
WSD

***Technology Education
Curriculum***

Approved by the WSB on 9/18/18

Windham School District Technology Education Curriculum

Thank you to all the teachers who assisted in creating the Grade 7 and 8 Technology Education Curriculum. They worked many hours to research/review technology education curricula and standards, review the document, ask questions and edit.

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Overview

The Windham School District Technology Education curriculum was produced after 9 months of research and 4 months of writing and revision. Data about Technology education curriculum was gathered from other NH districts and from neighboring states. The committee also studied the ISTE (International Society for Technology in Education) national standards, Massachusetts Digital Literacy and Computer Science standards, and New Hampshire ICT (Information, Literacy and Technology) and early drafts of the New Hampshire Computer Science standards. These sources were then combined to create the current Technology Education curriculum.

During the review/revision process, we also relied upon the experience and knowledge of our current Windham Middle School teachers who have taught various aspects of those standards in a variety of different educational settings (robotics club, summer programs, UNH STEM camps, etc). We determined those topics and standards that could be taught within the time constraints of the schedule, were a good fit for the age group and would be most beneficial for students as they enter high school.

Windham School District Technology Education Curriculum

Overview

Unit Name	Why (enduring understandings)	How (skills)	What (content, vocab)
Grade 7 Design Essentials	<ul style="list-style-type: none"> • 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. 	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • Design process • Engineering • Modeling • Optimization • Technological Solutions • Constraints • Iterative Process
Simple Machines in Action	<ul style="list-style-type: none"> • 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. 	<ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> • 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)	<ul style="list-style-type: none"> ● 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) 	<ul style="list-style-type: none"> ● 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 	<ul style="list-style-type: none"> ● potential energy ● kinetic energy ● momentum ● acceleration ● friction
Robotics Engineering	<ul style="list-style-type: none"> ● System control and robotics is the future of manufacturing in business and industry. ● System control technology is used in building control system 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. 	<ul style="list-style-type: none"> ● Build a basic working robot ● Program the robot to autonomously complete a given task 	<ul style="list-style-type: none"> ● brick ● motor ● sensor ● block programming ● loop ● automation ● axes ● rotation
Career exploration	<ul style="list-style-type: none"> ● There are many career paths available for students with technical knowledge and training 	<ul style="list-style-type: none"> ● 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 	<ul style="list-style-type: none"> ● 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	<ul style="list-style-type: none"> ● 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) 	<ul style="list-style-type: none"> ● Create programmatic images, animations, interactive art, and games. ● Create a flowchart to demonstrate critical thinking necessary for program design 	<ul style="list-style-type: none"> ● Program ● Animation ● Frame ● Parameter ● Variable ● Expression ● Boolean ● Conditionals ● Functions
Computing Systems	<ul style="list-style-type: none"> ● Computing systems are composed of hardware, software and networking components. ● Computers, as tools for design, modeling, information processing, communication, and system control, have greatly increased human productivity and knowledge. ● A problem solver understands what has been done, knows why the process was appropriate, and can support it with reasons and evidence. 	<ul style="list-style-type: none"> ● Explain the difference between hardware and software components of computers ● Explain the difference between internal and external networks ● Explain and use the pieces of the computing loop 	<ul style="list-style-type: none"> ● input ● output ● feedback ● processing ● hardware ● software ● network
Robotics Engineering	<ul style="list-style-type: none"> ● System control and robotics is the future of manufacturing in business and industry. ● System control technology is used in building control system at school, work, and home applications. ● Computer hardware and software can be used to control a variety of devices 	<ul style="list-style-type: none"> ● 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 	<ul style="list-style-type: none"> ● programming ● brick ● motor ● sensor ● block programming ● loop ● automation ● axes ● rotation

