Unit 4: Introduction to Programming with Karel the Dog

Content Area: **Technology**
Course(s):
Time Period: **Marking Period 2**
Length: **12 blocks**
Status: **Published**

Course Description & Instructional Notes

Karel is a dog that only knows how to move, turn left, and place tennis balls in his world. You can give Karel these commands to instruct him to do certain things. We use Karel to show you what it means to program, and allow you to focus on problem solving.

Prior Knowledge
none

Instructional Notes
The course utilizes a blended classroom approach. The content is fully web-based, with students writing and running code in the browser. Teachers utilize tools and resources provided by CodeHS to leverage time in the classroom and give focused 1-on-1 attention to students. Each unit of the course is broken down into lessons. Lessons consist of video tutorials, short quizzes, example programs to explore, and written programming exercises.

Technology Integration
Computer Science naturally integrates technology on a daily basis.

Enduring Understandings

Using top-down or bottom-up design, programmers break problems into smaller, more manageable pieces.

Programming languages use different commands and formats to accomplish tasks.

Essential Questions

How do programmers solve large scale problems?

Why is syntax important?

Student Learning Objectives

Students will be able to:

- Recognize, explain, and use the commands that Karel can be given. These commands are: move(), putBall(), takeBall() and turnLeft().
- Debug and rework their code as well as someone else's code
- Define and call functions and explain how they are used to improve programs
- Design and implement their own functions to solve problems
- Explain the importance of writing readable code
- Analyze and compare the readability of different programs
- Write functions that solve simpler sub-problems, and use them as building blocks to solve the larger problem
- Compare programs and identify good vs. poor decomposition
- Explain the preconditions and postconditions of a function
- Create clear and readable comments in their code that help the reader understand the code
- Utilize the new toolbox of commands that SuperKarel provides over Karel
- Create for loops to repeat code a fixed number of times
- Explain when a for loop would be a useful tool
- Utilize for loops to write programs that would be difficult/impossible without loops
- Create if statements to only execute code if a certain condition is true
- Explain the purpose of an If/Else statement
- Create If/Else statements to solve new types of problems
- Identify when an If/Else statement is appropriate to be used
- Explain the purpose of a while loop
- Create while loops to repeat code while a condition is true
- Utilize while loops to solve new types of problems
- Choose and combine control structures to solve complicated problems
- Analyze a solution to a problem and explain why it works
- Explain why it is important to indent code
- Write programs with proper indentation
- Define a problem in their own words and plan out a solution to the problem

Vocabulary & Learning Experiences

Vocabulary

lowerCamelCase, World, Karel, Command, Define a Function, Call a Function, Indentation, Curly Bracket, Parentheses, Function body, Read Like a Story, Programming Style, Start Function, Break Down (Decompose), Decomposition, Top Down Design, Algorithm, Precondition, Postcondition, Comment, SuperKarel, Loop, For Loop, Condition, Control Structure, Iterate, Boolean, If Statement, If Else Statement,

While Loop, Fencepost Problem, Pseudocode

Planned Learning Experiences
Challenge: Karel Problems
Students will synthesize all of the skills and concepts learned in the Karel unit to solve increasingly challenging Karel puzzles.

Resources

CodeHS

Code.org

Blown to Bits

Assessments

Formative
Think like a Computer Scientist Journal:
Students complete at least five journal entries based on teacher provided prompts that could include major topics, key points, vocabulary, syntax, and/or flowcharts/programming planning.
Quizzes embedded in CodeHS Modules and Code Review

Summative
Unit Quizzes (multiple choice only)
Student Choice Unit Project

NJSLS Standards

NJSLS Standards Copied and Pasted as well as linked.

NJSLS Computer Science and Design Thinking

8.2.12.ED.1: Use research to design and create a product or system that addresses a problem and make modifications based on input from potential consumers.

8.2.12.ED.3: Evaluate several models of the same type of product and make recommendations for a new design based on a cost benefit analysis.

8.2.12.ED.4: Design a product or system that addresses a global problem and document decisions made based on research, constraints, trade-offs, and aesthetic and ethical considerations and share this information with an appropriate audience.

8.2.12.ED.5: Evaluate the effectiveness of a product or system based on factors that are related to its requirements, specifications, and constraints (e.g., safety, reliability, economic considerations, quality control, environmental concerns, manufacturability, maintenance and repair, ergonomics).

8.2.12.NT.2: Redesign an existing product to improve form or function.

Additional NJSLS Standards

NJSLS Standards Copied and Pasted as well as linked.

Interdisciplinary Connections

NJSLS Career Readiness, Life Literacies, and Key Skills

NJSLS Companion Standards Grades 9-12 (Reading & Writing in Science & Technical Subjects)

9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas
9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice

9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving

9.4.12.TL.1: Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task

Modifications/Accommodations

GENERAL CONSIDERATIONS FOR DIVERSE LEARNERS

English Language Learners	Students Receiving Special Education Services	Advanced Learners

- Personal glossary

- Text-to-speech

- Extended time

- Simplified / verbal instructions

- Frequent breaks

[WIDA Can Do Descriptors for Grade 9-12]

[WIDA Essential Actions Handbook]

[FABRIC Paradigm]

[Wall Township ESL Grading Protocol]

*Use WIDA Can Do Descriptors in coordination with Student Language Portraits (SLPs).

- Small group/One to one

- Additional time

- Review of directions

- Student restates information

- Space for movement or breaks

- Extra visual and verbal cues and prompts

- Preferential seating

- Follow a routine/schedule

- Rest breaks

- Verbal and visual cues regarding directions and staying on task

- Checklists

- Immediate feedback

Students receiving Special Education programming have specific goals and objectives, as well as accommodations and modifications outlined within their Individualized Education Plans (IEP) due to an identified disability and/or diagnosis. In addition to exposure to the general education curriculum, instruction is differentiated based upon the student's needs. The IEP acts as a supplemental curriculum guide inclusive of instructional strategies that support each learner.

[Considerations for Special Education Students 6-12]

[National Center on Universal Design for Learning - About UDL]

[UDL Checklist]

[UDL Key Terms]

- Use of high level academic vocabulary/texts

- Problem-based learning

- Pre assess to condense curriculum

- Interest-based research

- Authentic problem-solving

- Homogeneous grouping opportunities

[Knowledge and Skill Standards in Gifted Education for All Teachers]

[Pre-K-Grade 12 Gifted Programming Standards]

[Gifted Programming Glossary of Terms]

Students with 504 Plan

Teachers are responsible for implementing designated services and strategies identified on a student's 504 Plan.

Alternative Assessments

Choice Boards

Games and Tournaments

Group Investigations

Learning Contracts

Leveled Rubrics

Literature Circles

Multiple Texts

Personal Agendas

Homogeneous Grouping

Independent Research & Projects

Multiple Intelligence Options

Project-Based Learning

Varied Supplemental Activities

Varied Journal Prompts

Tiered Activities/Assignments

Tiered Products

Graphic Organizers

Choice of Activities

Mini-Workshops to Reteach or Extend

Think-Pair-Share by readiness or interest

Use of Collaboration of Various Activities

Jigsaw

Think-Tac-Toe

Cubing Activities

Exploration by Interest

Flexible Grouping

Goal-Setting with Students

Homework Options

Open-Ended Activities

Varied Product Choices

Stations/Centers

Work Alone/Together