STEM CURRICULUM 5-8 2019

STEM curriculum for Grades 5-8. Includes NJSLS as they apply to student learning at each grade level and in a variety of courses including; Coding, Robotics, Engineering Iterations and Next Frontier.

Green Township School District

New Jersey Student Learning Standards

Technology

New Jersey's Technology Standards consist of 8.1 Educational Technology and 8.2 Technology, Engineering, Design and Computational Thinking, which work symbiotically to provide students with the necessary skills for college and career readiness.

"Advances in technology have drastically changed the way we interact with the world and each other. The digital age requires that we understand and are able to harness the power of technology to live and learn". - International Society for Technology in Education

In this ever-changing digital world where citizenship is being re-imagined, our students must be able to harness the power of technology to live, solve problems and learn in college, on the job and throughout their lives. Enabled with digital and civic citizenship skills, students are empowered to be responsible members of today's diverse global society.

Readiness in this century demands that students actively engage in critical thinking, communication, collaboration, and creativity. Technology empowers students with real-world data, tools, experts and global outreach to actively engage in solving meaningful problems in all areas of their lives. The power of technology discretely supports all curricular areas and multiple levels of mastery for all students.

"A major consequence of accelerating technological change is a difference in levels of technological ability and understanding. The workforce of the future must have the ability to use, manage, and understand technology." – International Technology and Engineering Educators Association

The design process builds in our students the recognition that success is not merely identifying a problem but working though a process and that failure is not an end but rather a point for reevaluation. Whether applied as a skill in product development, in the learning environment, in daily life, in a local or more global arena, the design process supports students in their paths to becoming responsible, effective citizens in college, careers and life.

Computational thinking provides an organizational means of approaching life and its tasks. It develops an understanding of technologies and their operations and provides students with the abilities to build and create knowledge and new technologies. Not all students will be programmers, but they should have an understanding of how computational thinking can build knowledge and control technology.

ISTE STANDARDS FOR STUDENTS

Today's students must be prepared to thrive in a constantly evolving technological landscape. The ISTE Standards for Students are designed to empower student voice and ensure that learning is a student-driven process. Connect with other educators in the ISTE Standards Community and learn how to use the standards in the classroom with the ISTE Standards for Students ebook.
Dive into the standards.

EXPLORE THE STUDENT STANDARDS

1

Empowered Learner

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

2

Digital Citizen

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

3

Knowledge Constructor

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

4

Innovative Designer

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

5

Computational Thinker

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

6

Creative Communicator

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

7

Global Collaborator

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

Green Township School District STEM Curriculum:
5th Grade Coding Unit

Coding Unit: 5th Grade

(Approximate Instructional Time: 6 weeks)

An understanding of computer science is becoming increasingly essential in today's world, therefore this unit is designed to give students a basic understanding of computer logic and common programming tools. Students will achieve the ability to code and understand that computing is pivotal for their success in the hyper-connected world that they live in. An understanding of coding will also allow students to improve upon their analytical reasoning and problem solving skills.

NJ Student Learning Standards for <u>Technology</u>	**Critical Knowledge & Skills**
● 8.2.8.E.1 ● 8.2.8.E.2 ● 8.2.8.E.3 ● 8.2.8.E.4	Students are able to: ● identify ways computers are used that have had an impact across the range of human activity and within different careers where they are used. ● demonstrate an understanding of the relationship between hardware and software. ● develop an algorithm to solve an assigned problem using a specified set of commands and use peer review to critique the solution. ● use appropriate terms in conversation (e.g., programming, language, data, RAM, ROM, Boolean logic terms).

Pacing Guide		
Topic	**Guiding Questions**	**Time Allocated**
Basic concepts (Algorithms)	● What are the fundamentals of computer programming? ● How are algorithms used in coding? ● How is computer programming useful in real life? ● How can I use computer programming to complete a task?	1 week
Advanced concepts (loops, conditionals, functions, variables)	● What are the advanced building blocks of code?	4 weeks
Programming showcase		1 week

Interdisciplinary Connections

English-Language Arts:

Anchor Standards:

- ***NJSLSA.W3.*** *Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.*
- ***NJSLSA.W6.*** *Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.*
- ***NJSLSA.SL1.*** *Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.*
- ***NJSLSA.SL2.*** *Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.*
- ***NJSLSA.SL4.*** *Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.*
- ***NJSLSA.SL5.*** *Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.*

Standards for Mathematical Practice

- ***MP.1*** *Make sense of problems and persevere in solving them.*
- ***MP.2*** *Reason abstractly and quantitatively.*
- ***MP.3*** *Construct viable arguments & critique the reasoning of others.*

- ***MP.4*** *Model with mathematics.*
- ***MP.5*** *Use appropriate tools strategically.*
- ***MP.6*** *Attend to precision.*
- ***MP.7*** *Look for and make use of structure.*
- ***MP.8*** *Look for and express regularity in repeated reasoning.*

21st Century Skills/ Career Ready Practices:

- ***CRP1.*** *Act as a responsible and contributing citizen and employee.*
- ***CRP2.*** *Apply appropriate academic and technical skills.*
- ***CRP4.*** *Communicate clearly and effectively and with reason.*
- ***CRP5.*** *Consider the environmental, social and economic impacts of decisions.*
- ***CRP6.*** *Demonstrate creativity and innovation.*
- ***CRP7.*** *Employ valid and reliable research strategies.*
- ***CRP8.*** *Utilize critical thinking to make sense of problems and persevere in solving them.*
- ***CRP10.*** *Plan education and career paths aligned to personal goals.*
- ***CRP11.*** *Use technology to enhance productivity.*

