Computer Programming & Robotics

Grade: 7

Unit 1:
Introduction to Technology Education & the Design World

Summary and Rationale

In this unit students will be introduced to Technology Education, the design process, and Digital Citizenship. The design process is a series of steps that are used to create a solution to an inquiry. Students will use the design process as they work through unplugged computer programming steps. Students will build communication skills, collaboration skills and think creatively to solve a series of problems. As they begin to understand the impact of technology on daily lives they will also recognize the impact of their actions online. At the end of each unit students will reflect on the challenge and the problem solving process.

Recommended Pacing

Ongoing: content will be addressed throughout the course

Standards

Technology Standards 8.1 Technology Standards 8.2	
8.1.8 D.1	Understand and model appropriate online behaviors related to cyber safety, cyber bullying, cyber security, and cyber ethics including appropriate use of social media.
8.2.8.C.1	Explain how different teams/groups can contribute to the overall design of a product.
8.2.8.C.4	Identify the steps in the design process that would be used to solve a designated problem.
8.2.8.E.4	Use appropriate terms in conversation (e.g., programming, language, data, RAM, ROM, Boolean logic terms).
Personal Financial Literacy 9.1	
9.1.8. A. 3	Differentiate among ways that workers can improve earning power through the acquisition of new knowledge and skills.
9.1.8.A.5	Relate how the demand for certain skills determines an individual's earning power.
Career Awareness, Exploration, and Preparation 9.2	
9.2.8.B.7	Evaluate the impact of online activities and social media on employer decisions.
Career Ready Practices	
CRP1.	Act as a responsible and contributing citizen and employee.
CRP2.	Apply appropriate academic and technical skills.
CRP4.	Communicate clearly and effectively and with reason.
CRP6.	Demonstrate creativity and innovation.
CRP7.	Employ valid and reliable research strategies.
CRP8.	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP9.	Model integrity, ethical leadership and effective management.
CRP11.	Use technology to enhance productivity.
CRP12.	Work productively in teams while using cultural global competence.

Instructional Focus

Enduring Understandings

- Introduce students to the nature of technology and discuss its importance on society.

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- Introduce students to classroom routines and procedures.
- Introduce students to organizing files and folders in Google Drive.
- Introduce students to the Design World.
- Introduce students to the 8 Pillars of Digital Citizenship

Essential Question

- How can you use the design process to complete a task?
- How are algorithms used in coding?
- What computational devices do people use in their every day life?
- What does Digital Citizenship mean to you?

Evidence of Learning (Assessments)

Includes but is not limited to:

- individual and group projects on problem solving
- refections on the process

Objectives

Students will know:

- Identify the elements of the design process
- Identify the impact of new technologies on the world and every day life
- Think critically and creatively to solve problems
- Model Digital Citizenship

Students will be able to:

- Work with a team to solve problems
- Use the decision making process to solve problems
- Use digital tools to complete a task
- Navigate the classroom by understanding daily learning goals/objectives
- Organize one's self for success

Integration

Technology Integration

Writing Integration

Students will reflect on their work stating; the process, the outcome, and future changes to the process.

Suggested Resources

Graph Paper -Programming - https://code.org/curriculum/course2/1/Teacher
Unplugged Activities - http://www.edutopia.org/blog/15-ways-teaching-students-coding-vicki-davis
Tynker - http://www.tynker.com/blog/articles/success-stories/rigorous-cs-curriculum-for-8th-grade-with-tynker/
CS Unplugged Activities - http://csunplugged.org/

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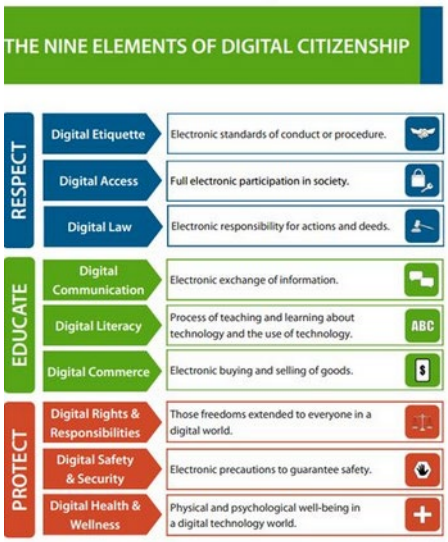
Code.Org - https://studio.code.org/s/20-hour
Activites Kids Code - https://studio.code.org/s/20-hour
Teacher Led Unplugged - https://code.org/educate/curriculum/teacher-led
Magazine Engineering Other Projects K-12 - http://www.egfi-k12.org/
Digital Citizenship - http://www.digitalcitizenship.net/Nine_Elements.html



