Exploration into Coding and Robotics - 6th and 7th Grade Cycle Class
Length of Course: 9 weeks
Jennifer Mitterko

Curriculum

Course Description:
Exploration into Coding and Robotics is a cycle course that is transitioning to meet the needs of ever changing technological world. It will also serve as an introduction to more advanced courses available in high school. The core topics covered during the course will be Robotics and Coding.. The hands-on activities will vary in level of complexity depending on the previous experiences of the students. During the quarter, the students will use various data and design applications to enhance the learning and connect it to real life experiences.

Students will have the opportunity to explore modules in coding, computer programming and many other facets contained in STEAM projects and standards.

Big Ideas: *Course Objectives / Content Statement(s) Basic Coding implemented through Google's CS First and Scratch*
Pacing: 3 to 4 Weeks

Essential Questions	**Enduring Understandings**
What is coding and what can you use coding to create? What is Scratch and how can it be used to solve real world problems? How does computer science relate to everyday life? What relationship does coding have with the terms software and hardware?	*What will students understand about the big ideas?* Students will understand that… How coding is used in everyday life. How to code basic creations using Scratch. Scratch is considered software that can interact with hardware depending on the project, task, or types of hardware and software. There are many different types of programming or coding languages that range from basic to very complex. Programming languages are used with various types of hardware in order to make the hardware perform the specific functions. Computer Science is… ● a theory and practice that allows you to program a computer to do what you want it to ● a tool that helps you tell a story or make something happen with technology ● a discipline that emphasizes persistence in problem solving — a skill that is applicable across disciplines, driving job growth and innovation across all sectors of the workforce ● a skill that teaches students how to use computers to create, not just consume
Areas of Focus: Proficiencies (Cumulative Progress Indicators) Students will: **Standard 8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.**	**Examples, Outcomes, Assessments** *(see note below about the content of this section)* Instructional Focus: Solve problems and create projects by building programs within Scratch. Use the block-based programming language Scratch to learn basic programming logic.

Strand D: Digital Citizenship: *Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.*

8.1.8.D.3 Demonstrate an understanding of fair use and Creative Commons to intellectual property.

8.1.8.D.4 Assess the credibility and accuracy of digital content.

8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.

Strand A: The Nature of Technology: Creativity and Innovation *Technology systems impact every aspect of the world in which we live.*

8.2.8.A.3 Investigate a malfunction in any part of a system and identify its impacts.

Strand B: Technology and Society: *Knowledge and understanding of human, cultural and societal values are fundamental when designing technological systems and products in the global society.*

8.2.8.B.2 Identify the desired and undesired consequences from the use of a product or system.

Strand C. Design: *The design process is a systematic approach to solving problems.*

8.2.8.C.2 Explain the need for optimization in a design process.

8.2.8.C.3 Evaluate the function, value, and aesthetics of a technological product or system, from the perspective of the user and producer.

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.

Apply the seven block types in Scratch: statements, loops, events, booleans, conditions, variables and procedures.

Understand what a loop is and create loops inside of each other (embedded loops).

Create in Scratch a project that relates to the presented theme and allows parallel programming (more than one block stack).

Sample Assessments:
Completion of the Coding Activities in the CS First Program

Instructional Strategies:
This unit will follow the directions and materials presented by the Google CS First (https://www.cs-first.com/training/welcome-cs-first). The directions and materials include video tutorials along with written directions to build in Scratch. The wrap-up video at the end of an activity shows how the activities tie to the real world specifically innovations and careers.

Interdisciplinary Connections:
The videos embedded in the CS First Program provides connections to other content areas as well as career paths.

