Windham School District

Grades 7-8

Technology Education

Approved by the WSB on 04/05/2022

WINDHAM SCHOOL DISTRICT

Technology Education Grades 7-8

Thank you to all the staff who assisted in reviewing the Grade 7-8 Science Curriculum. They worked many hours to research/review science education curricula, standards, ask questions and edit.

TEAM

Shannan McKenna	SAU
Michael Koski	SAU
Karen Tenhagen	WMS

Mission Statement

The Windham Schools Technology Education curriculum is designed to introduce students to new tools they can use to show what they know, solve problems and design solutions. Additionally, students will explore STEM career options, learn to code computer programs, and use their new skills in a variety of challenges.

Windham School District Curriculum
Curriculum Overview

Unit Name	Why (enduring understandings)	How (skills)	What (content, vocab)
Grade 7 Design Essentials	● The Engineering Design Process is a method that is used to solve technological challenges to change and improve products for the way we live. ● Through individual and collaborative work, students should demonstrate knowledge of the problem-solving process.	● Explain the design process both orally and in written form ● Work independently and in teams to demonstrate knowledge of the problem-solving process. ● Think critically about solutions to problems	● Design process ● Engineering ● Modeling ● Optimization ● Technological Solutions ● Constraints ● Iterative Process ● Criteria
Simple Machines in Action	● Energy and matter interact through forces that result in changes in motion. ● Simple machines make work easier by trading a change in force for a change in distance.	● Name six simple machines and list examples of each ● Explain the meaning of work and energy as it relates to machines ● Explain how each simple machine can be or is integrated into larger machines ● Design and construct a “Rube Goldberg Machine” that includes all of the simple-machine types	● Rube Goldberg Machine ● mechanical advantage ● wheel and axle ● simple machine ● inclined plane ● pulley ● wedge ● screw ● fulcrum ● work ● force ● mass ● effort ● gravity ● load

Transforming Energy (potential to kinetic)	● Energy can be transferred from one object to another and can be transformed from one form to another, but the total amount of energy never changes. (Boundary: Qualitative analysis only of Acceleration)	● Design a vehicle which uses potential energy transformed to kinetic energy for movement ● Test the vehicle for task requirements and design multiple iterations by changing variables ● Create a graph to represent the distance/time relationship	● potential energy ● kinetic energy ● momentum ● acceleration ● friction
Robotics Engineering	● System control and robotics is the future of manufacturing in business and industry. ● System control technology is used in building control systems at school, work, and home applications. ● Computer hardware and software can be used to control a variety of devices to complete specific tasks and do work.	● Build a basic working robot ● Program the robot to autonomously complete a given task	● brick ● motor ● sensor ● block programming ● loop ● automation ● axes ● rotation
Career exploration (Career Fair Related to WHS classes)	● There are many career paths available for students with technical knowledge and training	● Gain knowledge of personal characteristics, interests, aptitudes, and skills ● Gain awareness of and respect for the diversity of the world of work ● Understand of the relationship between school performance and future choices ● Understand personal goal-setting and decision-making patterns and attitudes	● Medical Technology ● Agricultural Technologies and related Biotechnologies ● Energy and Power Technologies ● Information and Communication Technologies ● Transportation Technologies ● Manufacturing Technologies ● Construction Technologies ● Engineering
Grade 8 Computer Programming	● Computer Programming plays a role in either a specific form of entertainment or as a vehicle for self-expression. ● Computer programming is a way to process a series of instructions	● Create programmatic images, animations, interactive art, and games. ● Create a flowchart to demonstrate critical thinking necessary for program design	● Program ● Animation ● Frame ● Parameter ● Variable ● Expression

