MP1-Cubelets

Content Area: **G&T**
Course(s): **G&T 5**
Time Period: **Marking Period 1**
Length: **MP1**
Status: **Published**

Activites

1 – Data Flow Diagrams

Outline:

- Gradual Release Model - Whole group: Diagram at least one simple robot construction and agree on common legend for diagrams.
- Small group: Diagram and compare diagrams of various simple robot constructions.

*(Optional second day) Pairs: Diagram-and-trade exercise

Objectives:

- Students will accurately diagram the flow of data in simple Cubelets robot constructions.

Assessment:

Teachers look for:

- Students debating with peers about details of their diagrams.
- Students using symbols from the class legend.
- Students explaining their diagrams.

2 – Investigation: Variables and Block Values

Outline:

- Students investigate or review range of data values in Cubelets.
- Students add data values to SENSE-ACT data flow diagrams.
- Students add data values to data flow diagrams that include non-Battery THINK Cubelets, and only one SENSE Cubelet.
- Students add data values to data flow diagrams that include 2 SENSE Cubelets.

Objectives:

- Students will demonstrate their understanding of data flow in Cubelets constructions by adding block values to their data flow diagrams and checking their work with the Bar Graph and/or the Cubelets app.

Assessment:

Teachers look for:

- Students use their understanding of Cubelets to defend their predictions of block value.
- Students accurately use Bar Graph Cubelet or app to measure block value.
- Students revise their predictions of block value based on data.

3 – Challenge: Edge Sensor Robot – Algorithm

Outline:

Teacher presents challenge

- Students work in groups to collaboratively design their robot construction using Data Flow Diagrams.
- Students prototype and test their design.
- Students revise their design until they are successful.

Objectives:

- Students will use Design Thinking to design and prototype edge-sensing robot constructions.

Assessment: Teachers look for:

- Students iterating through the steps of Design Thinking.
- Students using collaborative language.
- Students planning and revising their designs using data flow diagrams.

4 – Challenge: Line-Follower Robot
Outline:

Teacher presents challenge

- Students work in groups to collaboratively design their robot construction using Data Flow Diagrams.
- Students prototype and test their design.
- Students revise their design until they are successful.

Objectives:

- Students will use Design Thinking to design and prototype line-following robot constructions.

Assessment:

Teachers look for:

- Students iterating through the steps of Design Thinking.
- Students using collaborative language.
- Students planning and revising their designs using data flow diagrams.

5 – Investigation: Loops
Outline:

Introduce vocabulary: Loops

- Students investigate using Rotate Cubelets to design robots that move based on loops.

Objectives:

- Students will design a variety of loops for their Cubelets robot constructions and give examples about how loops are useful in other applications.

Assessment:

Teachers look for:

- Students explain how their loop works.
- Students give examples of other applications of loops.

6 – (optional) Communication Challenge
Outline:

- Students design robots that communicate using various ACT Cubelets.
- Students then add a looping feature to their robot to automate the message.

Objectives:

- Students will apply their understanding of loops to a communication challenge.

Assessment:

Teachers look for:

- Students design a robot that communicates effectively.
- Students try multiple designs of looping to automate their messaging.

7 – Investigation: Does Order matter?
Outline:

- Sentence Unscramble Warm Up.
- Students use background knowledge to hypothesize whether (and when) order matters in Cubelets constructions.
- Students investigate THINK Cubelets to collect evidence about whether order matters in Cubelets constructions.
- Class combines evidence to determine whether order matters in Cubelets constructions.

Objectives:

- Students draw conclusions about whether (and when) order matters in Cubelets constructions.

Assessment:

Teachers look for:

- Students making connections to non-Cubelets instances where order matters
- Students intentionally investigating each Cubelet
- Student accurately recording evidence from their investigations

8 – Investigating Minimum & Maximum Cubelets
Outline:

- Introduce basic animal gathering behaviors (scavenging, foraging, and elusive).
- Students design scavenger robot.

Objectives:

- Students will apply their understanding of Cubelets to design a robot that demonstrates scavenging behavior.

Assessment:

Teachers look for:

- Students use computer science language to discuss their challenge.
- Students record milestone iterations of their design.

- Students revise their design based on tests.

9 – Challenge: Conditional Statements
Outline:

- Introduce challenge & conditional statements.
- Make connections to background knowledge.
- Students investigate and incorporate Threshold Cubelet into an alarm clock.
- Students design advertisements for their alarm clock design.
- Students share their stories with classmates.

Objectives:

- Students design a light-detecting alarm clock based on conditional statements as shown by the Threshold Cubelet.

Assessment:

Teachers look for:

- Students intentionally incorporating the Threshold Cubelet.
- Students making connections to other conditional statements.
- Students creatively advertise their alarm clocks.

Enduring Understandings

ISTE - The International Society for Technology in Education

3.d. Build knowledge by actively exploring real-world issues and problems, developing ideas and theories and pursuing answers and solutions.

4.a. Students engage in a cyclical design process to develop prototypes and reflect on the role that trial and error plays.

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4.d. Students demonstrate perseverance when working with open-ended problems.

5.b. With guidance from an educator, students analyze age-appropriate data and look for similarities in order to identify patterns and find solutions.

5.c. Students break down problems into smaller parts, identify key information and propose solutions.

5.d Students understand and explore basic concepts related to automation, patterns, and algorithmic thinking.

Empowered Learner Understand the fundamental concepts of technology operations, demonstrate the ability to choose, use, and troubleshoot current technologies and are able to transfer their knowledge to explore emerging technologies.

Innovative Designer Know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts or solving authentic problems.

Develop, test, and refine prototypes as part of a cyclical design process.

Exhibit a tolerance for ambiguity, perseverance, and the capacity to work with open-ended problems.

Computational Thinker Break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving.

Understand how automation works and use algorithmic thinking to develop a sequence of steps to create and test automated solutions.

K12CS - K–12 Computer Science Framework

Algorithms Different algorithms can achieve the same result. Some algorithms are more appropriate for a specific context than others.

Variables Programming languages provide variables, which are used to store and modify data. The data type determines the values and operations that can be performed on that data.

Modularity Programs can be broken down into smaller parts to facilitate their design, implementation, and review. Programs can also be created by incorporating smaller portions of programs that have already been created.

Program Development People develop programs using an iterative process involving design, implementation, and review. Design often involves reusing existing code or remixing other programs within a community. People continuously review whether programs work as expected, and they fix, or debug, parts that do not. Repeating these steps enables people to refine and improve programs.

Inference and Modeling The accuracy of inferences and predictions is related to how realistically data is represented. Many factors influence the accuracy of inferences and predictions, such as the amount and relevance of data collected.

Computing Systems – Devices Computing devices may be connected to other devices or components to extend their capabilities, such as sensing and sending information. Together, devices and components form a system of interdependent parts.

Computing Systems – Troubleshooting Common troubleshooting strategies, such as checking that power is available, checking that physical and wireless connections are working, and clearing out the working memory by restarting programs or devices, are effective for many systems.

By the end of Grade 5 Hardware and software work together as a system to accomplish tasks, such as sending, receiving, processing, and storing units of information as bits. Bits serve as the basic unit of data in computing systems and can represent a variety of information.

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New Jersey Student Learning Standards

W.5.2 Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

W.5.4 Produce clear and coherent writing in which the development and organization are appropriate to task, purpose, and audience