Technology Integration:
Google CS First Materials and website
https://www.cs-first.com/
Scratch Program from MIT
https://scratch.mit.edu/

Global Perspectives:
The CS First Program shows the students how to connect with others from different parts of the world using Scratch and various coding programs. The CS First videos are presented by Google Employees who

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. **E. Computational Thinking: Programming:** *Computational thinking builds and enhances problem solving, allowing students to move beyond using knowledge to creating knowledge.* 8.2.8.E.1 Identify ways computers are used that have had an impact across the range of human activity and within different careers where they are used. 8.2.8.E.2 Demonstrate an understanding of the relationship between hardware and software. 8.2.8.E.4 Use appropriate terms in conversation (e.g, programming, language, data, RAM, ROM, Boolean logic terms). **ISTE's National Standards for Educational Technology for Students (2016 Version)** **1. Empowered Learner - Students leverage technology to take an active role in choosing, achieving and demonstrating competency in their learning goals, informed by the learning sciences. Students:** **(a.)** articulate and set personal learning goals, develop strategies leveraging technology to achieve them and reflect on the learning process itself to improve learning outcomes. **(b.)** build networks and customize their learning environments in ways that support the learning process. **(c.)** use technology to seek feedback that informs and improves their practice and to demonstrate their learning in a variety of ways. **(d.)** 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. **2. Digital Citizen - Students recognize the rights, responsibilities and opportunities of living, learning and working in an interconnected digital world, and they act and model in ways that are safe, legal and ethical. Students:** **(a.)** cultivate and manage their digital identity and reputation and are aware of the permanence of their actions in the digital world. **(b.)** engage in positive, safe, legal and ethical behavior when using technology, including social interactions online or when using networked devices. **(c.)** demonstrate an understanding of and respect for the rights and obligations of using and sharing intellectual property. **(d.)** manage their personal data to maintain	are from a variety of backgrounds, gender, and appearances which

digital privacy and security and are aware of data-collection technology used to track their navigation online.

4. Innovative Designer - Students use a variety of technologies within a design process to identify and solve problems by creating new, useful or imaginative solutions. Students:

(a.) know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts or solving authentic problems. **(b.)** select and use digital tools to plan and manage a design process that considers design constraints and calculated risks. **(c.)** develop, test and refine prototypes as part of a cyclical design process. **(d.)** exhibit a tolerance for ambiguity, perseverance and the capacity to work with open-ended problems.

6. Creative Communicator - Students communicate clearly and express themselves creatively for a variety of purposes using the platforms, tools, styles, formats and digital media appropriate to their goals. Students:

(a.) choose the appropriate platforms and tools for meeting the desired objectives of their creation or communication. **(b.)** create original works or responsibly repurpose or remix digital resources into new creations. **(c.)** communicate complex ideas clearly and effectively by creating or using a variety of digital objects such as visualizations, models or simulations.**(d.)** publish or present content that customizes the message and medium for their intended audiences.

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.
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.	

NOTE re: Examples, Outcomes and Assessments

The following skills and themes should be reflected in the design of units and lessons for this course or content area.

21st Century Skills:

- Creativity and Innovation
- Critical Thinking and Problem Solving
- Communication and Collaboration
- Information Literacy
- Media Literacy
- Life and Career Skills

21st Century Themes (as applies to content area):

- Financial, Economic, Business, and Entrepreneurial Literacy
- Civic Literacy
- Health Literacy

Big Ideas: *Course Objectives* / *Content Statement(s)* Robotics

Pacing: 2 to 3 weeks

Essential Questions	**Enduring Understandings**
What is a Robot? How does a Robot work? How does a Robot's function dictate it's build and appearance? How does the hardware and software interact to make the Robot work? **Hardware:** robot parts **Software:** currently manufacturer based on a programming language like Scratch or Python or C++ What is the "Loop" you must follow when troubleshooting problems with a Robot? What role(s) do Robots play in today's society? Are there any limitations when using a Robot for a task? How could improvements or advancements in Robotics change the quality of life for people in the future?	*What will students understand about the big ideas?* Students will understand that… Robots are a combination of hardware and software that work or communicate to perform a specific task. Robots vary in shape & size, type which is based on function, and application which could be domestic or industrial. Robots are often used to reach beyond our human limitations, improve the quality of life for people with certain conditions, and increase production and efficiency of tasks normally performed by humans. *e.g.: enter unsafe conditions(radiation or bomb threat), perform tasks the human body cannot handle(complete tasks in space), and go and do things humans can't do (drones fly and take pictures)* Identify the standard parts or components of the Robotics kits to increase content specific vocabulary that can be used with most (if not all) Robotics kits but primarily for building a Robot. Proper terminology associated with Robotics in order to further discussions about design, function, and/or troubleshooting. The troubleshooting loop they must follow is **T**hink - What's the problem?, **D**o - What do I have to do to fix the problem?, and **T**est - Try out their solution and state if it worked. If not, they need to repeat the **TDT** Loop. Robots will change over time with the improvements or advancements made by humans. Advancements in the area of Robotics will change the way we live in the future.
Areas of Focus: Proficiencies **(Cumulative Progress Indicators)** Students will:	**Examples, Outcomes, Assessments** *(see note below about the content of this section)* **Instructional Focus:** Gain background knowledge on the History of Robots,

