ROBBINSVILLE PUBLIC SCHOOLS

OFFICE OF CURRICULUM AND INSTRUCTION

DEPARTMENT

Grade 6 Technology

Board of Education

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BOARD OF EDUCATION INITIAL ADOPTION DATE: September, 2017

Course Philosophy

The Technology program focuses on every individual developing technology problem solving skills, technological literacy, and 21st century skills through hands-on activities integrating Science, Technology, Engineering, and Mathematics (STEM). The Technology education program is dedicated in providing experiences that prepare students to be successful in their transition through secondary education and into post secondary careers. Teaching technological literacy, will help students develop the skills necessary to be lifelong learners and successfully contribute and function in a technological society.

Course Description

In 6th grade, Technology is an activity based course that introduces students to technology by exploring systems of technology, design, and engineering through three dimensional prototyping and developing systems to solve problems. Using an integrated Science, Technology, Engineering, and Mathematics (STEM) approach to instruction; students will study and apply technological problem solving method, engineering design process, 21st century skills, graphic design and communication, knowledge of energy transfer, physical laws of motion, and structural engineering. Students will have a variety of projects and activities in the design and engineering technology lab related to three dimensional prototyping technology and designing systems to problem solve. Students will work in teams and individually to complete required classroom and lab assignments.

Robbinsville Public Schools

Curriculum Map

(This is a worksheet intended to support the development of the overall document. It should be submitted to the supervisors if appropriate but it will not be included in the final board-approved document)

6th Grade Technology- Three dimentional design and prototyping

Relevant Standards	Standards Unpacked Skill / Concept / Process?	Enduring Understandings / Unit Goals	Essential Questions	Unit Title / Suggested Timeline
Unit #1: Exploring 3D CAD & Prototyping **NGSS:** MS-ETS1-1: ETS1.A: **ELA/Literacy -** RST.6-8.1. WHST.6-8.8 **Mathematics -** MP.2 7.EE.3 **Common Core Technology The characteristics and scope of technology.** 8.2.8.A.1 8.2.8.A.2	**ELA/Literacy - RST.6-8.1** Cite specific textual evidence to support analysis of science and technical texts. (MS-ETS1-1) **MS-ETS1-1.** Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles **8.2.8.A.5** Describe how resources such as material, energy, information, time, tools, people, and capital contribute to a technological product or system.	• Computer Aided Design improves efficiency within the design loop • 3D Printing is a process called additive manufacturing • Additive manufacturing has pros and cons • Learn a CAD program in order to design and print an object	• How can 3D CAD and 3D printing play a role in the advancement of technology and continue to improve human lives and the environment? • How is CAD beneficial to the engineering design process? • How do hardware and software work together? • When designing in Tinkercad, why is it important to follow step-by-step directions carefully? • How does the process of 3D printing (additive manufacturing) affect the way we must think about our designs?	8 hours (8 class periods)

8.2.8.A.3 **The relationships among technologies and the connections between technology and other fields of study.** 8.2.8.A.4 8.2.8.A.5 **The cultural, social,economic and political effects of technology.** 8.2.8.B.1 8.2.8.B.2 8.2.8.B.3 8.2.8.B.4 **The role of society in the development and use of technology.** 8.2.8.B.5 **The attributes of design.** 8.2.8.C.1 8.2.8.C.2 8.2.8.C.3	**8.2.8.B.2** Identify the desired and undesired consequences from the use of a product or system. **The attributes of design.** **8.2.8.C.1** Explain how different teams/groups can contribute to the overall design of a product. **The application of engineering design.** **8.2.8.C.4** Identify the steps in the design process that would be used to solve a designated problem. **8.2.8.C.5.a** Create a technical sketch of a product with materials and measurements labeled. **8.2.8.C.8** Develop a proposal for a chosen solution that include models (physical, graphical or mathematical) to communicate the solution to peers. **Apply the design process.** **8.2.8.D.1** Design and create a product that			

The application of engineering design. 8.2.8.C.4 8.2.8.C.5.a **The role of troubleshooting ,research and development, invention and innovation and experimentatio n in problem solving.** 8.2.8.C.6 8.2.8.C.7 8.2.8.C.8 **Apply the design process** 8.2.8.D.1 8.2.8.D.2 8.2.8.D.3 **Use and maintain technological products and systems.** 8.2.8.D.4 **Assess the impact of products and systems.** 8.2.8.D.5 8.2.8.D.6	addresses a real world problem using a design process under specific constraints. **8.2.8.D.2** Identify the design constraints and trade-offs involved in designing a prototype (e.g., how the prototype might fail and how it might be improved) by completing a design problem and reporting results in a multimedia presentation, design portfolio or engineering notebook. **8.2.8.D.3** Build a prototype that meets a STEM-based design challenge using science, engineering, and math principles that validate a solution.			