School Resources, Suggested Activities, and Assessments

Educational Resources:	**Suggested Activities:**
Texts/Supplemental Reading/References Resources include but are not limited to: ● Teacher created SMARTBoard material ● Scratch.mit.edu ● Dash Robots	Possible activities include but are not limited to: ● Programming Dash Robots ● Programming games/animations/stories using MIT's Scratch platform
District/School Formative Assessment Plan	**District/School Summative Assessment Plan**
● Teacher observation of students engaged in group and independent activities. ● Individual and small group conferences/interviews to assess understanding with rubric ● Self-assessment by students with guidance from teacher. ● Exit tickets	● Teacher created assessments and projects ● Teacher/District created benchmark assessments ● End of unit project presentation/testing

Differentiation, Accommodations, and Modifications

Gifted and Talented

Extension Activities

- Conduct research and provide presentation of various topics.
- Design surveys to generate and analyze data to be used in discussion.
- Debate topics of interest / cultural importance.
- Authentic listening and reading sources that provide data and support for speaking and writing prompts.
- Exploration of art and/or artists to understand society and history.
- Implement RAFT Activities as they pertain to the types / modes of communication (role, audience, format, topic).

Anchor Activities

- Use of Higher Level Questioning Techniques
- Provide assessments at a higher level of thinking

English Language Learners

Modifications for Classroom

- Pair visual prompts with verbal presentations
- Ask students to restate information, directions, and assignments.
- Repetition and practice.
- Model skills/techniques that need to be mastered.
- Extended time to complete class work
- Visual dictionaries to help build vocabulary
- Provide copy of classnotes
- Pair with a peer for assistance during class

Modifications for Homework/Assignments

- Modified Assignments
- Native Language Translation (peer, online assistive technology, translation device, bilingual dictionary)
- Extended time for assignment completion as needed
- Highlight key vocabulary
- Use graphic organizers

Students with Disabilities

(**appropriate accommodations, instructional adaptations, and/or modifications as determined by the IEP or 504 team**)

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- Repetition and practice
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- Extended time to complete class work
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- Preferential seating to be mutually determined by the student and teacher
- Student may request to use a computer to complete assignments.
- Establish expectations for correct spelling on assignments.
- Extra textbooks for home.
- Student may request books on tape / CD / digital media, as available and appropriate.
- Assign a peer helper in the class setting
- Provide oral reminders and check student work during independent work time
- Assist student with long and short term planning of assignments
- Encourage student to proofread assignments and tests
- Provide regular parent/ school communication
- Teachers will check/sign student agenda daily
- Student requires use of other assistive technology device

Modifications for Homework and Assignments

- Extended time to complete assignments.
- Student requires more complex assignments to be broken up and explained in smaller units, with work to be submitted in phases.
- Provide the student with clearly stated (written) expectations and grading criteria for assignments.
- Implement RAFT activities as they pertain to the types / modes of communication (role, audience, format, topic).

Modifications for Assessments

- Extended time on classroom tests and quizzes.
- Student may take/complete tests in an alternate setting as needed.
- Restate, reread, and clarify directions/questions
- Distribute study guide for classroom tests.
- Establish procedures for accommodations / modifications for assessments.

Students at Risk of School Failure

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Green Township School District STEM Curriculum:
Unit 1: Engineering Design Process
Grade 5

Unit 1: Engineering Design Process

(Approximate Instructional Time: 6 weeks)

This unit will introduce students to the engineering design process. Students will focus on learning key scientific concepts, and then apply the engineering design process to plan, create, test their prototypes. The engineering design process provides a mindset that cultivates open-ended problem solving and encourages students to learn from their failures. This process also fosters students' abilities to create innovative solutions to everyday challenges.

NJ Student Learning Standards for Science/Engineering	**Critical Knowledge & Skills**
● 3-5-ETS1-1 ● 3-5-ETS1-2 ● 3-5-ETS1-3	Students are able to: ● define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost. ● generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem. ● plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

NJ Student Learning Standards for <u>Technology</u>	**Critical Knowledge & Skills**
● 8.2.5.C.1 ● 8.2.5.C.2 ● 8.2.5.C.4 ● 8.2.5.C.5	Students are able to: ● collaborate with peers to illustrate components of a designed system. ● explain how specifications and limitations can be used to direct a product's development. ● collaborate and brainstorm with peers to solve a problem evaluating all solutions to provide the best results with supporting sketches or models. ● explain the functions of a system and subsystems.

Pacing Guide		
Topic	**Guiding Questions**	**Time Allocated**
Introduction to unit	● What is the Engineering Design Process? ● Why is this process important in the engineering/science field? ● How do I use my results to improve upon my projects?	1 week
Challenge introduction, design and building (project 1)	● What are my engineering design goals and constraints? ● How well is my prototype working? ● How can I improve my prototype? ● Did my changes improve my prototype?	2.5 weeks
Challenge introduction, design and building (project 2)	● What are my engineering design goals and constraints? ● How well is my prototype working? ● How can I improve my prototype? ● Did my changes improve my prototype?	2.5 weeks

Interdisciplinary Connections

English-Language Arts:

Anchor Standards:

