

A photograph of a classroom scene. In the foreground, a young boy with dark skin and short hair is sitting at a desk, looking towards the right. He has a pencil in his mouth. In the background, a girl with long brown hair is standing and looking towards the camera. To the right, another child's hand is raised high. The background is a chalkboard with some faint writing, including the number '9' and '6'. The overall scene is brightly lit and shows a typical classroom environment.

Chapter 10

***Constructivist
Learning Theory,
Problem Solving,
and Transfer***



Overview

- Meaningful Learning Within a Constructivist Framework
- The Nature of Problem Solving
- Transfer of Learning
- Technology Tools for Knowledge Construction and Problem Solving

Meaningful Learning Within a Constructivist Framework

- Meaningful learning occurs when individuals construct a personal interpretation of the world by filtering new ideas and experiences through existing knowledge structures (i.e., schemes)

Meaningful Learning Within a Constructivist Framework

- Jerome Bruner and Discovery Learning: An Early Constructivist Perspective
 - Too much school learning emphasizes rote learning of verbal statements and mathematical formulas that cannot be applied outside the classroom
 - Children should be helped to discover how ideas relate to each other and to existing knowledge, and how to solve problems

Meaningful Learning Within a Constructivist Framework

- Constructivism Today
 - Common Claims that Frame Constructivism
 - Meaningful learning is the active creation of knowledge structures from personal experience
 - Knowledge structures are created from interpretations of personal experience and from interactions with others who have different ideas
 - Self-regulation is a key to successful learning
 - Solving authentic problems contributes to meaningful learning and transfer

Meaningful Learning Within a Constructivist Framework

- Constructivism Today
 - Three Variations on a Constructivist Theme
 - **Cognitive Constructivism:** Emphasizes the development of meaningful learning by focusing on the cognitive processes that take place within individuals
 - **Social Constructivism:** Emphasizes the development of meaningful learning by focusing on culture and social interactions
 - **Critical Constructivism:** Emphasizes the effect of teachers' assumptions about students from various racial, ethnic, and SES backgrounds on students' knowledge construction

Meaningful Learning Within a Constructivist Framework

- Conditions That Foster Constructivist Learning
 - Cognitive Apprenticeship
 - Teachers modeling cognitive processes that students eventually take responsibility for as they become more skilled
 - Situated Learning
 - Giving learning tasks situated in realistic contexts
 - Multiple Perspectives
 - Students should have the opportunity to view ideas and problems from multiple ways

Meaningful Learning Within a Constructivist Framework

- Putting Constructivism in Perspective
 - It is almost impossible to create highly detailed lesson plans because so much variation is possible
 - Teaching from a constructivist perspective is more time consuming and places higher demands on learners as compared to a typical lecture format
 - Constructivism is not the only orientation to learning that you will ever need

Video: Middle School Science Instruction: Inquiry Learning



The Nature of Problem Solving

- Three Common Types of Problems
 - Well-structured problems
 - Clearly formulated, solved by specific procedure, solution evaluated against agreed-upon standard
 - Ill-structured problems
 - Complex, few clues to solution procedures, less-definite criteria for measuring solution
 - Issues
 - Ill-structured problems that arouse strong feelings and drive people into opposing camps as to the nature of and solution to the problem

The Nature of Problem Solving

- Helping Students Become Good Problem Solvers
 - Realize That a Problem Exists
 - Understand the Nature of the Problem
 - Compile Relevant Information
 - Formulate and Carry Out a Solution
 - Evaluate the Solution

The Nature of Problem Solving

- Helping Students Become Good Problem Solvers
 - Step 1: Realize That a Problem Exists
 - Often called problem finding
 - Depends on curiosity and dissatisfaction with the status quo
 - Particularly useful when working with ill-structured problems

The Nature of Problem Solving

- Helping Students Become Good Problem Solvers
 - Step 2: Understand the Nature of the Problem
 - Often called problem representation or problem framing
 - Requires high level of knowledge of subject matter and familiarity with that type of problem