Standard 8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.

Strand A: Technology Operations and Concepts: *Students demonstrate a sound understanding of technology concepts, systems and operations.*

8.1.8.A.1 - Demonstrate knowledge of a real world problem using digital tools.

8.1.8.A.3 - Use and/or develop a simulation that provides an environment to solve a real world problem or theory.

Strand E: Research and Information Fluency: *Students apply digital tools to gather, evaluate, and use information.*

8.1.8.E.1 - Effectively use a variety of search tools and filters in professional public databases to find information to solve a real world problem.

8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.

Strand A. The Nature of Technology: *Creativity and Innovation Technology systems impact every aspect of the world in which we live.*

8.2.8.A.2 Examine a system, consider how each part relates to other parts, and discuss a part to redesign to improve the system

8.2.8.A.3 Investigate a malfunction in any part of a system and identify its impacts.

8.2.8.A.5 Describe how resources such as material, energy, information, time, tools, people, and capital contribute to a technological product or system.

Strand B. Technology and Society: *Knowledge and*

what is a Robot, and How people's perception of Robots has changed over time.

Build a Robot using the GoPiGo Kit from Dexter Industries with a partner. Students will control the robot in order to maneuver it through an obstacle course. Additional activities or missions could be used which changes the look and/or function of the robot.

Explore the many different uses of robots, different types of robots, and advancements in robotics.

Discussions/debates on how robots could improve the quality of life for humans or harm them in the future.

Sample Assessments:

Traditional Assessment on the proper terminology, robotics history and uses, and advancements.

Authentic Assessment - Robot Build and completion of tasks.

Instructional Strategies:

Game - Students will write a program for another student who is a "robot". This demonstrates how every movement/step has to be it's own line.

Whole group discussions on topics which have numerous possible answers.

Reflection Journal on Robot Build

Step-by-Step instructions are provided for the GoPiGo Kits. Video Tutorials will also be provided if necessary.

When necessary, the students will either work in a jigsaw or stations to ensure there is enough resources for all students.

Interdisciplinary Connections:

When exploring the History of Robots, the students will be looking at artifacts from ancient Greece

understanding of human, cultural and societal values are fundamental when designing technological systems and products in the global society.

8.2.8.B.2 Identify the desired and undesired consequences from the use of a product or system.

8.2.8.B.5 Identify new technologies resulting from the demands, values, and interests of individuals, businesses, industries, and societies.

Strand C. Design: *The design process is a systematic approach to solving problems.*

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.3 Evaluate the function, value, and aesthetics of a technological product or system, from the perspective of the user and producer.

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.

D. Abilities for a Technological World: *The designed world is the product of a design process that provides the means to convert resources into products and systems.*

8.2.8.D.3 Build a prototype that meets a STEM-based design challenge using science, engineering, and math principles that validate a solution.

8.2.2.D.5 Explain the impact of resource selection and the production process in the development of a common or technological product or system.
Basically - Identify how using a tool(s) or certain materials aids in reducing work.

E. Computational Thinking: Programming:
Computational thinking builds and enhances problem solving, allowing

through Europe in the 1800's.

Science?

Technology Integration:
"History of Robots" video The Good Stuff (PBS)
Various Tutorials depending on the students' needs
GoPiGo Kit from Dexter Technologies
EZ- Robots - JD Model

Global Perspectives:
The Global Learning Resource Library

students to move beyond using knowledge to creating knowledge.

8.2.8.E.1 Identify ways computers are used that have had an impact across the range of human activity and within different careers where they are used.