Unit #2: **3D Prototype STEM Design Challenge** **NGSS:** MS-ETS1-1: ETS1.A: **ELA/Literacy -** RST.6-8.1. WHST.6-8.8 **Mathematics -** MP.2 7.EE.3 **Common Core Technology** **The characteristics and scope of technology.** 8.2.8.A.1 8.2.8.A.2 8.2.8.A.3 **The relationships among technologies and the connections between**	**ELA/Literacy -** **RST.6-8.1** Cite specific textual evidence to support analysis of science and technical texts. (MS-ETS1-1) **MS-ETS1-1.** Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles **8.2.8.A.5** Describe how resources such as material, energy, information, time, tools, people, and capital contribute to a technological product or system. **8.2.8.B.2** Identify the desired and undesired consequences from the use of a product or system. **The attributes of design.** **8.2.8.C.1** Explain how different teams/groups	• Using 3D CAD and 3D printing, follow the design loop to create a part that is integral to a larger system • Work as part of a team to create a product, taking on specific roles within the group • Draft and defend a proposal for the product the group plans to make	• How can three dimensional (3D) printing play a role in the advancement of technology and continue to improve human lives and the environment? • How is 3D printing a useful resource when designing a new product? • How does working in a team affect the over design and production of a product?	12 hours (12 class periods)

technology and other fields of study. 8.2.8.A.4 8.2.8.A.5 **The cultural, social,economic and political effects of technology.** 8.2.8.B.1 8.2.8.B.2 8.2.8.B.3 8.2.8.B.4 **The role of society in the development and use of technology.** 8.2.8.B.5 **The attributes of design.** 8.2.8.C.1 8.2.8.C.2 8.2.8.C.3 **The application of engineering design.** 8.2.8.C.4 8.2.8.C.5.a **The role of troubleshooting ,research and**	can contribute to the overall design of a product. **The application of engineering design.** **8.2.8.C.4** Identify the steps in the design process that would be used to solve a designated problem. **8.2.8.C.5.a** Create a technical sketch of a product with materials and measurements labeled. **8.2.8.C.8** Develop a proposal for a chosen solution that include models (physical, graphical or mathematical) to communicate the solution to peers. **Apply the design process.** **8.2.8.D.1** Design and create a product that addresses a real world problem using a design process under specific constraints. **8.2.8.D.2** Identify the design constraints and trade-offs involved in			

development, invention and innovation and experimentation in problem solving. 8.2.8.C.6 8.2.8.C.7 8.2.8.C.8 **Apply the design process** 8.2.8.D.1 8.2.8.D.2 8.2.8.D.3 **Use and maintain technological products and systems.** 8.2.8.D.4 **Assess the impact of products and systems.** 8.2.8.D.5 8.2.8.D.6	designing a prototype (e.g., how the prototype might fail and how it might be improved) by completing a design problem and reporting results in a multimedia presentation, design portfolio or engineering notebook. **8.2.8.D.3** Build a prototype that meets a STEM-based design challenge using science, engineering, and math principles that validate a solution.			