	entered into the computer where data is entered (input) into a program and manipulated for a desired result (output)		● Boolean ● Conditionals ● Functions
Robotics Engineering	● System control and robotics is the future of manufacturing in business and industry. ● System control technology is used in building control systems at school, work, and home applications. ● Computer hardware and software can be used to control a variety of devices to complete specific tasks and do work.	● Build a basic working robot ● Design and build an arm for the robot to complete a particular task ● Program the robot to autonomously complete a given task	● programming ● brick ● motor ● sensor ● block programming ● loop ● automation ● axis ● rotation
Graphing Calculator Exploration	● Calculators are a useful tool for computation and can be used for communicating data in various ways. ● (Note: Integrated use of graphing tool into other units)	● Complete a designed activity which includes both graphing and other programmable features of the system	● graphing ● plotting ● variables ● commands ● I/O ● functions ● expressions
3D Design	● Engineers use 3D modeling when solving technical problems ● Develop understanding about the difference between a sketch, working drawing and 3D model	● Explain the process of 3D printing from design conception to additive manufacturing ● Using 3D printing software, design and print a small keychain tag using designated constraints ● Using 3D printing software, design and print a container that will float containing a certain mass of materials	● modeling ● axis ● design ● filament ● layer resolution ● slicing ● extruder ● print speed ● positioning precision ● fused filament fabrication (FFF) ● additive manufacturing ● Computer Aided Design (CAD) ● prototype

Career exploration (Career Fair Related to WHS classes)	● There are many career paths available for students with technical knowledge and training	● Gain knowledge of personal characteristics, interests, aptitudes, and skills ● Gain awareness of and respect for the diversity of the world of work ● Understand of the relationship between school performance and future choices ● Understand personal goal-setting and decision-making patterns and attitudes	● Medical Technology ● Agricultural Technologies and related Biotechnologies ● Energy and Power Technologies ● Information and Communication Technologies ● Transportation Technologies ● Manufacturing Technologies ● Construction Technologies ● Engineering

Windham School District Curriculum
Design Essentials: Grade 7

Stage 1 Desired Results

ESTABLISHED GOALS:
Content Standards:
(New Hampshire Technology/Engineering Education Curriculum Guide)

- A1. Demonstrate the accurate use of appropriate measuring tools to gather, manipulate, and communicate information.
- A2. Demonstrate safe working attitudes and practices.
- A3.Demonstrate basic skills in the safe and proper selection and use of technical equipment, materials, and processes.
- D1. Apply problem-solving techniques to technological challenges involving materials, processes, and products.
- E1. Apply academic concepts and practices in a technological setting.
- H1. Exhibit responsible individual and cooperative work habits.

(NH Computer Science Standards)

- 2-CS-01 Recommend improvements to the design of computing devices, based on an analysis of how users interact with the devices. The study of human–computer interaction (HCI) can improve the design of devices, including both hardware and software. Students should make recommendations for existing devices (e.g., a laptop, phone, or tablet) or design their own components or interface (e.g., create their own controllers). Teachers can guide students to consider usability through several lenses, including accessibility, ergonomics, and learnability. For example, assistive devices provide capabilities such as scanning written information and converting it to speech.
- 2-AP-13 Decompose problems and subproblems into parts to facilitate the design, implementation, and review of programs. Students should break down problems into subproblems, which

Transfer

Students will be able to

- Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. (NGSS - MS-ETS1-1)

Meaning

ENDURING UNDERSTANDINGS
Students will understand that…

- The Engineering Design Process is a method that is used to solve technological challenges to change and improve products for the way we live.
- Through individual and collaborative work, students should demonstrate knowledge of the problem-solving process.

ESSENTIAL QUESTIONS

- What is the design process?
- What is Engineering?

Acquisition

Students will know…

- How to use the problem solving process
- How to use the design process.

Students will be skilled at…

- Explaining the design process both orally and in written form
- Working independently and in teams to demonstrate knowledge of the problem-solving process.

can be further broken down to smaller parts. Decomposition facilitates aspects of program development by allowing students to focus on one piece at a time (e.g., getting input from the user, processing the data, and displaying the result to the user). Decomposition also enables different students to work on different parts at the same time. For example, animations can be decomposed into multiple scenes, which can be developed independently. **(WSD Digital Literacy Standards)** ● 6-8.CT.e.1 Create a model of a real-world system and explain why some details, features and behaviors were required in the model and why some could be ignored.	● How to effectively work in a group to collaborate including brainstorming. ● How to clearly communicate your process in both an oral and written format (documentation, design notebook, reflection).	● Thinking critically about solutions to problems
Used in Content Area Standards		***21st Century Skills***
not applicable		● WSD Digital Literacy Standards ● NH Computer Science Standards

Stage 2 - Evidence	
Evaluative Criteria	***Assessment Evidence***
	ASSESSMENT: ● Design and evaluate competing design solutions ● Based on inputs, anticipate desired outputs
	OTHER EVIDENCE:

Windham School District Curriculum
Simple Machines in Action: Grade 7

Stage 1 Desired Results

ESTABLISHED GOALS:
Content Standards:
(New Hampshire Technology/Engineering Education Curriculum Guide)

- A1. Demonstrate the accurate use of appropriate measuring tools to gather, manipulate, and communicate information.
- A2. Demonstrate safe working attitudes and practices.
- A3.Demonstrate basic skills in the safe and proper selection and use of technical equipment, materials, and processes.
- D1. Apply problem-solving techniques to technological challenges involving materials, processes, and products.
- H1. Exhibit responsible individual and cooperative work habits.

(NH Computer Science Standards)

- 2-AP-18 Distribute tasks and maintain a project timeline when collaboratively developing computational artifacts. Collaboration is a common and crucial practice in programming development. Often, many individuals and groups work on the interdependent parts of a project together. Students should assume pre-defined roles within their teams and manage the project workflow using structured timelines. With teacher guidance, they will begin to create collective goals, expectations, and equitable workloads. For example, students may divide the design stage of a game into planning the storyboard, flowchart, and different parts of the game mechanics. They can then distribute tasks and roles among members of the team and assign deadlines.

Transfer

Students will be able to

- Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved. (NGSS - MS-ETS1-4)
- Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. (NGSS - MS-ETS1-2)

Meaning

ENDURING UNDERSTANDINGS
Students will understand that…

- Energy and matter interact through forces that result in changes in motion.
- Simple machines make work easier.

ESSENTIAL QUESTIONS

- How does a scientist describe work?
- How do we use machines in our everyday lives?
- How do machines do work?
- How do simple machines combine to make work easier?

Acquisition

Students will know…

- How to identify types of Simple Machines
- How to design a Rube Goldberg Machine using one of each simple machine

Students will be skilled at…

- Naming and listing examples of each of the six simple machines
- Explaining the meaning of work and energy as it relates to machines
- Explaining how each simple machine can be or is integrated into larger machines
- Constructing a “Rube Goldberg Machine” that includes all of the simple-machine types

● 2-AP-19 Document programs in order to make them easier to follow, test, and debug. Documentation allows creators and others to more easily use and understand a program. Students should provide documentation for end users that explains their artifacts and how they function. For example, students could provide a project overview and clear user instructions. They should also incorporate comments in their product and communicate their process using design documents, flowcharts, and presentations.		
Used in Content Area Standards		***21st Century Skills***
not applicable		● WSD Digital Literacy Standards ● NH Computer Science Standards

Stage 2 - Evidence	
Evaluative Criteria	***Assessment Evidence***
	ASSESSMENT: ● Develop a model to meet certain criteria ● Evaluate a model related to criteria
	OTHER EVIDENCE:

Windham School District Curriculum
Transforming Energy: Grade 7

Stage 1 Desired Results

ESTABLISHED GOALS:
Content Standards:
(New Hampshire Technology/Engineering Education Curriculum Guide)

- A1. Demonstrate the accurate use of appropriate measuring tools to gather, manipulate, and communicate information.
- A2. Demonstrate safe working attitudes and practices.
- A3.Demonstrate basic skills in the safe and proper selection and use of technical equipment, materials, and processes.
- D1. Apply problem-solving techniques to technological challenges involving materials, processes, and products.
- H1. Exhibit responsible individual and cooperative work habits.

(NH Computer Science Standards)

- 2-AP-18 Distribute tasks and maintain a project timeline when collaboratively developing computational artifacts. Collaboration is a common and crucial practice in programming development. Often, many individuals and groups work on the interdependent parts of a project together. Students should assume pre-defined roles within their teams and manage the project workflow using structured timelines. With teacher guidance, they will begin to create collective goals, expectations, and equitable workloads. For example, students may divide the design stage of a game into planning the storyboard, flowchart, and different parts of the game mechanics. They can then distribute tasks and roles among members of the team and assign deadlines.