8.2.8.E.2 Demonstrate an understanding of the relationship between hardware and software.

8.2.8.E.4 Use appropriate terms in a conversation (e.g., programming, language, data, RAM, ROM, Boolean logic terms).

ISTE's National Standards for Educational Technology for Students (2016 Version)

1. Empowered Learner - Students leverage technology to take an active role in choosing, achieving and demonstrating competency in their learning goals, informed by the learning sciences. Students:

(a.) articulate and set personal learning goals, develop strategies leveraging technology to achieve them and reflect on the learning process itself to improve learning outcomes. **(b.)** build networks and customize their learning environments in ways that support the learning process. **(c.)** use technology to seek feedback that informs and improves their practice and to demonstrate their learning in a variety of ways. **(d.)** 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.

2. Digital Citizen - Students recognize the rights, responsibilities and opportunities of living, learning and working in an interconnected digital world, and they act and model in ways that are safe, legal and ethical. Students:

(a.) cultivate and manage their digital identity and reputation and are aware of the permanence of their actions in the digital world. **(b.)** engage in positive, safe, legal and ethical behavior when using technology, including social interactions online or when using networked devices. **(c.)** demonstrate an understanding of and respect for the rights and obligations of using and sharing intellectual property. **(d.)** manage their personal data to maintain digital privacy and security and are aware of data-collection technology used to track their navigation online.

3. Knowledge Constructor - Students critically curate a variety of resources using digital tools to construct knowledge, produce creative artifacts and make meaningful learning experiences for themselves and others. Students:

(a.) plan and employ effective research strategies to locate

information and other resources for their intellectual or creative pursuits. **(b.)** evaluate the accuracy, perspective, credibility and relevance of information, media, data or other resources. **(c.)** curate information from digital resources using a variety of tools and methods to create collections of artifacts that demonstrate meaningful connections or conclusions. **(d.)** build knowledge by actively exploring real-world issues and problems, developing ideas and theories and pursuing answers and solutions. **4. Innovative Designer - Students use a variety of technologies within a design process to identify and solve problems by creating new, useful or imaginative solutions. Students:** **(a.)** know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts or solving authentic problems. **(b.)** select and use digital tools to plan and manage a design process that considers design constraints and calculated risks. **(c.)** develop, test and refine prototypes as part of a cyclical design process. **(d.)** exhibit a tolerance for ambiguity, perseverance and the capacity to work with open-ended problems. **5. Computational Thinker - Students develop and employ strategies for understanding and solving problems in ways that leverage the power of technological methods to develop and test solutions. Students:** **(a.)** formulate problem definitions suited for technology assisted methods such as data analysis, abstract models and algorithmic thinking in exploring and finding solutions. **(b.)** collect data or identify relevant data sets, use digital tools to analyze them, and represent data in various ways to facilitate problem-solving and decision-making. **(c.)** break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving. **(d.)** understand how automation works and use algorithmic thinking to develop a sequence of steps to create and test automated solutions. **6. Creative Communicator - Students communicate clearly and express themselves creatively for a variety of purposes using the platforms, tools, styles, formats and digital media appropriate to their goals. Students:** **(a.)** choose the appropriate platforms and tools for meeting the desired objectives of their creation or communication. **(b.)** create original works or responsibly repurpose or remix digital resources into new creations. **(c.)** communicate complex ideas clearly and effectively by creating or using a variety of digital objects such as visualizations, models or simulations. **(d.)** publish or present content that customizes the message and medium for their intended audiences. **7. Global Collaborator - Students use digital tools to broaden**	

their perspectives and enrich their learning by collaborating with others and working effectively in teams locally and globally. Students: **(b.)** use collaborative technologies to work with others, including peers, experts or community members, to examine issues and problems from multiple viewpoints. **(c.)** contribute constructively to project teams, assuming various roles and responsibilities to work effectively toward a common goal. **(d.)** explore local and global issues and use collaborative technologies to work with others to investigate solutions. **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. **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.	

NOTE re: Examples, Outcomes and Assessments

The following skills and themes should be reflected in the design of units and lessons for this course or content area.