- ***NJSLSA.R1.*** *Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.*
- ***NJSLSA.R7****. Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.*
- ***NJSLSA.W2.*** *Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.*
- ***NJSLSA.W6.*** *Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.*
- ***NJSLSA.W7.*** *Conduct short as well as more sustained research projects, utilizing an inquiry-based research process, based on focused questions, demonstrating understanding of the subject under investigation.*
- ***NJSLSA.W8.*** *Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.*
- ***NJSLSA.SL1.*** *Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.*
- ***NJSLSA.SL2.*** *Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.*

- ***NJSLSA.SL4.*** *Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.*
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Standards for Mathematical Practice

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21st Century Skills/ Career Ready Practices:

- ***CRP1.*** *Act as a responsible and contributing citizen and employee.*
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School Resources, Suggested Activities, and Assessments	
Educational Resources:	**Suggested Activities:**
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District/School Formative Assessment Plan	**District/School Summative Assessment Plan**
● Teacher observation of students engaged in group and independent activities. ● Individual and small group conferences/interviews to assess understanding with rubric ● Self-assessment by students with guidance from teacher. ● Exit tickets	● Teacher created assessments and projects ● Teacher/District created benchmark assessments ● End of unit project presentation/testing Sample Project Grading Rubric

Differentiation, Accommodations, and Modifications

Gifted and Talented

Extension Activities

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Anchor Activities

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- Provide assessments at a higher level of thinking

English Language Learners

Modifications for Classroom

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- Repetition and practice.
- Model skills/techniques that need to be mastered.
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- Provide copy of classnotes
- Pair with a peer for assistance during class

Modifications for Homework/Assignments

- Modified Assignments
- Native Language Translation (peer, online assistive technology, translation device, bilingual dictionary)
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Modifications for Homework and Assignments

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Students at Risk of School Failure

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Green Township School District STEM Curriculum:
MS Coding Unit
Grade 6, 7, 8

Coding Unit: Middle School

(Approximate Instructional Time: 6 weeks)

An understanding of computer science is becoming increasingly essential in today's world, therefore this unit is designed to give students a basic understanding of computer logic and common programming tools. An understanding of coding will also allow students to improve upon their analytical reasoning and problem solving skills. Students will understand how math and language arts are a vital part of the coding process. This unit will provide students with the skills they will need for their future in this hyper-connected world.

NJ Student Learning Standards for <u>Technology</u>	**Critical Knowledge & Skills**
● 8.2.5.E.1	Students are able to: ● identify how computer programming impacts our everyday lives.
● 8.2.5.E.2	● demonstrate an understanding of how a computer takes input of data, processes and stores the data through a series of commands, and outputs information.
● 8.2.5.E.3	● using a simple, visual programming language, create a program using loops, events and procedures to generate specific output.
● 8.2.5.E.4	● use appropriate terms in conversation (e.g., algorithm, program, debug, loop, events, procedures, memory, storage, processing, software, coding, procedure, and data).

Pacing Guide		
Topic	**Guiding Questions**	**Time Allocated**
Basic concepts (Algorithms)	• What are the fundamentals of computer programming? • How are algorithms used in coding? • How is computer programming useful in real life? • How can I use computer programming to complete a task? • Where is computer science used in the workforce?	1 week
Advanced concepts (loops, conditionals, functions, variables)	• What are the advanced building blocks of code?	4 weeks
Programming showcase		1 week

Interdisciplinary Connections

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Anchor Standards:

- ***NJSLSA.W3.*** *Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.*
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District/School Formative Assessment Plan	District/School Summative Assessment Plan
● Teacher observation of students engaged in group and independent activities. ● Individual and small group conferences/interviews to assess understanding with rubric ● Self-assessment by students with guidance from teacher. ● Exit tickets	● Teacher created assessments and projects ● Teacher/District created benchmark assessments ● End of unit project presentation/testing

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- Student requires use of other assistive technology device

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- Student requires more complex assignments to be broken up and explained in smaller units, with work to be submitted in phases.
- Provide the student with clearly stated (written) expectations and grading criteria for assignments.
- Implement RAFT activities as they pertain to the types / modes of communication (role, audience, format, topic).

Modifications for Assessments

- Extended time on classroom tests and quizzes.
- Student may take/complete tests in an alternate setting as needed.
- Restate, reread, and clarify directions/questions
- Distribute study guide for classroom tests.
- Establish procedures for accommodations / modifications for assessments.

Green Township School District STEM Curriculum:
Unit 2: The Next Frontier
Grade 6, 7, 8

Unit 2: The Next Frontier **(Approximate Instructional Time: 12 weeks)** **This unit serves as an authentic standards-based investigation into a real scientific and engineering problem. Students are challenged to develop solutions to the challenges of creating an otherworldly human settlement. Researching and understanding the multitude of theories revolving around life on other planets, has the potential to spark lively discussions and innovations while inviting students to extrapolate from their own working knowledge of scientific principles.**	
NJ Student Learning Standards for <u>Science/Engineering</u>	**Critical Knowledge & Skills**
• MS-ETS1-1 • MS-ETS1-2 • MS-ETS1-3	Students are 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. • evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. • analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success. • 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.

• MS-ETS1-4	
NJ Student Learning Standards for <u>Technology</u>	**Critical Knowledge & Skills**
• 8.1.8.F.1	Students are able to: • identify and define authentic problems and significant questions for investigation. • plan and manage activities to develop a solution or complete a project. • collect and analyze data to identify solutions and/or make informed decisions. • use multiple processes and diverse perspectives to explore alternative solutions.
• 8.2.8.C.2	• explain the need for optimization in a design process.
• 8.2.8.C.4	• identify the steps in the design process that would be used to solve a designated problem.
• 8.2.8.C.5	• explain the interdependence of a subsystem that operates as part of a system.
• 8.2.8.C.5.a	• create a technical sketch of a product with materials and measurements labeled.
• 8.2.8.D.1	• design and create a product that addresses a real world problem using a design process under specific constraints. • build a prototype that meets a STEM-based design challenge using science, engineering, and math

• 8.2.8.D.3	principles that validate a solution.