Transfer

Students will be able to
Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved. (NGSS - MS-ETS1-4)

Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. (NGSS - MS-ETS1-2)

Meaning

ENDURING UNDERSTANDINGS
Students will understand that…

- Energy can be transferred from one object to another and can be transformed from one form to another, but the total amount of energy never changes. (Boundary: Qualitative analysis only of Acceleration)

ESSENTIAL QUESTIONS

- How are energy transfers and energy transformations alike and different?
- How do you identify kinetic energy vs. potential energy?

Acquisition

Students will know…

- What happens when energy is transformed
- What is an example of energy transformation
- How to differentiate between types of energy

Students will be skilled at…

- Designing a vehicle which uses potential energy transformed to kinetic energy for movement
- Testing the vehicle for task requirements and design multiple iterations by changing variables
- Creating a graph to represent the distance/time relationship

● 2-AP-19 Document programs in order to make them easier to follow, test, and debug. Documentation allows creators and others to more easily use and understand a program. Students should provide documentation for end users that explains their artifacts and how they function. For example, students could provide a project overview and clear user instructions. They should also incorporate comments in their product and communicate their process using design documents, flowcharts, and presentations.	● How to recognize that energy has the ability to cause motion or create change	
Used in Content Area Standards		***21st Century Skills***
not applicable		● NH Computer Science Standards

Stage 2 - Evidence	
Evaluative Criteria	***Assessment Evidence***
	ASSESSMENT: ● Design a model to meet certain criteria ● Evaluate a model related to criteria
	OTHER EVIDENCE:

Windham School District Curriculum
Robotics Engineering: Grade 7

Stage 1 Desired Results

ESTABLISHED GOALS:
Content Standards:
(New Hampshire Technology/Engineering Education Curriculum Guide)

- A1. Demonstrate the accurate use of appropriate measuring tools to gather, manipulate, and communicate information.
- A2. Demonstrate safe working attitudes and practices.
- A3.Demonstrate basic skills in the safe and proper selection and use of technical equipment, materials, and processes.
- D1. Apply problem-solving techniques to technological challenges involving materials, processes, and products.
- H1. Exhibit responsible individual and cooperative work habits.

(NH Computer Science Standards)

- 2-AP15 Seek and incorporate feedback from team members and users to refine a solution that meets user needs. Development teams that employ user-centered design create solutions (e.g., programs and devices) that can have a large societal impact, such as an app that allows people with speech difficulties to translate hard-to-understand pronunciation into understandable language. Students should begin to seek diverse perspectives throughout the design process to improve their computational artifacts. Considerations of the end-user may include usability, accessibility, age-appropriate content, respectful language, user perspective, pronoun use, color contrast, and ease of use.
- 2-AP-16 Incorporate existing code, media, and libraries into original programs, and give attribution. Building on the work of others enables students to produce more interesting and powerful creations. Students should use portions of code, algorithms, and/or digital media in their own programs and websites. At this

Transfer

Students will be able to

- Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved. (NGSS - MS-ETS1-4)
- Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. (NGSS - MS-ETS1-2)

Meaning

ENDURING UNDERSTANDINGS
Students will understand that…

- System control and robotics is the future of manufacturing in business and industry.
- System control technology is used in building control systems at school, work, and home applications.
- Computer hardware and software can be used to control a variety of devices to complete specific tasks and do work.

ESSENTIAL QUESTIONS

- How can an autonomously programmed robot be designed to perform specific tasks using a variety of sensors that acquire information about the world external to the robot?
- How can autonomous robots be designed and used to perform manual and repetitive tasks safely?

Acquisition

Students will know…

- Build a basic robot and use the programming effectively to get the robot to move.

Students will be skilled at…

- Building a basic, working robot

level, they may also import libraries and connect to web application program interfaces (APIs). For example, when creating a side-scrolling game, students may incorporate portions of code that create a realistic jump movement from another person's game, and they may also import Creative Commons-licensed images to use in the background. Students should give attribution to the original creators to acknowledge their contributions. **(WSD Digital Literacy Standards)** ● **6-8.CS.a.4** Identify and describe the use of sensors, actuators, and control systems in an embodied system (e.g., a robot, an e-textile, installation art, smart room). ● **6-8.CS.a.5** Individually and collaboratively design and demonstrate the use of a device (e.g., robot, e-textile) to accomplish a task.	● Develop and program an arm that performs a specific purpose	● Designing and build an arm for the robot to complete a particular task ● Programming the robot to autonomously complete a given task
Used in Content Area Standards		***21st Century Skills***
not applicable		● WSD Digital Literacy Standards ● NH Computer Science Standards