Robbinsville Public Schools
Scope, Sequence, and Assessment

Technology, Grade 6

Unit Title	Unit Understandings and Goals	Recommended Duration	Assessments		
			Diagnostic (before)	Formative (during)	Summative (after)
Exploring 3D CAD & Prototyping	• Computer Aided Design improves efficiency within the design loop • 3D Printing is a process called additive manufacturing • Additive manufacturing has pros and cons • Learn a CAD program in order to design and print an object	8 hours	Class discussion to see guage understanding of CAD and 3D printing	• WebQuests • Class discussions • Project planning evaluation and revision (teacher check) • Project journal (Peer, Self, and Teacher check given with feedback) • 1:1 teacher meetings • Checks for understanding- exit tickets • Peer check of collaboration skills and accountability using rubric • Self assessment of collaboration skills and accountability using a rubric	• Performance based assessments (testing of the product and evaluating the products ability to meet goal of design challenges.) **Ex:** CAD Portfolio & Independent Design Poject • (Group and individual) presentation of product(s) from design challenge

3D Prototype STEM Design Challenge	• Using 3D CAD and 3D printing, follow the design loop to create a part that is integral to a larger system • Work as part of a team to create a product, taking on specific roles within the group • Draft and defend a proposal for the product the group plans to make	12 hours	How could you use 3D printing in your life to solve a real problem? Turn & Talk Share out	• Teacher conferences • Project proposal • Class discussions • Exit tickets • Peer check of collaboration skills and accountability using rubric • Project planning evaluation and revision (teacher check) • Project journal (Peer, Self, and Teacher check given with feedback) • Self assessment of collaboration skills and accountability using a rubric	• Inquiry based, STEM Design Challenge(s) that follows the design loop and incorporates a 3D printed part integral to the project's success & write up • Performance based assessments (testing of the product and evaluating the products ability to meet goal of design challenges.) • (Group and individual) presentation of product(s) from design challenge

Robbinsville Public Schools

Unit #1: Exploring 3D CAD & Prototyping

Enduring Understandings:	**Essential Questions:**
● 3D CAD and printing will continue to have a greater impact on society in many different fields. ● Hardware and software work together control a variety of devices that are used complete specific tasks.	● How can 3D CAD and 3D printing play a role in the advancement of technology and continue to improve human lives and the environment? ● How is CAD beneficial to the engineering design process? ● How do hardware and software work together? ● When designing in Tinkercad, why is it important to follow step-by-step directions carefully? ● How does the process of 3D printing (additive manufacturing) affect the way we must think about our designs?

Guiding / Topical Questions with Specific Standards		**Content, Themes, Concepts, and Skills**	**Teaching Strategies**	**Instructional Resources and Materials**	**Assessment Strategies**
NGSS: MS-ETS1-1: ETS1.A: **ELA/Literacy - RST.6-8.1. WHST.6-8.8** **Mathematics - MP.2** **7.EE.3** **Common Core Technology**	What is the relationship between hardware and software? How does the 3D printing process, additive manufacturing, shape the way we use 3D CAD to create prototypes?	● Computer Aided Design improves efficiency within the design loop ● 3D Printing is a process called additive manufacturing ● Additive manufacturing has pros and cons ● Learn a CAD program in order to design and print an object	● Mini lesson/lecture ● Project based learning ● Cooperative Learning ● Hands-On Activities ● Input/Output stations ● Independent work ● Socratic Seminar ● STEM design challenge projects ● Class discussion ● Large Group Demos ● Small Group Instruction ● Individualized Instruction ● Multimedia Presentations ● Interactive Comp. Software ○ Webquests ● Journal Writing	● Internet resouces ● Content Resource manuals ● Tech Lab tools and materials (wood cutters, hot glue, scissors, tape, calculators, safety equipment) ● PowerPoint Presentation ● Google software suit ● Design Software	Formative: ● Check for understanding questions will be utilized during large group instruction. ● Exit tickets ● Temperature guages ● Students will be asked open ended questions during small group and individualized instruction to

The characteristics and scope of technology.
8.2.8.A.1
8.2.8.A.2
8.2.8.A.3
 	
The relationships among technologies and the connections between technology and other fields of study.
8.2.8.A.4
8.2.8.A.5
 	
The cultural, social,economic and political effects of technology.
8.2.8.B.1
8.2.8.B.2
8.2.8.B.3
8.2.8.B.4
 	
The role of society in the
				• MS Software
				
				• Tech Lab Equipments and Design Tools
				  • 3D printers
				  • CO_2 Laser
				  • Band saw
					check for understanding
					
					• Students will complete Project journals that will be reviewed for accountability and understanding.
					
					• Students will complete Self-evaluation/ reflection rubric after group and independent work.
					