Pacing Guide		
Topic	**Guiding Questions**	**Time Allocated**
Introduction and Research	• What would life look like on another planet? • Why is it important to seek viable living options on planets other than earth? • What plans are already in place for colonizing other planets and how do we improve upon them?	1 class periods
Design and Building (project 1)	• What are my engineering design goals and constraints? • How well is my prototype working?	3 class periods
Testing (project 1)	• How well did my prototype perform in initial testing?	1 class period
Iteration and Re-testing (project 1)	• How can I improve my prototype?	1 class period
Introduction and Research	• What types of rovers and exploration tools are currently being used? • What types of terrains are on possible colony planets? • What other factors may inhibit a rover?	1 class periods
Design and Building (project 2)	• What are my engineering design goals and constraints? • How well is my prototype working?	3 class periods
Testing (project 2)	• How well did my prototype perform in initial testing?	1 class period
Iteration and Re-testing (project 2)	• How can I improve my prototype?	1 class period

Interdisciplinary Connections

English-Language Arts:

Anchor Standards:

- ***NJSLSA.R1.*** *Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.*
- ***NJSLSA.R7****. Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.*
- ***NJSLSA.W2.*** *Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.*
- ***NJSLSA.W6.*** *Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.*
- ***NJSLSA.W7.*** *Conduct short as well as more sustained research projects, utilizing an inquiry-based research process, based on focused questions, demonstrating understanding of the subject under investigation.*
- ***NJSLSA.W8.*** *Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.*
- ***NJSLSA.SL1.*** *Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.*
- ***NJSLSA.SL2.*** *Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.*
- ***NJSLSA.SL4.*** *Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.*
- ***NJSLSA.SL5.*** *Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.*

Standards for Mathematical Practice

- ***MP.1*** *Make sense of problems and persevere in solving them.*
- ***MP.2*** *Reason abstractly and quantitatively.*
- ***MP.3*** *Construct viable arguments & critique the reasoning of others.*
- ***MP.4*** *Model with mathematics.*
- ***MP.5*** *Use appropriate tools strategically.*
- ***MP.6*** *Attend to precision.*
- ***MP.7*** *Look for and make use of structure.*
- ***MP.8*** *Look for and express regularity in repeated reasoning.*

21st Century Skills/ Career Ready Practices:
● ***CRP1.*** *Act as a responsible and contributing citizen and employee.* ● ***CRP2.*** *Apply appropriate academic and technical skills.* ● ***CRP4.*** *Communicate clearly and effectively and with reason.* ● ***CRP5.*** *Consider the environmental, social and economic impacts of decisions.* ● ***CRP6.*** *Demonstrate creativity and innovation.* ● ***CRP7.*** *Employ valid and reliable research strategies.* ● ***CRP8.*** *Utilize critical thinking to make sense of problems and persevere in solving them.* ● ***CRP10.*** *Plan education and career paths aligned to personal goals.* ● ***CRP11.*** *Use technology to enhance productivity.*

School Resources, Suggested Activities, and Assessments	
Educational Resources:	**Suggested Activities:**
Texts/Supplemental Reading/References Resources include but are not limited to: ● Teacher created SMARTBoard material ● Teacher approved articles/videos found on ○ Britannica.com ○ Pebblego.com ○ NewsELA.com ○ PBS.org ○ YouTube.com ○ Discovery.edu ○ NASA.Gov	Possible activities include but are not limited to: ● Create a model communication satellite ● Build a prototype Mars or Moon Rover ● Create a digital Mars or Moon settlement
District/School Formative Assessment Plan	**District/School Summative Assessment Plan**
● Teacher observation of students engaged in group and independent activities. ● Individual and small group conferences/interviews to assess understanding with rubric ● Self-assessment by students with guidance from teacher. ● Exit tickets	● Teacher created assessments and projects ● Teacher/District created benchmark assessments ● End of unit project presentation/testing Sample Project Grading Rubric

Differentiation, Accommodations, and Modifications

Gifted and Talented

Extension Activities

- Conduct research and provide presentation of various topics.
- Design surveys to generate and analyze data to be used in discussion.
- Debate topics of interest / cultural importance.
- Authentic listening and reading sources that provide data and support for speaking and writing prompts.
- Exploration of art and/or artists to understand society and history.
- Implement RAFT Activities as they pertain to the types / modes of communication (role, audience, format, topic).