Stage 2 - Evidence	
Evaluative Criteria	***Assessment Evidence***
	ASSESSMENT: ● Develop a model to meet certain criteria ● Evaluate a model related to criteria
	OTHER EVIDENCE:

Windham School District Curriculum
Career Exploration: Grade 7

Stage 1 Desired Results

ESTABLISHED GOALS:

Content Standards:

(New Hampshire Technology/Engineering Education Curriculum Guide)

- A4. Identify basic skills required in technological careers.
- B2. Identify and investigate various types of technology systems (including: medical, agricultural, biological, energy and power, information and communication, transportation, manufacturing, construction and engineering).
- G1. Evaluate technological systems and their impact on people, the environment, culture, and the economy.

(NH Computer Science Standards)

- 2-IC-20 Compare tradeoffs associated with computing technologies that affect people's everyday activities and career options. Advancements in computer technology are neither wholly positive nor negative. However, the ways that people use computing technologies have tradeoffs. Students should consider current events related to broad ideas, including privacy, communication, and automation. For example, driverless cars can increase convenience and reduce accidents, but they are also susceptible to hacking. The emerging industry will reduce the number of taxi and shared-ride driver's, but will create more software engineering and cybersecurity jobs.

(WSD Digital Literacy Standards)

- 6-8.CAS.c.1 Describe current events and emerging technologies in computing and the effects they may have on

Transfer

Students will be able to

- Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. (NGSS - MS-ETS1-1)

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- There are many career paths available for students with technical knowledge and training

ESSENTIAL QUESTIONS

- What factors and special skills need to be considered when selecting and preparing for future employment?
- What type of technical skills are required for your chosen career?
- What jobs and careers are available regionally and nationally?

Acquisition

Students will know…

- How to explore the opportunities available in the technology fields.
- That there are a variety of local technological opportunities by interacting with local professionals.

Students will be skilled at…

- Gaining knowledge of personal characteristics, interests, aptitudes, and skills
- Gaining awareness of and respect for the diversity of the world of work

education, the workplace, individuals, communities, and global society. ● 6-8.CAS.c.2 Identify and discuss the technology proficiencies needed in the classroom and the workplace, and how to meet the needs.		● Understanding of the relationship between school performance and future choices ● Understanding personal goal-setting and decision-making patterns and attitudes
Used in Content Area Standards		***21st Century Skills***
not applicable		● WSD Digital Literacy Standards ● NH Computer Science Standards

Stage 2 - Evidence	
Evaluative Criteria	***Assessment Evidence***
	ASSESSMENT: ● Research/explore technology careers in various fields ● Present findings using slideshow/powerpoint

Windham School District Curriculum
Computer Programming: Grade 8

Stage 1 Desired Results

ESTABLISHED GOALS:

Content Standards:

(New Hampshire Technology/Engineering Education Curriculum Guide)

- C1. Demonstrate skills needed to find, use, and communicate technical information.
- E1. Apply academic concepts and practices in a technological setting.

(NH Computer Science Standards)

- 2-AP-13 Decompose problems and subproblems into parts to facilitate the design, implementation, and review of programs. Students should break down problems into subproblems, which can be further broken down to smaller parts. Decomposition facilitates aspects of program development by allowing students to focus on one piece at a time (e.g., getting input from the user, processing the data, and displaying the result to the user). Decomposition also enables different students to work on different parts at the same time. For example, animations can be decomposed into multiple scenes, which can be developed independently.
- 2-AP-12 Design and iteratively develop programs that combine control structures, including nested loops and compound conditionals. Control structures can be combined in many ways. Nested loops are loops placed within loops. Compound conditionals combine two or more conditions in a logical relationship (e.g., using AND, OR, and NOT), and nesting conditionals within one another allows the result of one conditional to lead to another. For example, when programming an interactive story, students could use a compound conditional within

Transfer

Students will be able to

- Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. (NGSS - MS-ETS1-1)

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- Computer Programming plays a role in either a specific form of entertainment or as a vehicle for self expression.
- Computer programming is a way to process a series of instructions entered into the computer where data is entered (input) into a program and manipulated for a desired result (output)