	to complete specific tasks and do work.		
Graphing Calculator Exploration	<ul style="list-style-type: none"> ● 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) 	<ul style="list-style-type: none"> ● Complete a designed activity which includes both graphing and other programmable features of the system 	<ul style="list-style-type: none"> ● graphing ● plotting ● variables ● commands ● I/O ● functions ● expressions
3D Design	<ul style="list-style-type: none"> ● Engineers use 3D modeling when solving technical problems ● Develop understanding about the difference between a sketch, working drawing and 3D model 	<ul style="list-style-type: none"> ● 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 	<ul style="list-style-type: none"> ● 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	<ul style="list-style-type: none"> ● There are many career paths available for students with technical knowledge and training 	<ul style="list-style-type: none"> ● Gain knowledge of personal characteristics, interests, aptitudes, and skills ● Gain awareness of and respect for the diversity of the world of work 	<ul style="list-style-type: none"> ● Medical Technology ● Agricultural Technologies and related Biotechnologies ● Energy and Power Technologies ● Information and Communication Technologies ● Transportation Technologies

		<ul style="list-style-type: none"> ● Understand of the relationship between school performance and future choices ● Understand personal goal-setting and decision-making patterns and attitudes 	<ul style="list-style-type: none"> ● Manufacturing Technologies ● Construction Technologies ● Engineering
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Windham School District Technology Education Curriculum

Design Essentials: 7th grade

Stage 1 Desired Results		
ESTABLISHED GOALS: <i>Content Standards:</i> (New Hampshire Technology/Engineering Education Curriculum Guide) <ul style="list-style-type: none"> ● 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) <ul style="list-style-type: none"> ● 2-CS-01 Recommend improvements to the design of computing devices, based 	Transfer	
	<i>Students will be able to</i> 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 <i>Students will understand that...</i> <ul style="list-style-type: none"> ● 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 <ul style="list-style-type: none"> ● What is the design process? ● What is Engineering?
	Acquisition	
	<i>Students will know...</i> <ul style="list-style-type: none"> ● How to use the problem solving process ● How to use the design process. ● How to effectively work in a group to collaborate including brainstorming. 	<i>Students will be skilled at...</i> <ul style="list-style-type: none"> ● Explaining the design process both orally and in written form ● Working independently and in teams to demonstrate knowledge of the problem-solving process. ● Thinking critically about solutions to problems

<p>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.</p> <ul style="list-style-type: none"> ● 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. 	<ul style="list-style-type: none"> ● How to clearly communicate your process in both an oral and written format (documentation, design notebook?, reflection). 	
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(WSD Digital Literacy Standards) <ul style="list-style-type: none"> 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. 		
Used in Content Area Standards		21st Century Skills
<i>not applicable</i>		<ul style="list-style-type: none"> WSD Digital Literacy Standards NH Computer Science Standards

Stage 2 - Evidence	
Evaluative Criteria	Assessment Evidence
	ASSESSMENT:
	OTHER EVIDENCE:

Windham School District Technology Education Curriculum

Simple Machines in Action: 7th grade

Stage 1 Desired Results		
ESTABLISHED GOALS: <i>Content Standards:</i> (New Hampshire Technology/Engineering Education Curriculum Guide) <ul style="list-style-type: none"> ● 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) <ul style="list-style-type: none"> ● 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 	Transfer	
	<i>Students will be able to</i> 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 <i>Students will understand that...</i> <ul style="list-style-type: none"> ● Energy and matter interact through forces that result in changes in motion. ● Simple machines make work easier. 	ESSENTIAL QUESTIONS <ul style="list-style-type: none"> ● 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	
	<i>Students will know...</i> <ul style="list-style-type: none"> ● How to identify types of Simple Machines ● How to design a Rube Goldberg Machine using one of each simple machine 	<i>Students will be skilled at...</i> <ul style="list-style-type: none"> ● 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

<p>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.</p> <ul style="list-style-type: none"> ● 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. 		
<p><i>Used in Content Area Standards</i></p> <p><i>not applicable</i></p>	<p><i>21st Century Skills</i></p> <ul style="list-style-type: none"> ● WSD Digital Literacy Standards ● NH Computer Science Standards 	

Stage 2 - Evidence

<i>Evaluative Criteria</i>	<i>Assessment Evidence</i>
	ASSESSMENT: <ul style="list-style-type: none">● Develop a model to meet certain criteria● Evaluate a model related to criteria
	OTHER EVIDENCE:

Windham School District Technology Education Curriculum

Transforming Energy: 7th grade

Stage 1 Desired Results

ESTABLISHED GOALS:	<i>Transfer</i>	
	<p><i>Students will be able to</i></p> <p>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)</p> <p>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)</p>	
	<i>Meaning</i>	
	<p>ENDURING UNDERSTANDINGS</p> <p><i>Students will understand that...</i></p> <ul style="list-style-type: none"> 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) 	<p>ESSENTIAL QUESTIONS</p> <ul style="list-style-type: none"> How are energy transfers and energy transformations alike and different? How do you identify kinetic energy vs. potential energy?
	<i>Acquisition</i>	
<p><i>Content Standards:</i> (New Hampshire Technology/Engineering Education Curriculum Guide)</p> <ul style="list-style-type: none"> 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. <ul style="list-style-type: none"> H1. Exhibit responsible individual and cooperative work habits. <p>(NH Computer Science Standards)</p>	<p><i>Students will know...</i></p> <ul style="list-style-type: none"> What happens when energy is transformed What is an example of energy transformation How to differentiate between types of energy 	<p><i>Students will be skilled at...</i></p> <ul style="list-style-type: none"> 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

<ul style="list-style-type: none"> ● 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. ● 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 	<ul style="list-style-type: none"> ● How to recognize that energy has the ability to cause motion or create change 	
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documents, flowcharts, and presentations.		
Used in Content Area Standards		21st Century Skills
<i>not applicable</i>		<ul style="list-style-type: none"> NH Computer Science Standards

Stage 2 - Evidence

Evaluative Criteria	Assessment Evidence
	ASSESSMENT: <ul style="list-style-type: none"> Design a model to meet certain criteria Evaluate a model related to criteria
	OTHER EVIDENCE:

Windham School District Technology Education Curriculum

Robotics Engineering: 7th grade

Stage 1 Desired Results		
ESTABLISHED GOALS: Content Standards: (New Hampshire Technology/Engineering Education Curriculum Guide) <ul style="list-style-type: none"> ● 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) <ul style="list-style-type: none"> ● 2-AP15 Seek and incorporate feedback from team members and users to refine a solution that meets user needs. 	Transfer	
	<i>Students will be able to</i> 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 <i>Students will understand that...</i> <ul style="list-style-type: none"> ● System control and robotics is the future of manufacturing in business and industry. ● System control technology is used in building control system 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 <ul style="list-style-type: none"> ● 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	
	<i>Students will know...</i> <ul style="list-style-type: none"> ● Build a basic robot and use the programming effectively to get the robot to move. 	<i>Students will be skilled at...</i> <ul style="list-style-type: none"> ● Building a basic, working robot ● Designing and build an arm for the robot to complete a particular task

<p>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.</p> <ul style="list-style-type: none"> ● 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 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. 	<ul style="list-style-type: none"> ● Develop and program an arm that performs a specific purpose 	<ul style="list-style-type: none"> ● Programming the robot to autonomously complete a given task
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<p>Students should give attribution to the original creators to acknowledge their contributions.</p> <p>(WSD Digital Literacy Standards)</p> <ul style="list-style-type: none"> ● 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. 		
Used in Content Area Standards		21st Century Skills
<i>not applicable</i>		<ul style="list-style-type: none"> ● WSD Digital Literacy Standards ● NH Computer Science Standards

Stage 2 - Evidence	
Evaluative Criteria	Assessment Evidence
	<p>ASSESSMENT:</p> <ul style="list-style-type: none"> ● Develop a model to meet certain criteria ● Evaluate a model related to criteria
	OTHER EVIDENCE:

Windham School District Technology Education Curriculum

Career Exploration: 7th grade

Stage 1 Desired Results		
ESTABLISHED GOALS: <i>Content Standards:</i> (New Hampshire Technology/Engineering Education Curriculum Guide) <ul style="list-style-type: none"> 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) <ul style="list-style-type: none"> 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, 	Transfer	
	<i>Students will be able to</i> 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 <i>Students will understand that...</i> <ul style="list-style-type: none"> There are many career paths available for students with technical knowledge and training 	ESSENTIAL QUESTIONS <ul style="list-style-type: none"> 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	
	<i>Students will know...</i> <ul style="list-style-type: none"> How to explore the opportunities available in the technology fields. That there are a variety of local technological opportunities by interacting with local professionals. 	<i>Students will be skilled at...</i> <ul style="list-style-type: none"> Gaining knowledge of personal characteristics, interests, aptitudes, and skills Gaining awareness of and respect for the diversity of the world of work