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Unit 2: Coding Programming Language	
Summary and Rationale	
In this unit, students will enter the world of computer science by learning how to create animations, computer games, and interactive projects. Using a graphical programming language, students learn fundamental programming concepts such as variables, loops, conditional statements, and event handling. Students will learn how to use critical thinking and computer coding to think creatively. The course will show students how to make and import objects, create audio recordings, test and revise code to develop interactive projects.	
Recommended Pacing	
ongoing: content will be addressed throughout the course	
Standards	
Technology Standards 8.2	
8.2.8.D.1	Design and create a product that addresses a real world problem using a design process under specific constraints.
8.2.5.E.3	Using a simple, visual programming language, create a program using loops, events and procedures to generate specific output.
8.2.8. E 2	Demonstrate an understanding of the relationship between hardware and software.
8.2.8.E 3	Develop an algorithm to solve and assigned problem using a specified set of commands and use peer review to critique the solution.
8.2.8.E.4	Use appropriate terms in conversation (e.g., programming, language, data, RAM, ROM, Boolean logic terms).
Personal Financial Literacy 9.1	
9.1.8. A. 3	Differentiate among ways that workers can improve earning power through the acquisition of new knowledge and skills.
9.1.8.A.5	Relate how the demand for certain skills determines an individual's earning power.
Career Awareness, Exploration, and Preparation 9.2	
9.2.8.B.7	Evaluate the impact of online activities and social media on employer decisions.
9.2.8.B.3.	Evaluate communication, collaboration, and leadership skills that can be developed through school, homework, and extra curriculuar activities for use in a career.
Career Ready Practices	
CRP1.	Act as a responsible and contributing citizen and employee.
CRP2.	Apply appropriate academic and technical skills.
CRP4.	Communicate clearly and effectively and with reason.
CRP6.	Demonstrate creativity and innovation.
CRP7.	Employ valid and reliable research strategies.
CRP8.	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP9.	Model integrity, ethical leadership and effective management.
CRP11.	Use technology to enhance productivity.

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CRP12.	Work productively in teams while using cultural global competence.
Interdisciplinary Connections	
Standard x.x	
Integration of Technology	
Standard x.x	
CPI #	Cumulative Progress Indicator (CPI)

Instructional Focus

Enduring Understandings

- Computational thinking builds and enhances problem solving, allowing students to move beyond using knowledge to creating knowledge.
- By working through the design process, students become researchers and innovators who are technologically literate in today's society.

Essential Questions

- What are the basics of computer programming?
- What are the skills needed to become technologically literate in the 21st century?
- How does the design process allow us to become more technologically literate?

Evidence of Learning (Assessments)

Can include, but is not limited to:
Capstone Design project: You are a programmer. Design a product/process/ game that solves a problem or presents information electronically. Your task is to use the appropriate technology tools to design the product.

Objectives

Students will know:

- how to use digital media and environments to communicate and work collaboratively.
- how to use computational thinking and computer programming as tools to design a system or product.
- how to recognize a problem and apply critical thinking and problem solving skills to solve the problem.
- how to plan and manage activities to complete a project.

Students will be able to:

- use brainstorming activities to enhance creative, and innovative thinking in individual and group problem solving.
- work collaboratively in teams to achieve common goals with greater efficiency
- demonstrate the use of creative thinking, construct knowledge, and develop innovative processes using technology to perform a task.
- use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.
- understand computational thinking and computer programming as tools used in design and engineering.
- synthesize and assimilate knowledge to help them better understand complex problems, and to develop effective strategies to achieve workable solutions.

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Integration

Technology Integration

Writing Integration

Students will reflect on the design process used in creating various programs including what issues arose and solutions found.

Competencies

Suggested Resources

Tomorrow Corporation - http://tomorrowcorporation.com/humanresourcemachine
Scratch Middle School Projects
http://scratched.gse.harvard.edu/resources/search/results/taxonomy%3A21
http://scratched.gse.harvard.edu/guide/download.html

Idea- create an online egg hunt for children

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Unit 3
Robotics Design

Summary and Rationale

The design process is a systematic approach to solving problems. The students will be able to understand the attributes of design and the role of troubleshooting, research and development, invention and innovation and experimentation in problem solving using the Lego Mindstorm EV3 Robotics kit. Students will work in small teams to build, program, test and evaluate a robotic model while applying concepts, as well as developing and using 21st Century Skills.

The Robotics unit will use hands-on methods for the design and development of robotic devices whose function is to accomplish prescribed tasks. Each individual will experiment with a variety of configurations while writing programs that allow the robot to navigate intelligently and autonomously. The unit will utilize models and methods that facilitate student understanding. An emphasis will be placed on simple machines in terms of moving, turning, lifting, sensing the environment in terms of light, contact and proximity, monitoring interval states; and most importantly, solving problems that occur in everyday life. The entire program and lab experience is both kinesthetic and computer-based, to maximize student learning and understanding.

Recommended Pacing

ongoing: content will be addressed throughout the course

Standards

Technology Standards 8.2	
8.2.8.C.1	Explain how different teams/groups can contribute to the overall design of a product.
8.2.8.C.2	Explain the need for optimization in a design process.
8.2.8.C.4	Identify the steps in the design process that would be used to solve a designated problem.
8.2.8.C.5	Explain the interdependence of a subsystem that operates as part of a system.
8.2.8.C.6	Collaborate to examine a malfunctioning system and identify the step-by-step process used to troubleshoot, evaluate and test options to repair the product, presenting the better solution.
8.2.8.C.7	Collaborate with peers and experts in the field to research and develop a product using the design process, data
8.2.8.C.8	Develop a proposal for a chosen solution that include models (physical, graphical or mathematical) to communicate the solution to peers.
Personal Financial Literacy 9.1	
9.1.8. A. 3	Differentiate among ways that workers can impove earning power through the acquisition of new kowledge and skills.
9.1.8.A.5	Relate how the demand for certain skills determines an individual's earning power.
Career Awareness, Exploration, and Preparation 9.2	
9.2.8.B.7	Evaluate the impact of online activities and social media on employer decisions.
Career Ready Practices	
CRP1.	Act as a responsible and contributing citizen and employee.