ESSENTIAL QUESTIONS

- What is a computer program?
- How does programming enable creativity and individual expression?
- What practices and strategies will help me as I write programs?
- How can programs be organized so that common problems only need to be solved once?
- How can I build on previous solutions to create even more complex behavior?

a loop to unlock a door only if a character has a key AND is touching the door. ● 2-AP-14 Create procedures with parameters to organize code and make it easier to reuse. Students should create procedures and/or functions that are used multiple times within a program to repeat groups of instructions. These procedures can be generalized by defining parameters that create different outputs for a wide range of inputs. For example, a procedure to draw a circle involves many instructions, but all of them can be invoked with one instruction, such as "drawCircle." By adding a radius parameter, the user can easily draw circles of different sizes **(WSD Digital Literacy Standards)** ● 6-8.CT.d.3 Create a program, individually or collaboratively, that implements an algorithm to achieve a given goal. ● 6-8.CT.d.4 Implement problem solving solutions using a programming language, including all of the following: looping behavior, conditional statements, expressions, variables, and functions.	***Acquisition***	
	Students will know… ● A computer is an electronic device that stores, retrieves, and processes data and can be programmed with instructions. ● There are many programming languages that perform different functions. ● Computer programming is about finding different ways to solve problems. ● How to use organization tools and a programming language to solve a problem or create something	*Students will be skilled at…* ● Creating a flowchart to demonstrate critical thinking necessary for program design ● Creating programmatic images, animations, interactive art, and games.
Used in Content Area Standards		***21st Century Skills***
not applicable		● WSD Digital Literacy Standards ● NH Computer Science Standards

Stage 2 - Evidence	
Evaluative Criteria	***Assessment Evidence***
	ASSESSMENT: ● Define the criteria and constraints of a design problem
	OTHER EVIDENCE:

Windham School District Curriculum
Robotics Engineering: Grade 8

Stage 1 Desired Results

ESTABLISHED GOALS:

Content Standards:

(New Hampshire Technology/Engineering Education Curriculum Guide)

- A1. Demonstrate the accurate use of appropriate measuring tools to gather, manipulate, and communicate information.
- A2. Demonstrate safe working attitudes and practices.
- A3.Demonstrate basic skills in the safe and proper selection and use of technical equipment, materials, and processes.
- D1. Apply problem-solving techniques to technological challenges involving materials, processes, and products.
- H1. Exhibit responsible individual and cooperative work habits.

(NH Computer Science Standards)

- 2-AP-15 Seek and incorporate feedback from team members and users to refine a solution that meets user needs. Development teams that employ user-centered design create solutions (e.g., programs and devices) that can have a large societal impact, such as an app that allows people with speech difficulties to translate hard-to-understand pronunciation into understandable language. Students should begin to seek diverse perspectives throughout the design process to improve their computational artifacts. Considerations of the end-user may include usability, accessibility, age-appropriate content, respectful language, user perspective, pronoun use, color contrast, and ease of use
- 2-AP16 Incorporate existing code, media, and libraries into original programs, and give attribution. Building on the work of others enables students to produce more interesting and powerful creations. Students should use portions of code, algorithms, and/or digital media in their own programs and websites. At this level, they may also import libraries and connect to web application program interfaces (APIs). For example, when

Transfer

Students will be able to

- Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved. (NGSS - MS-ETS1-4)
- Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. (NGSS - MS-ETS1-2)

Meaning

ENDURING UNDERSTANDINGS

Students will understand that…

- System control and robotics is the future of manufacturing in business and industry.
- System control technology is used in building control systems at school, work, and home applications.
- Computer hardware and software can be used to control a variety of devices to complete specific tasks and do work.

