instructional recommendations made by the National Council of Teachers of Mathematics (1989) in the Curriculum and Evaluation Standards for School Mathematics (1989) and Principles and Standards for School Mathematics (2000), and the instructional implications that stem from a psychology of mathematical learning. In particular, the course will focus on an investigative approach to teaching mathematics—on how to use problems, everyday situations, projects, children's literature, and content instruction in other areas as a vehicle for teaching mathematical content in a purposeful (interesting), meaningful (conceptually-based), and thought-provoking (inquiry-based) manner. The course is designed to model an

active learning (pupil-centered) approach to instruction. The course will examine mathematics education from K through 8.

Another basic aim of the course is to cultivate a positive disposition toward teaching mathematics. A key element of this is promoting more accurate beliefs about the nature of mathematics, mathematical learning, and mathematical teaching. It is important for teachers to recognize that mathematics can be challenging and even interesting, fun, and rewarding to teach and to learn.