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CRP2.	Apply appropriate academic and technical skills.
CRP4.	Communicate clearly and effectively and with reason.
CRP6.	Demonstrate creativity and innovation.
CRP7.	Employ valid and reliable research strategies.
CRP8.	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP9.	Model integrity, ethical leadership and effective management.
CRP11.	Use technology to enhance productivity.
CRP12.	Work productively in teams while using cultural global competence.
Interdisciplinary Connections	
Standard x.x	
Integration of Technology	
Standard x.x	
CPI #	Cumulative Progress Indicator (CPI)
9.1.8.A.2	Implement problem-solving strategies to solve a problem in school or the community

Instructional Focus

Enduring Understandings

- The design process requires workers to constantly improve on products and solutions that may already exist through the process of researching, testing, designing, and building. It is this method that allows current ideas and products to be improved upon and new innovations to be developed.
- Success in the exploration of technology, engineering and computer science requires the identification, development, and use of 21st Century Skills. It is important to acquire the necessary skills in information and media literacy in order to navigate the ever changing digital resources available.
- Life and career skills such as flexibility and adaptability, initiative and self-direction, productivity and accountability, and leadership and responsibility become lifelong attributes towards success. Developing these skills through work in teams, negotiation and problem-solving are critical to all content areas.
- Creativity, innovation, critical thinking, problem solving, communication and collaboration are valuable skills when working with others to achieve a common goal. Combining these skills in a product driven environment extends the learning.

Essential Question

- What is STEM and how does it relate to engineering?
- How does the evolution of technology require engineering innovations to meet the needs of society?
- What 21st Century Skills are required for success in engineering and design? (teamwork, collaboration, trial & error, innovation, etc.)
- What steps are involved in designing and building a product?
- How has robotics changed how products are manufactured?

Evidence of Learning (Assessments)

- Weekly challenges
- Journal/ Process/ Reflection entries
- Final robot challenge

Objectives

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Students will know:

- what a robot is and how it is used in the world
- the role humans play in making a robot successful
- the Engineering design process and the roles of engineering in product development
- how to manipulate the various EV3 Mindstorms components
- how to use programming blocks to solve a problem

Students will be able to:

- work in teams to solve problems that closely align with real world issues and needs using robotic technology.
- manage projects by successfully completing a variety of performance-based robotics tasks.
- configure programming blocks to result in a variety of movements
- synthesize and assimilate knowledge to better understand complex problems, and to develop effective strategies to achieve workable solutions.
- evaluate the effect of a robot's speed, direction, light sensor position, and the sensitivity in terms of the robot's effectiveness to accurately track lines.
- write a reflection on the process involved in meeting various robot challenges and how teamwork was used to solve each challenge.

Integration

Technology Integration

Writing Integration

Competencies

Suggested Resources

http://sharepoint.pthsd.k12.nj.us/ci/Approved%20Curriculum/TEC718%20Robotics%20I%20%20Gr%207%20022014.pdf

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Unit 4 Robot Programming	
Summary and Rationale	
Recommended Pacing	
___ days, weeks, etc.	
Standards	
Personal Financial Literacy 9.1	
9.1.8. A. 3	Differentiate among ways that workers can impove earning power through the acquisition of new kowledge and skills.
9.1.8.A.5	Relate how the demand for certain skills determines an individual's earning power.
Career Awareness, Exploration, and Preparation 9.2	
Career and Technical Education 9.3	
Career Ready Practices	
CRP1.	Act as a responsible and contributing citizen and employee.
CRP2.	Apply appropriate academic and technical skills.
CRP3.	Attend to personal health and financial well-being.
CRP4.	Communicate clearly and effectively and with reason.
CRP5.	Consider the environmental, social and economic impacts of decisions.
CRP6.	Demonstrate creativity and innovation.

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CRP7.	Employ valid and reliable research strategies.
CRP8.	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP9.	Model integrity, ethical leadership and effective management.
CRP10.	Plan education and career paths aligned to personal goals.
CRP11.	Use technology to enhance productivity.
CRP12.	Work productively in teams while using cultural global competence.
Interdisciplinary Connections	
Standard x.x	
Integration of Technology	
Standard x.x	
CPI #	Cumulative Progress Indicator (CPI)

Instructional Focus

Enduring Understandings

Essential Question

Evidence of Learning (Assessments) Parenthetical notes include competency components.

Capstone project (2c: Expression of Self)

Objectives

Students will know:

- -
- -

Students will be able to:

- -
- -

Integration

Technology Integration

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Writing Integration
Competencies
Suggested Resources