21st Century Skills:

- Creativity and Innovation
- Critical Thinking and Problem Solving
- Communication and Collaboration
- Information Literacy

Media Literacy
Life and Career Skills

21st Century Themes (as applies to content area):
Financial, Economic, Business, and Entrepreneurial Literacy
Civic Literacy
Health Literacy

Big Ideas: *Course Objectives / Content Statement(s)* - In's and Out's of 3D Printing, Connecting 3D Printing to real life, Using 3D Printing to solve a problem

Pacing: 2 weeks

Essential Questions	**Enduring Understandings**
What is 3D Printing? How does it work? How did printer technology evolve to have the capability to print in 3D? Why is the CAD software required for 3D printing to function? In what ways has 3D Printing Technology opened the minds of humans to think outside the box to invent, reinvent, and solve problems? How are current and emerging 3D printing applications used in a wide variety of industries? How could improvements or advancements in 3D Printing technology change the quality of life for people in the future?	*What will students understand about the big ideas?* Students will understand that… What is 3D printing and the process of printing an object. ... o create more efficient solutions to problems and inspire new inventions to improve the lives Proper terminology associated with 3D Printing in order to further discussions about designs/projects, printing process, and/or troubleshooting. Describe the advantages and limitations of 3D printing technology. Advancements in printing technology and plastics manufacturing developed into the 3D Printing of today. Evaluate real-life scenarios and recommend the appropriate use of 3D printing technology
Areas of Focus: Proficiencies	**Examples, Outcomes, Assessments**

(Cumulative Progress Indicators)
Students will:
Standard 8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.

Strand A: Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.

8.1.8.A.1 - Demonstrate knowledge of a real world problem using digital tools.

8.1.8.A.2 - Create a document (e.g. newsletter, reports, personalized learning plan, business letters or flyers) using one or more digital applications to be critiqued by professionals for usability.
8.1.8.A.3 - Use and/or develop a simulation that provides an environment to solve a real world problem or theory.

8.1.8.A.4 - Graph and calculate data within a spreadsheet and present a summary of the results

Strand B: Creativity and Innovation: Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.

8.1.8.B.1- Synthesize and publish information about a local or global issue or event (ex. Telecollaborative project, blog, school web).

ISTE's National Standards for Educational Technology for Students (2016 Version)

1. Empowered Learner - Students leverage technology to take an active role in choosing, achieving and demonstrating competency in their learning goals, informed by the learning sciences. Students:

(a.) articulate and set personal learning goals, develop strategies leveraging technology to achieve them and reflect on the learning process itself to improve learning outcomes.

(see note below about the content of this section)

Instructional Focus:

Sample Assessments:

Instructional Strategies:
Reflection Journal on their experience 3D Printing

Interdisciplinary Connections:

Technology Integration:
TinkerCAD software
Makerbot Printers
Various Tutorials depending on the students' needs

Global Perspectives:
The Global Learning Resource Library

(b.) build networks and customize their learning environments in ways that support the learning process. **(c.)** use technology to seek feedback that informs and improves their practice and to demonstrate their learning in a variety of ways. **(d.)** 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. **2. Digital Citizen - Students recognize the rights, responsibilities and opportunities of living, learning and working in an interconnected digital world, and they act and model in ways that are safe, legal and ethical. Students:** **(a.)** cultivate and manage their digital identity and reputation and are aware of the permanence of their actions in the digital world. **(b.)** engage in positive, safe, legal and ethical behavior when using technology, including social interactions online or when using networked devices. **(c.)** demonstrate an understanding of and respect for the rights and obligations of using and sharing intellectual property. **(d.)** manage their personal data to maintain digital privacy and security and are aware of data-collection technology used to track their navigation online. **3. Knowledge Constructor - Students critically curate a variety of resources using digital tools to construct knowledge, produce creative artifacts and make meaningful learning experiences for themselves and others. Students:** **(a.)** plan and employ effective research strategies to locate information and other resources for their intellectual or creative pursuits. **(b.)** evaluate the accuracy, perspective, credibility and relevance of information, media, data or other resources. **(c.)** curate information from digital resources using a variety of tools and methods to create collections of artifacts that demonstrate meaningful connections or conclusions. **(d.)** build knowledge by actively exploring real-world issues and problems, developing ideas and theories and pursuing answers and solutions. **4. Innovative Designer - Students use a variety of technologies within a design process to identify and solve problems by creating new, useful or imaginative solutions. Students:** **(a.)** know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts or solving authentic problems. **(b.)** select and use digital tools to plan and manage a design process that considers design constraints and calculated risks. **(c.)** develop, test and refine prototypes	