<p>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.</p> <p>(WSD Digital Literacy Standards)</p> <ul style="list-style-type: none"> 6-8.CAS.c.1 Describe current events and emerging technologies in computing and the effects they may have on 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. 		<ul style="list-style-type: none"> 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
<i>not applicable</i>		<ul style="list-style-type: none"> WSD Digital Literacy Standards NH Computer Science Standards

Stage 2 - Evidence	
Evaluative Criteria	Assessment Evidence
	ASSESSMENT:

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Windham School District Technology Education Curriculum

Computer Programming: 8th grade

Stage 1 Desired Results		
ESTABLISHED GOALS: <i>Content Standards:</i> (New Hampshire Technology/Engineering Education Curriculum Guide) <ul style="list-style-type: none"> ● 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) <ul style="list-style-type: none"> ● 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. 	Transfer	
	<i>Students will be able to</i> 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 <i>Students will understand that...</i> <ul style="list-style-type: none"> ● 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 <ul style="list-style-type: none"> ● 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?
	Acquisition	
	<i>Students will know...</i> <ul style="list-style-type: none"> ● A computer is an electronic device that stores, retrieves, and processes data and can be programmed with instructions. 	<i>Students will be skilled at...</i> <ul style="list-style-type: none"> ● Creating a flowchart to demonstrate critical thinking necessary for program design

<ul style="list-style-type: none"> ● 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 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 <p>(WSD Digital Literacy Standards)</p>	<ul style="list-style-type: none"> ● 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 	<ul style="list-style-type: none"> ● Creating programmatic images, animations, interactive art, and games.
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<ul style="list-style-type: none"> ● 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. 		
Used in Content Area Standards		21st Century Skills
<i>not applicable</i>		<ul style="list-style-type: none"> ● WSD Digital Literacy Standards ● NH Computer Science Standards

Stage 2 - Evidence	
Evaluative Criteria	Assessment Evidence
	ASSESSMENT: <ul style="list-style-type: none"> ● Define the criteria and constraints of a design problem
	OTHER EVIDENCE:

Windham School District Technology Education Curriculum

Computing Systems: 8th grade

Stage 1 Desired Results		
ESTABLISHED GOALS: Content Standards: (New Hampshire Technology/Engineering Education Curriculum Guide) <ul style="list-style-type: none"> B1. Recognize the core concepts of a “technological system” which include input, processes, output, and feedback. F1. Trace the evolution of technological systems and processes. (NH Computer Science Standards) <ul style="list-style-type: none"> 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, 	Transfer	
	<i>Students will be able to</i> 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 <i>Students will understand that...</i> <ul style="list-style-type: none"> Computing systems are composed of hardware, software and networking components. Computers, as tools for design, modeling, information processing, communication, and system control, have greatly increased human productivity and knowledge. A problem solver understands what has been done, knows why the process was appropriate, and can support it with reasons and evidence. 	ESSENTIAL QUESTIONS <ul style="list-style-type: none"> What are the input, output, processing components of a computer, and what are their functions? How has computing technology changed communication? How has computing technology changed society?
	Acquisition	
	<i>Students will know...</i> <ul style="list-style-type: none"> How basic networks operate 	<i>Students will be skilled at...</i> <ul style="list-style-type: none"> Modeling and explain the difference between hardware and software components of computers