The Nature of Problem Solving

- Helping Students Become Good Problem Solvers
 - Step 3: Compile Relevant Information
 - For well-structured problems, recall relevant information from LTM
 - For ill-structured problems, seek external sources of information

The Nature of Problem Solving

- Helping Students Become Good Problem Solvers
 - Step 4: Formulate and Carry Out a Solution
 - Study worked examples.
 - Work on a simpler version of the problem
 - Break the problem into parts
 - Work backward
 - Backward fading
 - Solve an analogous problem
 - Create an external representation of the problem

The Nature of Problem Solving

- Helping Students Become Good Problem Solvers
 - Step 5: Evaluate the Solution
 - Ask and answer a set of basic questions (who, what, where, when, how)
 - Identify imperfections and complications
 - Anticipate possible negative reactions from other people
 - Devise improvements

Transfer of Learning

- Transfer of learning is...
 - Students independently apply knowledge and skills to similar but new information

Transfer of Learning

- The Nature and Significance of Transfer of Learning
 - The Theory of Identical Elements
 - In 1901, Edward Thorndike and Robert Woodworth argue that transfer depends on the number of identical elements that two tasks share
 - Their theory of identical elements displaces the traditional doctrine of formal discipline

Transfer of Learning

- The Nature and Significance of Transfer of Learning
 - Positive, Negative, and Zero Transfer
 - **Positive Transfer:** A situation in which prior learning aids subsequent learning
 - **Negative Transfer:** A situation in which prior learning interferes with subsequent learning
 - **Zero Transfer:** A situation in which prior learning has no effect on new learning

Transfer of Learning

- The Nature and Significance of Transfer of Learning
 - Specific and General Transfer
 - **Specific Transfer:** A situation in which prior learning aids subsequent learning because of specific similarities between two tasks
 - **General Transfer:** A situation in which prior learning aids subsequent learning due to the use of similar cognitive strategies

Transfer of Learning

- The Nature and Significance of Transfer of Learning
 - Near and Far Transfer
 - **Near Transfer:** Knowledge domains are highly similar, the settings in which the original learning and transfer tasks occur are basically the same, and the elapsed time between the two tasks is relatively short
 - **Far Transfer:** Knowledge domains and settings are judged to be dissimilar and the time between the original learning and transfer tasks is relatively long

Transfer of Learning

- Contemporary Views of Specific/Near and General/Specific Transfer
 - Low-Road Transfer
 - A situation in which a previously learned skill or idea is almost automatically retrieved from memory and applied to a highly similar current task
 - High-Road Transfer
 - A situation involving the conscious, controlled, somewhat effortful formulation of an “abstraction” that allows a connection to be made between two tasks

Transfer of Learning

- Contemporary Views of Specific/Near and General/Far Transfer
 - Teaching for Low-Road and High-Road Transfer
 - Provide students with multiple opportunities for varied practice to help them develop a rich web of interrelated concepts
 - Give students opportunities to solve problems that are similar to those they will eventually have to solve
 - Teach students how to formulate for a variety of tasks general rules, strategies, or schemes that can be used in the future with a variety of similar problems

Transfer of Learning

- Contemporary Views of Specific/Near and General/Far Transfer
 - Teaching for Low-Road and High-Road Transfer (cont'd)
 - Give students cues that will allow them to retrieve from memory earlier-learned information that can be used to make current learning easier
 - Teach students to focus on the beneficial effects of creating and using rules and strategies to solve particular kinds of problems

Technology Tools for Knowledge Construction and Problem Solving

- Computer-supported Intentional Learning Environments (Knowledge Forum)
 - Students learn how to set goals, generate and interrelate new ideas, link new knowledge to old, share ideas with peers
- Quest Atlantis and Consequential Engagement
 - An online multi-user virtual environment in which students collaborate with others to solve various problems related to a hypothetical society