ESSENTIAL QUESTIONS

- How can an autonomously programmed robot be designed to perform specific tasks using a variety of sensors that acquire information about the world external to the robot?
- How can autonomous robots be designed and used to perform manual and repetitive tasks safely?

creating a side-scrolling game, students may incorporate portions of code that create a realistic jump movement from another person's game, and they may also import Creative Commons-licensed images to use in the background. Students should give attribution to the original creators to acknowledge their contributions. **(WSD Digital Literacy Standards)** ● 6-8.CS.a.4 Identify and describe the use of sensors, actuators, and control systems in an embodied system (e.g., a robot, an e-textile, installation art, smart room). ● 6-8.CS.a.5 Individually and collaboratively design and demonstrate the use of a device (e.g., robot, e-textile) to accomplish a task.	***Acquisition***	
	Students will know… ● Build a basic robot and use the programming effectively to get the robot to move. ● Develop and program an arm that performs a specific purpose	*Students will be skilled at…* ● Building a basic, working robot ● Designing and building an arm for the robot to complete a particular task ● Programming the robot to autonomously complete a given task
Used in Content Area Standards		***21st Century Skills***
not applicable		● WSD Digital Literacy Standards ● NH Computer Science Standards

Stage 2 - Evidence	
Evaluative Criteria	***Assessment Evidence***
	ASSESSMENT: ● Develop a model to meet certain criteria ● Evaluate a model related to criteria
	OTHER EVIDENCE:

Windham School District Curriculum
Graphing Calculator Exploration: Grade 8

Stage 1 Desired Results

ESTABLISHED GOALS:
Content Standards:
(New Hampshire Technology/Engineering Education Curriculum Guide)

- C1. Demonstrate skills needed to find, use, and communicate technical information.
- E1. Apply academic concepts and practices in a technological setting.

(NH Computer Science Standards)

- 2-DA-07 Represent data using multiple encoding schemes. Data representations occur at multiple levels of abstraction, from the physical storage of bits to the arrangement of information into organized formats (e.g., tables). Students should represent the same data in multiple ways. For example, students could represent the same color using binary, RGB values, hex codes (low-level representations), as well as forms understandable by people, including words, symbols, and digital displays of the color (high-level representations).

(WSD Digital Literacy Standards)

- 6-8.CS.a.6 Use a variety of computing devices (e.g., probes, sensors, handheld devices, Global Positioning System [GPS]) to individually and collaboratively collect, analyze, and present information for content-related problems.

Transfer

Students will be able to
Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. (NGSS - MS-ETS1-2)

Meaning

ENDURING UNDERSTANDINGS
Students will understand that…

- Calculators are a useful tool for computation and can be used for communicating and collecting data in various ways.
- (Note: Integrated use of graphing tool into other units)

ESSENTIAL QUESTIONS

- How can a graphing calculator assist me in solving problems?
- How can a graphing calculator process/represent data?

Acquisition

Students will know…

- How to use the graphing calculator as a programming/data collection tool.
- Complete a lesson using the graphing calculator that requires something to be built.

Students will be skilled at…

- Completing a designed activity which includes both graphing and other programmable features of the system

Used in Content Area Standards

not applicable

21st Century Skills

- WSD Digital Literacy Standards
- NH Computer Science Standards

Stage 2 - Evidence	
Evaluative Criteria	***Assessment Evidence***
	ASSESSMENT: ● Design and evaluate competing design solutions ● Based on inputs, anticipate desired outputs
	OTHER EVIDENCE:

Windham School District Curriculum
Technology Education 3D Design: Grade 8

Stage 1 Desired Results

ESTABLISHED GOALS:
Content Standards:
(New Hampshire Technology/Engineering Education Curriculum Guide)

- A1. Demonstrate the accurate use of appropriate measuring tools to gather, manipulate, and communicate information.
- A2. Demonstrate safe working attitudes and practices.
- A3.Demonstrate basic skills in the safe and proper selection and use of technical equipment, materials, and processes.
- D1. Apply problem-solving techniques to technological challenges involving materials, processes, and products.
- H1. Exhibit responsible individual and cooperative work habits.

(**NH Computer Science Standards)**

- 2-AP-10 Use flowcharts and/or pseudocode to address complex problems as algorithms. Complex problems are problems that would be difficult for students to solve computationally. Students should use pseudocode and/or flowcharts to organize and sequence an algorithm that addresses a complex problem, even though they may not actually program the solutions. Testing the algorithm with a wide range of inputs and users allows students to refine their recommendation algorithm and to identify other inputs they may have initially excluded.

Transfer

Students will be able to

- Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved. (NGSS - MS-ETS1-4)
- Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. (NGSS - MS-ETS1-2)

Meaning

ENDURING UNDERSTANDINGS
Students will understand that…

- Engineers use 3D modeling when solving technical problems
- Develop understanding about the difference between a sketch, working drawing and 3D model

ESSENTIAL QUESTIONS

- What is the value of 3D design?
- What role does 3D design play in society?
- How has technology changed 3D design?