<p>ergonomics, and learnability. For example, assistive devices provide capabilities such as scanning written information and converting it to speech.</p> <ul style="list-style-type: none"> ● 2-CS-02 Design projects that combine hardware and software components to collect and exchange data. Collecting and exchanging data involves input, output, storage, and processing. When possible, students should select the hardware and software components for their project designs by considering factors such as functionality, cost, size, speed, accessibility, and aesthetics. For example, components for a mobile app could include accelerometer, GPS, and speech recognition. The choice of a device that connects wirelessly through a Bluetooth connection versus a physical USB connection involves a tradeoff between mobility and the need for an additional power source for the wireless device. <p>(WSD Digital Literacy Standards)</p> <ul style="list-style-type: none"> ● 6-8.CS.a.1 Describe the main function of an operating system. ● 6-8.CS.a.2 Recognize that there is a wide range of application software. ● 6-8.CS.a.3 Identify and describe the function of the main internal parts of a basic computing device (e.g., motherboard, hard drive, Central Processing Unit [CPU]). 	<ul style="list-style-type: none"> ● How to identify the basic parts and functions of a computer. ● The components of input, processing, output and feedback 	<ul style="list-style-type: none"> ● Explaining the difference between internal and external networks ● Explaining and using the pieces of the computing loop
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Used in Content Area Standards		21st Century Skills
<i>not applicable</i>		<ul style="list-style-type: none"> ● WSD Digital Literacy Standards ● NH Computer Science Standards

Stage 2 - Evidence	
Evaluative Criteria	Assessment Evidence
	ASSESSMENT:
	OTHER EVIDENCE:

Windham School District Technology Education Curriculum

Robotics Engineering: 8th grade

Stage 1 Desired Results		
<p>ESTABLISHED GOALS:</p> <p><i>Content Standards:</i> (New Hampshire Technology/Engineering Education Curriculum Guide)</p> <ul style="list-style-type: none"> ● 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. <p>(NH Computer Science Standards)</p>	Transfer	
	<p><i>Students will be able to</i></p> <p>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)</p> <p>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)</p>	
	Meaning	
	<p>ENDURING UNDERSTANDINGS <i>Students will understand that...</i></p> <ul style="list-style-type: none"> ● System control and robotics is the future of manufacturing in business and industry. ● System control technology is used in building control system 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. 	<p>ESSENTIAL QUESTIONS</p> <ul style="list-style-type: none"> ● How can an autonomously programed 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	
	<p><i>Students will know...</i></p> <ul style="list-style-type: none"> ● Build a basic robot and use the programming effectively to get the robot to move. 	<p><i>Students will be skilled at...</i></p> <ul style="list-style-type: none"> ● Building a basic, working robot ● Designing and building an arm for the robot to complete a particular task

<ul style="list-style-type: none"> ● 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 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 	<ul style="list-style-type: none"> ● Develop and program an arm that performs a specific purpose 	<ul style="list-style-type: none"> ● Programming the robot to autonomously complete a given task
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<p>should give attribution to the original creators to acknowledge their contributions. (WSD Digital Literacy Standards)</p> <ul style="list-style-type: none"> 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. 		
Used in Content Area Standards		21st Century Skills
<i>not applicable</i>		<ul style="list-style-type: none"> WSD Digital Literacy Standards NH Computer Science Standards

Stage 2 - Evidence

Evaluative Criteria	Assessment Evidence
	<p>ASSESSMENT:</p> <ul style="list-style-type: none"> Develop a model to meet certain criteria Evaluate a model related to criteria
	OTHER EVIDENCE:

Windham School District Technology Education Curriculum

Graphing Calculator Exploration: 8th grade

Stage 1 Desired Results

ESTABLISHED GOALS: <i>Content Standards:</i> (New Hampshire Technology/Engineering Education Curriculum Guide) <ul style="list-style-type: none"> ● 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) <ul style="list-style-type: none"> ● 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)	<i>Transfer</i>	
	<i>Students will be able to</i> 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)	
	<i>Meaning</i>	
	ENDURING UNDERSTANDINGS <i>Students will understand that...</i> <ul style="list-style-type: none"> ● 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 <ul style="list-style-type: none"> ● How can a graphing calculator assist me in solving problems? ● How can a graphing calculator process/represent data?
	<i>Acquisition</i>	
	<i>Students will know...</i> <ul style="list-style-type: none"> ● 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. 	<i>Students will be skilled at...</i> <ul style="list-style-type: none"> ● Completing a designed activity which includes both graphing and other programmable features of the system

<ul style="list-style-type: none"> 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. 		
Used in Content Area Standards		21st Century Skills
<i>not applicable</i>		<ul style="list-style-type: none"> WSD Digital Literacy Standards NH Computer Science Standards