as part of a cyclical design process. **(d.)** exhibit a tolerance for ambiguity, perseverance and the capacity to work with open-ended problems.

5. Computational Thinker - Students develop and employ strategies for understanding and solving problems in ways that leverage the power of technological methods to develop and test solutions. Students:

(a.) formulate problem definitions suited for technology assisted methods such as data analysis, abstract models and algorithmic thinking in exploring and finding solutions. **(b.)** collect data or identify relevant data sets, use digital tools to analyze them, and represent data in various ways to facilitate problem-solving and decision-making. **(c.)** break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving. **(d.)** understand how automation works and use algorithmic thinking to develop a sequence of steps to create and test automated solutions.

6. Creative Communicator - Students communicate clearly and express themselves creatively for a variety of purposes using the platforms, tools, styles, formats and digital media appropriate to their goals. Students:

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7. Global Collaborator - Students use digital tools to broaden their perspectives and enrich their learning by collaborating with others and working effectively in teams locally and globally. Students:

(a.) use digital tools to connect with learners from a variety of backgrounds and cultures, engaging with them in ways that broaden mutual understanding and learning. **(b.)** use collaborative technologies to work with others, including peers, experts or community members, to examine issues and problems from multiple viewpoints. **(c.)** contribute constructively to project teams, assuming various roles and responsibilities to work effectively toward a common goal. **(d.)** explore local and global issues and use collaborative technologies to work with others to investigate solutions.

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. **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.	

NOTE re: Examples, Outcomes and Assessments

The following skills and themes should be reflected in the design of units and lessons for this course or content area.

21st Century Skills:

- Creativity and Innovation
- Critical Thinking and Problem Solving
- Communication and Collaboration
- Information Literacy
- Media Literacy
- Life and Career Skills

21st Century Themes (as applies to content area):

- Financial, Economic, Business, and Entrepreneurial Literacy
- Civic Literacy
- Health Literacy

Big Ideas: *Course Objectives / Content Statement(s)* Connecting Tech: Blending Robotics with 3D Printing
Pacing: 2 weeks

Essential Questions	**Enduring Understandings** *What will students understand about the big ideas?* Students will understand that…

Scope & Sequence

Day	Activity/Activities	Notes Etc.
1 (Probably this year only out of the lab)	Introduction to the new class, supplies, etc. Explain what Blended Learning is - some tasks/activities will be on physical paper or using physical objects while other tasks will be done digitally. How they will work together - Coding more independently while Robotics and 3D Printing will be either with a partner or a group. How collaboratively they work will be part of their grade considering that how they work in the real world. How to program a robot activity. Introduce Engineer Notebook(?) TDT	
2 (Hopefully back in the lab)	If necessary, finish the how to program a robot activity. Jump into CS First Activities. Newbies - pick a topic and start one of the topics listed. They must complete all 8 activities for a grade. For someone who has a CS First Account but has not completed two full projects, depending on what they have done they should complete one set of activities based on one topic. If they have a lot done in their own scratch account, I will provide them	