					Summative:
					• Quizzes/Tests
					• Inquiry based, problem based projects and investigations.
					• Performance based assessments- results of investigation or design challenge
					• Accountability assessment of self directed learning. (assessed through rubric)

developme nt and use of technology. 8.2.8.B.5 **The attributes of design.** 8.2.8.C.1 8.2.8.C.2 8.2.8.C.3 **The application of engineerin g design.** 8.2.8.C.4 8.2.8.C.5.a **The role of troublesho oting,resea rch and developme nt, invention and innovation and experiment ation in problem solving.** 8.2.8.C.6 8.2.8.C.7 8.2.8.C.8					

Apply the design process 8.2.8.D.1 8.2.8.D.2 8.2.8.D.3 **Use and maintain technological products and systems.** 8.2.8.D.4 **Assess the impact of products and systems.** 8.2.8.D.5 8.2.8.D.6					

Robbinsville Public Schools

Unit #2: 3D Prototype STEM Design Challenge

Enduring Understandings:	**Essential Questions**
● Three dimensional (3D) CAD and printing will continue to have a greater impact on society in many different fields. ● Hardware and software work together control a variety of devices that are used complete specific tasks.	● How can three dimensional (3D) printing play a role in the advancement of technology and continue to improve human lives and the environment? ● How is 3D printing a useful resource when designing a new product? ● How does working in a team affect the over design and production of a product?

Guiding / Topical Questions with Specific Standards		**Content, Themes, Concepts, and Skills**	**Teaching Strategies**	**Instructional Resources and Materials**	**Assessment Strategies**
NGSS: MS-ETS1-1: ETS1.A: **ELA/Literacy** RST.6-8.1. WHST.6-8.8 **Mathematics** -MP.2 7.EE.3 **Common Core Technology** **The characteristics and scope of technology.** 8.2.8.A.1 8.2.8.A.2 8.2.8.A.3	What must be considered when designing an object to be 3D printed? How can a system benefit from the application of 3D printed parts?	● Using 3D CAD and 3D printing, follow the design loop to create a part that is integral to a larger system ● Work as part of a team to create a product, taking on specific roles within the group ● Draft and defend a proposal for the product the group plans to make	● Mini lesson/lecture ● Cooperative Learning ● Project based learning ● Hands-On Activities ● Input/Output stations ● Independent work ● Socratic Seminar ● STEM design challenge projects ● Class discussion ● Large Group Demos ● Small Group Instruction ● Individualized Instruction ● Multimedia Presentations ● Interactive Comp. Software ○ Webquests ● Journal Writing	● Internet resouces ● Content Resource manuals ● Tech Lab tools and materials (wood cutters, hot glue, scissors, tape, calculators, safety equipment) ● PowerPoint Presentation ● Google software suit ● Design Software	Formative: ● Check for understanding questions will be utilized during large group instruction. ● Exit tickets ● Temperature guages ● Students will be asked open ended questions during small group and individualized instruction to check for understanding

The relationships among technologies and the connections between technology and other fields of study.
8.2.8.A.4
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The cultural, social,economic and political effects of technology.
8.2.8.B.1
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8.2.8.B.3
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The role of society in the development and use of technology.
8.2.8.B.5
 	
The attributes of design.
8.2.8.C.1
8.2.8.C.2
8.2.8.C.3
 	
The application of
				• Tools and Materials Student workstations MS Software
				
				• Tech Lab Equipments and Design Tools
				  • 3D printers
				  • CO_2 Laser
				  • Band saw
					• Students will complete Project journals that will be reviewed for accountability and understanding.
					
					• Students will complete Self-evaluation/ reflection rubric after group and independent work.
					
					Summative:
					• Quizzes/Tests
					• Inquiry based, problem based projects and investigations.
					• Performance based assessments- results of investigation or design challenge
					• Accountability assessment of self directed learning. (assessed through rubric)

engineering design. 8.2.8.C.4 8.2.8.C.5.a **The role of troubleshooting,research and development, invention and innovation and experimentation in problem solving.** 8.2.8.C.6 8.2.8.C.7 8.2.8.C.8 **Apply the design process** 8.2.8.D.1 8.2.8.D.2 8.2.8.D.3 **Use and maintain technological products and systems.** 8.2.8.D.4 **Assess the impact of products and systems.** 8.2.8.D.5 8.2.8.D.6					