Stage 2 - Evidence	
Evaluative Criteria	Assessment Evidence
	ASSESSMENT: <ul style="list-style-type: none"> Design and evaluate competing design solutions
	OTHER EVIDENCE:

Windham School District Technology Education Curriculum

3D Design: 8th grade

Stage 1 Desired Results		
ESTABLISHED GOALS: <i>Content Standards:</i> (New Hampshire Technology/Engineering Education Curriculum Guide) <ul style="list-style-type: none"> ● 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) <ul style="list-style-type: none"> ● 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 	Transfer	
	<i>Students will be able to</i> 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 <i>Students will understand that...</i> <ul style="list-style-type: none"> ● Engineers use 3D modeling when solving technical problems ● Develop understanding about the difference between a sketch, working drawing and 3D model 	ESSENTIAL QUESTIONS <ul style="list-style-type: none"> ● What is the value of 3D design? ● What role does 3D design play in society? ● How has technology changed 3D design?
	Acquisition	
	<i>Students will know...</i> <ul style="list-style-type: none"> ● 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 	<i>Students will be skilled at...</i> <ul style="list-style-type: none"> ● Explaining the process of 3D printing from design conception to additive manufacturing ● Using 3D printing software, designing a small keychain tag using designated constraints

<p>complex problem, even though they may not actually program the solutions. For example, students might express an algorithm that produces a recommendation for purchasing sneakers based on inputs such as size, colors, brand, comfort, and cost. 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.</p> <p>(WSD Digital Literacy Standards)</p> <ul style="list-style-type: none"> 6-8.CT.d.5 Trace programs step-by-step in order to predict their behavior. 	<p>container that can float and hold a certain amount of items)</p> <ul style="list-style-type: none"> How to apply Design Process to 3D Design 	<ul style="list-style-type: none"> Using 3D printing software, designing a container that will float containing a certain mass of materials
Used in Content Area Standards		21st Century Skills
<i>not applicable</i>		<ul style="list-style-type: none"> WSD Digital Literacy Standards NH Computer Science Academic Standards

Stage 2 - Evidence	
Evaluative Criteria	Assessment Evidence
	<p>ASSESSMENT:</p> <ul style="list-style-type: none"> Develop a model to meet certain criteria Evaluate a model related to criteria
	OTHER EVIDENCE:

Windham School District Technology Education Curriculum

Career Exploration: 8th grade

Stage 1 Desired Results		
ESTABLISHED GOALS: <i>Content Standards:</i> (New Hampshire Technology/Engineering Education Curriculum Guide) <ul style="list-style-type: none"> 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) <ul style="list-style-type: none"> 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 	Transfer	
	<i>Students will be able to</i> 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 <i>Students will understand that...</i> <ul style="list-style-type: none"> There are many career paths available for students with technical knowledge and training 	ESSENTIAL QUESTIONS <ul style="list-style-type: none"> 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	
	<i>Students will know...</i> <ul style="list-style-type: none"> How to explore the opportunities available in the technology fields. How to use the WHS Program of Studies in order to identify technology opportunities. 	<i>Students will be skilled at...</i> <ul style="list-style-type: none"> Identifying personal characteristics, interests, aptitudes, and skills Expressing awareness of and respect for the diversity of the world of work Identifying the relationship between school performance and future choices Identifying personal goal-setting and decision-making patterns and attitudes

<p>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.</p> <p>(WSD Digital Literacy Standards)</p> <ul style="list-style-type: none"> 6-8.CAS.c.1 Describe current events and emerging technologies in computing and the effects they may have on 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. 	<ul style="list-style-type: none"> That there are a variety of local technological opportunities by interacting with local professionals. 	
Used in Content Area Standards		21st Century Skills
<i>not applicable</i>		<ul style="list-style-type: none"> WSD Digital Literacy Standards NH Computer Science Standards

Stage 2 - Evidence	
Evaluative Criteria	Assessment Evidence
	<p>ASSESSMENT:</p> <ul style="list-style-type: none"> Define the criteria and constraints of a design problem
	OTHER EVIDENCE:

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>