

Center for Talent Development—Northwestern University
2004 Summer Apogee Program
Session II

Bits and Blocks: An Introduction to Computer Science

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Course Description

Using MicroWorlds software, students will learn and use the Logo programming language to design their own multi-media computer projects and games –complete with animation, sound effects, movie clips and music. Working independently and collaboratively, students will complete assigned projects, tackle class challenges and develop and create games of their own devising.

Objectives

The purpose of this course is fourfold:

1. To introduce students to the fundamentals of computer science.
2. To teach students the basics of structured, imperative programming through the use of the Logo computer language.
3. To introduce students to the programming, graphics and multimedia capabilities of the software program “MicroWorlds 2.0.”
4. To practice the critical, creative thinking skills and problem solving skills inherent in computer programming through a variety of problem solving and logic exercises.

Evaluation process

Students will demonstrate their knowledge and be evaluated both on a series of assigned and personal projects.

Text/resources used

Teacher developed handouts and lessons
MicroWorlds 2.0 software

Course Schedule

Using MicroWorlds and Logo, students will explore the following topics:

Basic Skills

Project management: starting up, saving, making new pages
Exploration of menus and centers
Turtle Movement: basic Logo commands
Graphic tools and techniques

Turtle shapes: assigning or creating new shapes
Text: creation and manipulation of text boxes
Programming turtles and colors
Programming buttons and sliders

Advanced Skills

Program Design: top-down, bottom-up, middle-out
Project Design and Structure: linear, tree, and network structures
Procedures and subprocedures
Multiple turtles: talking to different objects
Multiple pages: creation and navigation
Importing and creating music, sound and video
Interactive Programming: user and keyboard input
Making Decisions: If statements
Variables

Students will learn, explore, and implement the concepts and skills outlined about by creating projects drawn from the following:

- Push Button Turtle – create a control panel of push buttons that make a turtle move around the screen and draw designs.
- Interactive Story Book – write, design, and program an autobiographical, interactive story book.
- Miniature Golf Hole – design a miniature golf hole. Players can set the direction and distance of the putt. The program will determine when the ball falls in the hole.
- Multimedia Madhouse – design a “multimedia madhouse” that plays movies, melodies, sound effects and computer animations.
- Robot Competition 1: Treasure Hunt – program computer robots to compete against each other in a treasure hunt collecting jewels and coins while avoiding deadly obstacles.
- Watercup Challenge – program an imaginary robot to determine which of two cups does not contain water and pour it over its head. Try not to get wet when you test the program on yourself.
- Guess My Number – a player guesses a number between 1 and 100 selected randomly by the computer. The computer tells the player whether the guess was too high, too low, or correct.
- Shape Maker – based on user input, this project creates shapes with a varying number of sides. The program will identify and label basic shapes.
- Spiral Square Challenge – write a program that draw a spiral of squares nested inside one another.
- Basketball Scoreboard – create a scoreboard that displays and changes the score when different buttons are pressed.
- Pick a Number – two players guess a number between 1 and 25. The computer determines how far off the guesses are and announces who is closest.

- ❑ McTurtle Hut Cash Register –create a “talking” cash register which displays the items ordered, the prices of each, and the total cost of the order.
- ❑ Place Value Game –program a robot to play the Place Value Game. The robot will have to make sense of decisions about where on a chart to put numbers rolled on a die in order to achieve the highest score possible. Robots will compete head to head.
- ❑ Probability Graph –explore the probability of rolling different numbers on two dice and then write a program that will create an animated graph of dice roll trials.
- ❑ Slider Surprise –design a project that executes different multimedia procedures based on the settings of a slider control.
- ❑ Flow Charts –write flow charts to control imaginary robots that drive cars through intersections and watch movies on a VCR.
- ❑ Personal Projects –students will devise their own projects.

TJ owns a solo business (Leone Learning Systems, Inc.) that offers tutoring and educational software. He has a BA in Math and MS in Computer Science from the City College of New York. He is a former Montessori teacher and certified substitute teacher for the state of Illinois. He spent two years in graduate studies in education and computer science at Northwestern, and six years developing educational software at Northwestern. His web site is <http://www.leonelearningsystems.com>.