	with a number of other challenging Scratch Activities. Advanced Scratch students will be provided with Scratch Activities with very limited instructions to test their knowledge of basic commands in Scratch.	
Days 3 - 10 * * Time will vary due to prior experience with Scratch	Using CS First - students will complete activities that are self-guided. Whole Group Lesson to be included in days 1-10 introducing Scratch and/or Coding?	
Days 11 - 15 * *Time will vary due to # of activities etc.	Whole Group: Station Activities: (Suggested) ❏ BrainPOP Breakout EDU (Robotics - showyourwork is EDU password) ❏ Video - History of Robots by The Good Stuff (PBS)	Works with our subscription to BPOP. *Current Events articles on Robotics and 3D Printing will be used as discussion breaks to bring the class back together for Whole Group Discussions.
Days 16 - 18	3 Groups: ½ Class Dexter Industries Curriculum - Mission #1 ❏ Build programmable robot ❏ Connect to Raspberry Pi ❏ Test out New Robot Use video tutorial as needed (links within curriculum) AND 2-3 Groups: ½ Class ❏ Introduction to 3D Printing (see Google Doc of resources for starter lessons) ❏ Tinkercad - create accounts ❏ Basic Lessons in Tinkercad ❏ Activity - Common Sense Media - Design a GameBoard Piece (?) ❏ BrainPOP 3D Printing Lessons I want to print Moby's head! ❏ Basic lessons about design - pull a pre-made design from one of the teacher approved sites or one that can be added to our list	www.dexterindustries.com/GoBoxMissions/MissionOne (Click under the links under "BuildtheGoPiGo" & "TesttheGoPiGo" after the build is complete Tinkercad: tinkercad.com/quests https://www.commonsense.org/education/lesson-plans/introduction-to-3d-printing-designprint-a-board-game-piece *Current Events articles on Robotics and 3D Printing will be used as discussion breaks to bring the class back together for Whole Group Discussions.
Days 19 - 30	3 Groups: ½ Class Dexter Industries - Mission #2 (Obstacle Course)	*Current Events articles on Robotics and 3D Printing will be used as discussion breaks to bring the class back together

	AND 2-3 Groups: ½ Class - 3D printing ❏ Create a printable design in either Google Sketch-up or TinkerCAD. What the students do is dependent on previous experience. ❏ As a team, the students need to come together to develop a printable object that will solve either a challenge presented to them or a real life problem. The object needs to be something new that is designed by the students and not premade.	for Whole Group Discussions.

Digital Resources

Coding
https://scratch.mit.edu/tips https://www.cs-first.com/en/home
Robotics
https://www.dexterindustries.com/ https://youtu.be/TK-h4oATYSI A History of Robots by The Good Stuff (PBS)
3D Printing
http://www.schrockguide.net/3d-printing.html https://all3dp.com/1/useful-cool-things-3d-print-ideas-3d-printer-projects-stuff/ https://www.3dsupplyguys.com/3d-printing-education-center/3d-printers-for-schools/ https://www.edutopia.org/blog/jaw-dropping-classroom-3d-printer-todd-finley https://3duniverse.org/tag/3d-printing-lesson-plans/ http://www.stratasys.com/resources/education-materials https://all3dp.com/cool-things-to-3d-print-useful/ https://www.iste.org/explore/articleDetail?articleid=251 https://3dprint.com/tag/3d-printing-curriculum/ https://www.makerbot.com/education/

http://www.instructables.com/id/Beginner-3D-Printing-Projects/

https://educators.brainpop.com/bp-topic/3d-printing/

https://www.makerbot.com/media-center/2016/06/03/lesson-plans-steam-learning

Instructional Strategies:
Supports for English Language Learners:

Sensory Supports	Graphic Supports	Interactive Supports
Real-life objects (realia)	Charts	In pairs or partners
Manipulatives	Graphic organizers	In triads or small groups
Pictures & photographs	Tables	In a whole group
Illustrations, diagrams, & drawings	Graphs	Using cooperative group structures
Magazines & newspapers	Timelines	With the Internet (websites) or software programs
Physical activities	Number lines	In the home language
Videos & films		With mentors
Broadcasts		
Models & figures		

from https://wida.wisc.edu

Differentiation Strategies:

Accommodations	Interventions	Modifications
Allow for verbal responses	Multi-sensory techniques	Modified tasks/ expectations
Repeat/confirm directions	Increase task structure (e.g., directions, checks for understanding, feedback)	Differentiated materials
Permit response provided via computer or electronic device	Increase opportunities to engage in active academic responding (e.g., writing, reading aloud, answering questions in class)	Individualized assessment tools based on student need
Audio Books	Utilize prereading strategies and activities: previews, anticipatory guides, and semantic mapping	Modified assessment grading