Anchor Activities

- Use of Higher Level Questioning Techniques
- Provide assessments at a higher level of thinking

English Language Learners

Modifications for Classroom

- Pair visual prompts with verbal presentations
- Ask students to restate information, directions, and assignments.
- Repetition and practice.
- Model skills/techniques that need to be mastered.
- Extended time to complete class work
- Visual dictionaries to help build vocabulary
- Provide copy of class notes
- Pair with a peer for assistance during class
- Leveled reading material

Modifications for Homework/Assignments

- Modified Assignments
- Native Language Translation (peer, online assistive technology, translation device, bilingual dictionary)
- Extended time for assignment completion as needed
- Highlight key vocabulary
- Use graphic organizers

Students with Disabilities

(**appropriate accommodations, instructional adaptations, and/or modifications as determined by the IEP or 504 team**)

Modifications for Classroom

- Pair visual prompts with verbal presentations
- Ask students to restate information, directions, and assignments.
- Repetition and practice
- Model skills / techniques to be mastered.
- Extended time to complete class work
- Provide copy of class notes
- Preferential seating to be mutually determined by the student and teacher
- Students may request to use a computer to complete assignments.
- Establish expectations for correct spelling on assignments.
- Extra textbooks for home.
- Student may request books on tape / CD / digital media, as available and appropriate.
- Assign a peer helper in the class setting
- Provide oral reminders and check student work during independent work time
- Assist student with long and short term planning of assignments
- Encourage student to proofread assignments and tests
- Provide regular parent/ school communication
- Teachers will check/sign student agenda daily
- Student requires use of other assistive technology device
- Leveled reading material

Modifications for Homework and Assignments

- Extended time to complete assignments.
- Student requires more complex assignments to be broken up and explained in smaller units, with work to be submitted in phases.
- Provide the student with clearly stated (written) expectations and grading criteria for assignments.
- Implement RAFT activities as they pertain to the types / modes of communication (role, audience, format, topic).

Modifications for Assessments

- Extended time on classroom tests and quizzes.
- Student may take/complete tests in an alternate setting as needed.
- Restate, reread, and clarify directions/questions
- Distribute study guide for classroom tests.
- Establish procedures for accommodations / modifications for assessments.

Students at Risk of School Failure

Modifications for Classroom

- Pair visual prompts with verbal presentations
- Ask students to restate information, directions, and assignments.
- Repetition and practice
- Model skills / techniques to be mastered.
- Extended time to complete class work
- Provide copy of class notes
- Preferential seating to be mutually determined by the student and teacher
- Student may request to use a computer to complete assignments.
- Establish expectations for correct spelling on assignments.
- Extra textbooks for home.
- Student may request books on tape / CD / digital media, as available and appropriate.
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- Assist student with long and short term planning of assignments
- Encourage student to proofread assignments and tests
- Provide regular parent/ school communication
- Teachers will check/sign student agenda daily
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- Leveled reading material

Modifications for Homework and Assignments

- Extended time to complete assignments.
- Student requires more complex assignments to be broken up and explained in smaller units, with work to be submitted in phases.
- Provide the student with clearly stated (written) expectations and grading criteria for assignments.
- Implement RAFT activities as they pertain to the types / modes of communication (role, audience, format, topic).

Modifications for Assessments

- Extended time on classroom tests and quizzes.
- Student may take/complete tests in an alternate setting as needed.
- Restate, reread, and clarify directions/questions
- Distribute study guide for classroom tests.
- Establish procedures for accommodations / modifications for assessments.

Green Township School District STEM Curriculum:
Unit 3: Engineering Iterations
Grade 6, 7, 8

Unit 3: Engineering Iterations

(Approximate Instructional Time: 12 weeks)

This unit will introduce students to a series of different engineering challenges. Throughout each challenge, students will have the opportunity to test and make improvements to their prototypes. As students begin by defining the problem, they learn to recognize the need, identify a target population, relate to the project, and identify its requirements and constraints. Then they conduct research, brainstorm alternative solutions, evaluate and select a possible solution, create and test prototypes, and improve their designs as needed. The iteration stage within a design project, allows students to learn from their failures and successes to produce a final prototype.

NJ Student Learning Standards for Science/Engineering	**Critical Knowledge & Skills**
• MS-ETS1-1 • MS-ETS1-2 • MS-ETS1-3	Students are 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. • evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. • analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success. • 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.

• MS-ETS1-4	
NJ Student Learning Standards for <u>Technology</u>	**Critical Knowledge & Skills**
• 8.1.8.F.1	Students are able to: • identify and define authentic problems and significant questions for investigation. • plan and manage activities to develop a solution or complete a project. • collect and analyze data to identify solutions and/or make informed decisions. • use multiple processes and diverse perspectives to explore alternative solutions.
• 8.2.8.C.2	• explain the need for optimization in a design process.
• 8.2.8.C.4	• identify the steps in the design process that would be used to solve a designated problem.
• 8.2.8.C.5	• explain the interdependence of a subsystem that operates as part of a system.
• 8.2.8.C.5.a	• create a technical sketch of a product with materials and measurements labeled.
• 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.3	• build a prototype that meets a STEM-based design challenge using science, engineering, and math principles that validate a solution.

Pacing Guide		
Topic	**Guiding Questions**	**Time Allocated**
Introduction to unit	● What is the iteration process? ● Why is this process important in the engineering/science field? ● How do I use my results to improve upon my projects?	.5 period
Challenge introduction, design and building (project 1)	● What are my engineering design goals and constraints? ● How well is my prototype working?	1.5 periods
Testing, Iteration and Re-testing (project 1)	● How did my prototype perform in the initial testing? ● How can I improve my prototype? ● Did my changes improve my prototype?	2 periods
Challenge introduction, design and building (project 2)	● What are my engineering design goals and constraints? ● How well is my prototype working?	2 periods

Testing, Iteration and Re-testing (project 2)	• How did my prototype perform in the initial testing? • How can I improve my prototype? • Did my changes improve my prototype?	2 periods
Challenge introduction, design and building (project 3)	• What are my engineering design goals and constraints? • How well is my prototype working?	2 periods
Testing, Iteration and Re-testing (project 3)	• How did my prototype perform in the initial testing? • How can I improve my prototype? • Did my changes improve my prototype?	2 periods