Acquisition

Students will know…

- How to create a technical drawing for a 3D object
- How to use a 3D printer
- How to create a 3D printed design with a purpose or scenario (example: 3D container that can float and hold a certain amount of items)
- How to apply Design Process to 3D Design

Students will be skilled at…

- Explaining the process of 3D printing from design conception to additive manufacturing
- Using 3D printing software, designing a small keychain tag using designated constraints
- Using 3D printing software, designing a container that will float containing a certain mass of materials

(WSD Digital Literacy Standards) ● 6-8.CT.d.5 Trace programs step-by-step in order to predict their behavior.		
Used in Content Area Standards		***21st Century Skills***
not applicable		● WSD Digital Literacy Standards ● NH Computer Science Academic Standards

Stage 2 - Evidence	
Evaluative Criteria	***Assessment Evidence***
	ASSESSMENT: ● Develop a model to meet certain criteria ● Evaluate a model related to criteria ● Based on inputs, anticipate desired outputs

Windham School District Curriculum
Career Exploration: Grade 8

Stage 1 Desired Results

ESTABLISHED GOALS:
Content Standards:
(New Hampshire Technology/Engineering Education Curriculum Guide)

- A4. Identify basic skills required in technological careers.
- B2. Identify and investigate various types of technology systems (including: medical, agricultural, biological, energy and power, information and communication, transportation, manufacturing, construction and engineering).
- G1. Evaluate technological systems and their impact on people, the environment, culture, and the economy.

(NH Computer Science Standards)

- 2-IC-20 Compare tradeoffs associated with computing technologies that affect people's everyday activities and career options. Advancements in computer technology are neither wholly positive nor negative. However, the ways that people use computing technologies have tradeoffs. Students should consider current events related to broad ideas, including privacy, communication, and automation. For example, driverless cars can increase convenience and reduce accidents, but they are also susceptible to hacking. The emerging industry will reduce the number of taxi and shared-ride driver's, but will create more software engineering and cybersecurity jobs.

(WSD Digital Literacy Standards)

- 6-8.CAS.c.1 Describe current events and emerging technologies in computing and the effects they may have on

Transfer

Students will be able to

- Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. (NGSS - MS-ETS1-1)

Meaning

ENDURING UNDERSTANDINGS
Students will understand that…

- There are many career paths available for students with technical knowledge and training

ESSENTIAL QUESTIONS

- What factors and special skills need to be considered when selecting and preparing for future employment?
- What type of technical skills are required for your chosen career?
- What jobs and careers are available regionally and nationally?

Acquisition

Students will know…

- How to explore the opportunities available in the technology fields.

Students will be skilled at…

- Identifying personal characteristics, interests, aptitudes, and skills
- Expressing awareness of and respect for the diversity of the world of work

education, the workplace, individuals, communities, and global society. ● 6-8.CAS.c.2 Identify and discuss the technology proficiencies needed in the classroom and the workplace, and how to meet the needs.	● How to use the WHS Program of Studies in order to identify technology opportunities. ● That there are a variety of local technological opportunities by interacting with local professionals.	● Identifying the relationship between school performance and future choices ● Identifying personal goal-setting and decision-making patterns and attitudes
Used in Content Area Standards		***21st Century Skills***
not applicable		● WSD Digital Literacy Standards ● NH Computer Science Standards

Stage 2 - Evidence	
Evaluative Criteria	***Assessment Evidence***
	ASSESSMENT: ● Research/explore technology careers in project related fields ● Present findings using slideshow/powerpoint

Attachments:

New Hampshire Technology/Engineering Education Curriculum Guide
https://www.education.nh.gov/career/career/documents/tech_ed_curr_guide.pdf

Next Generation Science Standards - MS-ETS1 Engineering Design
http://www.nextgenscience.org/dci-arrangement/ms-ets1-engineering-design

Massachusetts Department of Elementary and Secondary Education. (2016, June). 2016

Massachusetts Digital Literacy and Computer Science (DLCS) Curriculum Framework. Retrieved from
http://www.doe.mass.edu/frameworks/dlcs.pdf