Interdisciplinary Connections

English-Language Arts:

Anchor Standards:

- ***NJSLSA.R1.*** *Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.*
- ***NJSLSA.R7****. Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.*
- ***NJSLSA.W2.*** *Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.*
- ***NJSLSA.W6.*** *Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.*
- ***NJSLSA.W7.*** *Conduct short as well as more sustained research projects, utilizing an inquiry-based research process, based on focused questions, demonstrating understanding of the subject under investigation.*
- ***NJSLSA.W8.*** *Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.*
- ***NJSLSA.SL1.*** *Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.*
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- ***NJSLSA.SL5.*** *Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.*

Standards for Mathematical Practice

- ***MP.1*** *Make sense of problems and persevere in solving them.*
- ***MP.2*** *Reason abstractly and quantitatively.*

- ***MP.3*** *Construct viable arguments & critique the reasoning of others.*
- ***MP.4*** *Model with mathematics.*
- ***MP.5*** *Use appropriate tools strategically.*
- ***MP.6*** *Attend to precision.*
- ***MP.7*** *Look for and make use of structure.*
- ***MP.8*** *Look for and express regularity in repeated reasoning.*

21st Century Skills/ Career Ready Practices:

- ***CRP1.*** *Act as a responsible and contributing citizen and employee.*
- ***CRP2.*** *Apply appropriate academic and technical skills.*
- ***CRP4.*** *Communicate clearly and effectively and with reason.*
- ***CRP5.*** *Consider the environmental, social and economic impacts of decisions.*
- ***CRP6.*** *Demonstrate creativity and innovation.*
- ***CRP7.*** *Employ valid and reliable research strategies.*
- ***CRP8.*** *Utilize critical thinking to make sense of problems and persevere in solving them.*
- ***CRP10.*** *Plan education and career paths aligned to personal goals.*
- ***CRP11.*** *Use technology to enhance productivity.*

School Resources, Suggested Activities, and Assessments

Educational Resources:	**Suggested Activities:**
Texts/Supplemental Reading/References Resources include but are not limited to: ● Teacher created SMARTBoard material ● Teacher approved articles/videos found on ○ Britannica.com ○ Pebblego.com ○ NewsELA.com ○ PBS.org ○ YouTube.com ○ Discovery.edu	Possible activities include but are not limited to: ● Doodlebot ● Rocket with parachute egg ● CoSpacesEDU escape room ● Sprinter cars
District/School Formative Assessment Plan	**District/School Summative Assessment Plan**
● Teacher observation of students engaged in group and	● Teacher created assessments and projects

independent activities. ● Individual and small group conferences/interviews to assess understanding with rubric ● Self-assessment by students with guidance from teacher. ● Exit tickets	● Teacher/District created benchmark assessments ● End of unit project presentation/testing

Differentiation, Accommodations, and Modifications

Gifted and Talented

Extension Activities
- Conduct research and provide presentation of various topics.
- Design surveys to generate and analyze data to be used in discussion.
- Debate topics of interest / cultural importance.
- Authentic listening and reading sources that provide data and support for speaking and writing prompts.
- Exploration of art and/or artists to understand society and history.
- Implement RAFT Activities as they pertain to the types / modes of communication (role, audience, format, topic).

Anchor Activities
- Use of Higher Level Questioning Techniques
- Provide assessments at a higher level of thinking

English Language Learners

Modifications for Classroom
- Pair visual prompts with verbal presentations
- Ask students to restate information, directions, and assignments.
- Repetition and practice.
- Model skills/techniques that need to be mastered.
- Extended time to complete class work
- Visual dictionaries to help build vocabulary
- Provide copy of class notes
- Pair with a peer for assistance during class
- Leveled reading material

Modifications for Homework/Assignments
- Modified Assignments

- Native Language Translation (peer, online assistive technology, translation device, bilingual dictionary)
- Extended time for assignment completion as needed
- Highlight key vocabulary
- Use graphic organizers

Students with Disabilities

(**appropriate accommodations, instructional adaptations, and/or modifications as determined by the IEP or 504 team**)

Modifications for Classroom

- Pair visual prompts with verbal presentations
- Ask students to restate information, directions, and assignments.
- Repetition and practice
- Model skills / techniques to be mastered.
- Extended time to complete class work
- Provide copy of class notes
- Preferential seating to be mutually determined by the student and teacher
- Students may request to use a computer to complete assignments.
- Establish expectations for correct spelling on assignments.
- Extra textbooks for home.
- Student may request books on tape / CD / digital media, as available and appropriate.
- Assign a peer helper in the class setting
- Provide oral reminders and check student work during independent work time
- Assist student with long and short term planning of assignments
- Encourage student to proofread assignments and tests
- Provide regular parent/ school communication
- Teachers will check/sign student agenda daily
- Student requires use of other assistive technology device
- Leveled reading material

Modifications for Homework and Assignments

- Extended time to complete assignments.
- Student requires more complex assignments to be broken up and explained in smaller units, with work to be submitted in phases.
- Provide the student with clearly stated (written) expectations and grading criteria for assignments.
- Implement RAFT activities as they pertain to the types / modes of communication (role, audience, format, topic).

Modifications for Assessments

- Extended time on classroom tests and quizzes.
- Student may take/complete tests in an alternate setting as needed.
- Restate, reread, and clarify directions/questions
- Distribute study guide for classroom tests.

- Establish procedures for accommodations / modifications for assessments.

Students at Risk of School Failure

Modifications for Classroom

- Pair visual prompts with verbal presentations
- Ask students to restate information, directions, and assignments.
- Repetition and practice
- Model skills / techniques to be mastered.
- Extended time to complete class work
- Provide copy of class notes
- Preferential seating to be mutually determined by the student and teacher
- Student may request to use a computer to complete assignments.
- Establish expectations for correct spelling on assignments.
- Extra textbooks for home.
- Student may request books on tape / CD / digital media, as available and appropriate.
- Assign a peer helper in the class setting
- Provide oral reminders and check student work during independent work time
- Assist student with long and short term planning of assignments
- Encourage student to proofread assignments and tests
- Provide regular parent/ school communication
- Teachers will check/sign student agenda daily
- Student requires use of other assistive technology device
- Leveled reading material

Modifications for Homework and Assignments

- Extended time to complete assignments.
- Student requires more complex assignments to be broken up and explained in smaller units, with work to be submitted in phases.
- Provide the student with clearly stated (written) expectations and grading criteria for assignments.
- Implement RAFT activities as they pertain to the types / modes of communication (role, audience, format, topic).

Modifications for Assessments

- Extended time on classroom tests and quizzes.
- Student may take/complete tests in an alternate setting as needed.
- Restate, reread, and clarify directions/questions
- Distribute study guide for classroom tests.
- Establish procedures for accommodations / modifications for assessments.

Green Township School District STEM Curriculum:
Unit 4: Robotics
Grade 6, 7, 8

Unit 4: Robotics

(Approximate Instructional Time: 6 weeks)

This unit will provide students with an opportunity to work with Lego Robots, which is hands-on and offers exposure to mechanical design, electronics, and programming. The engaging and motivating nature of the Lego Robotics software enables students to construct and program, as well as provide them with the scope to experiment, without prior knowledge or experience around programming or building. These activities will help students become prepared innovators and leaders that will be able to solve pressing challenges that we face in our world today and in our future.

NJ Student Learning Standards for Science/Engineering	**Critical Knowledge & Skills**
• MS-ETS1-1 • MS-ETS1-2 • MS-ETS1-3	Students are 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. • evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. • analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success. • 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.

• MS-ETS1-4	
NJ Student Learning Standards for <u>Technology</u>	**Critical Knowledge & Skills**
• 8.1.8.F.1	Students are able to: • identify and define authentic problems and significant questions for investigation. • plan and manage activities to develop a solution or complete a project. • collect and analyze data to identify solutions and/or make informed decisions. • use multiple processes and diverse perspectives to explore alternative solutions.
• 8.2.8.C.2	• explain the need for optimization in a design process.
• 8.2.8.C.4	• identify the steps in the design process that would be used to solve a designated problem.
• 8.2.8.C.5	• explain the interdependence of a subsystem that operates as part of a system.
• 8.2.8.D.1	• design and create a product that addresses a real world problem using a design process under specific constraints.
• 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. • demonstrate an understanding of the relationship between hardware and software.

• 8.2.8.E.2 • 8.2.8.E.3	• develop an algorithm to solve an assigned problem using a specified set of commands and use peer review to critique the solution.

Pacing Guide		
Topic	**Guiding Questions**	**Time Allocated**
Introduction to unit	• What are robots? • Where are robots used in society?	1 period
Building and programming	• What are my engineering design goals and constraints? • How can I program my Lego Robot to achieve my challenge goals?	4 periods
Testing	• How did my prototype perform in the testing?	1 period

Interdisciplinary Connections
English-Language Arts:
Anchor Standards: • ***NJSLSA.W8.*** *Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.* • ***NJSLSA.SL1.*** *Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.* • ***NJSLSA.SL2.*** *Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.* • ***NJSLSA.SL4.*** *Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.*

Standards for Mathematical Practice
● ***MP.1*** *Make sense of problems and persevere in solving them.* ● ***MP.2*** *Reason abstractly and quantitatively.* ● ***MP.3*** *Construct viable arguments & critique the reasoning of others.* ● ***MP.4*** *Model with mathematics.* ● ***MP.5*** *Use appropriate tools strategically.* ● ***MP.6*** *Attend to precision.* ● ***MP.7*** *Look for and make use of structure.* ● ***MP.8*** *Look for and express regularity in repeated reasoning.*
21st Century Skills/ Career Ready Practices:
● ***CRP1.*** *Act as a responsible and contributing citizen and employee.* ● ***CRP2.*** *Apply appropriate academic and technical skills.* ● ***CRP4.*** *Communicate clearly and effectively and with reason.* ● ***CRP5.*** *Consider the environmental, social and economic impacts of decisions.* ● ***CRP6.*** *Demonstrate creativity and innovation.* ● ***CRP7.*** *Employ valid and reliable research strategies.* ● ***CRP8.*** *Utilize critical thinking to make sense of problems and persevere in solving them.* ● ***CRP10.*** *Plan education and career paths aligned to personal goals.* ● ***CRP11.*** *Use technology to enhance productivity.*

School Resources, Suggested Activities, and Assessments	
Educational Resources:	**Suggested Activities:**

Texts/Supplemental Reading/References Resources include but are not limited to:
 	
● Teacher created SMARTBoard material
● Teacher approved articles/videos found on
  ○ Britannica.com
  ○ Pebblego.com
  ○ NewsELA.com
  ○ PBS.org
  ○ YouTube.com
	Possible activities include but are not limited to:
	
	● Autonomous Lego Robotics Robot that can navigate a maze using sensors (touch, ultrasonic, etc.)
	● Remote controlled Lego Robotic ATV

○ Discovery.edu	
District/School Formative Assessment Plan	**District/School Summative Assessment Plan**
● Teacher observation of students engaged in group and independent activities. ● Individual and small group conferences/interviews to assess understanding with rubric ● Self-assessment by students with guidance from teacher. ● Exit tickets	● Teacher created assessments and projects ● Teacher/District created benchmark assessments ● End of unit project presentation/testing

Differentiation, Accommodations, and Modifications

Gifted and Talented

Extension Activities

- Conduct research and provide presentation of various topics.
- Design surveys to generate and analyze data to be used in discussion.
- Debate topics of interest / cultural importance.
- Authentic listening and reading sources that provide data and support for speaking and writing prompts.
- Exploration of art and/or artists to understand society and history.
- Implement RAFT Activities as they pertain to the types / modes of communication (role, audience, format, topic).

Anchor Activities

- Use of Higher Level Questioning Techniques
- Provide assessments at a higher level of thinking

English Language Learners

Modifications for Classroom

- Pair visual prompts with verbal presentations
- Ask students to restate information, directions, and assignments.
- Repetition and practice.

- Model skills/techniques that need to be mastered.
- Extended time to complete class work
- Visual dictionaries to help build vocabulary
- Provide copy of class notes
- Pair with a peer for assistance during class
- Leveled reading material

Modifications for Homework/Assignments

- Modified Assignments
- Native Language Translation (peer, online assistive technology, translation device, bilingual dictionary)
- Extended time for assignment completion as needed
- Highlight key vocabulary
- Use graphic organizers

Students with Disabilities

(**appropriate accommodations, instructional adaptations, and/or modifications as determined by the IEP or 504 team**)

Modifications for Classroom

- Pair visual prompts with verbal presentations
- Ask students to restate information, directions, and assignments.
- Repetition and practice
- Model skills / techniques to be mastered.
- Extended time to complete class work
- Provide copy of class notes
- Preferential seating to be mutually determined by the student and teacher
- Students may request to use a computer to complete assignments.
- Establish expectations for correct spelling on assignments.
- Extra textbooks for home.
- Student may request books on tape / CD / digital media, as available and appropriate.
- Assign a peer helper in the class setting
- Provide oral reminders and check student work during independent work time
- Assist student with long and short term planning of assignments
- Encourage student to proofread assignments and tests
- Provide regular parent/ school communication
- Teachers will check/sign student agenda daily
- Student requires use of other assistive technology device
- Leveled reading material

Modifications for Homework and Assignments

- Extended time to complete assignments.

- Student requires more complex assignments to be broken up and explained in smaller units, with work to be submitted in phases.
- Provide the student with clearly stated (written) expectations and grading criteria for assignments.
- Implement RAFT activities as they pertain to the types / modes of communication (role, audience, format, topic).

Modifications for Assessments

- Extended time on classroom tests and quizzes.
- Student may take/complete tests in an alternate setting as needed.
- Restate, reread, and clarify directions/questions
- Distribute study guide for classroom tests.
- Establish procedures for accommodations / modifications for assessments.

Students at Risk of School Failure

Modifications for Classroom

- Pair visual prompts with verbal presentations
- Ask students to restate information, directions, and assignments.
- Repetition and practice
- Model skills / techniques to be mastered.
- Extended time to complete class work
- Provide copy of class notes
- Preferential seating to be mutually determined by the student and teacher
- Student may request to use a computer to complete assignments.
- Establish expectations for correct spelling on assignments.
- Extra textbooks for home.
- Student may request books on tape / CD / digital media, as available and appropriate.
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- Encourage student to proofread assignments and tests
- Provide regular parent/ school communication
- Teachers will check/sign student agenda daily
- Student requires use of other assistive technology device
- Leveled reading material

Modifications for Homework and Assignments

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Modifications for Assessments

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- Restate, reread, and clarify directions/questions
- Distribute study guide for classroom tests.
- Establish procedures for accommodations / modifications for assessments.

STEM Project Rubric
Grades 5 - 8

Student:_____ **Project: _____**

Assessment	Exceeds (4)	Satisfactory + (3)	Satisfactory (2)	Satisfactory - (1)	Not present (0)
End Product	The end product **exceeds** all challenge requirements.	The end product **meets all** challenge requirements.	The end product **meets most** of the challenge requirements.	The end product **meets few** of the challenge requirements.	The end product is **incomplete** or **does not mee**t the requirements
Planning and iteration	The student **displayed clear, coherent planning and iteration** during the **entire** building process	The student **displayed clear, coherent planning** during the **entire** building process	The student **displayed coherent planning** during the building process	The student **attempted coherent planning** during the building process	There was **no apparent planning** during the building process
Teamwork	The student **displayed positive leadership** skills and worked as a **productive team member** during the **entire** project	The student worked as a **productive team member** during the **entire** project	The student worked as a **productive team member** during the **majority** of the project	The student worked as a **productive team member** during **some** of the project	The student **did not work** as a **productive team member**
Effort and Attitude	The student **displayed full effor**t and **positive attitude** the **entire project**	The student displayed **effort** and **positive attitude** the **entire** project	The student displayed **effort** and **positive attitude** the **majority** of the project	The student displayed **effort** and **positive attitude** during **some** of the project	The student **did not** display **effort** and **positive attitude** during the project