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

8.1.A Educational Technology: All students will use digital tools to access, manage,evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge. **A. Technology Operations and Concepts:** Students demonstrate a sound understanding of technology concepts, systems and operations.

Kindergarten through Grade 2

- **8.1.2.A.1 -** Identify the basic features of a digital device and explain its purpose.
- **8.1.2.A.2 -** Create a document using a word processing application.
- **8.1.2.A.3 -** Compare the common uses of at least two different digital applications and identify the advantages and disadvantages of using each.
- **8.1.2.A.4 -** Demonstrate developmentally appropriate navigation skills in virtual environments.(i.e. Games, museums).
- **8.1.2.A.5 -** Enter information into a spreadsheet and sort the information.
- **8.1.2.A.6 -** Identify the structure and components of a database.
- **8.1.2.A.7 -** Enter information into a database or spreadsheet and filter the information.

Assessment Models

- Pre-Assessments
- Formative Assessments
- Summative Assessments
- Worksheets, Handouts

Suggested Learning Activities

- Q & A or Q and point to identify basic features of digital devices and explain its purpose.
    - Keyboard diagram, computer parts diagram.
- Google Doc of “my favorite things”.
- Create “Friendly letter” to the classroom teacher. (Friendly Letter template from Google)
- Identify Destiny as our Library Database and Learn360 as our School Database.
- Venn Diagram of Google Slides vs. Canva or Prezi.
- Journal response
- Class survey of favorite candy, enter into a spreadsheet, sort the information.
- Navigate through Google Maps, other environments or games.

Benchmark: Independently create a Google Doc that includes: varying fonts, texts and sizes; image insert; table or chart.

Grade 3 through 5

- **8.1.5.A.1 -** Select and use the appropriate digital tools and resources to accomplish a variety of tasks including solving problems.
- **8.1.5.A.2 -** Format a document using a word processing application to enhance text and include graphics, symbols and/or pictures.
- **8.1.5.A.3 -** Use a graphic organizer or organize information about a problem or issue.
- **8.1.5.A.4 -** Graph data using a spreadsheet, analyze and produce a report that explains the analysis of the data.
- **8.1.5.A.5 -** Create and use a database to answer basic questions.
- **8.1.5.A.6 -** Export data from a database into a spreadsheet; analyze and produce a report that explains the analysis of the data.

Assessment Models

- Formative Assessments
- Summative Assessments
- Worksheets
- Projects
- Spreadsheets
- Exit tickets
- Journal response

Suggested Learning Activities

- Polar Animal research project.
- Travel Brochure project.
- Google Sheets creation. Create a question, collect data and analyze.
- Google Docs, Slides
- Reflection/Self evaluation

Benchmark: Independently create a Google Sheet that includes: column headers; information rows; Sum function; data. Write a one page report explaining the data.

Grade 6 through 8

- **8.1.8.A.1 -** Demonstrate knowledge of real world problems using digital tools.
- **8.1.8.A.2 -** Create a document (e.g. newsletter, reports, personalized learning plan, business letters or flyers) using one or more digital applications to be critiqued by professionals for usability.
- **8.1.8.A.3 -** Use and/or develop a simulation that provides an environment to solve a real world problem or theory.
- **8.1.8.A.4 -** Graph and calculate data within a spreadsheet and present a summary of the results.

- **8.1.8.A.5 -** Create a database query, sort and create a report and describe the process, and explain the report results.

Assessment Models

- Formative Assessments
- Summative Assessments
- Peer Review
- Projects
- Spreadsheets
- Charts and Graphs
- Digital Reports
- Class Participation

Suggested Learning Activities

- Create flyers for school activities.
- Graph & Spreadsheet of Personal electronic use.
- Recycling in School: research, data analysis and solution.
- Collaborate with Social Studies: create a historical newspaper using Google template.
    - https://docs.google.com/presentation/d/1pU5s3WSEVyOQyvRDd3FiWLEVj6KbG0sbCOI1uVCNcfs/copy
    - https://docs.google.com/document/d/1-y3qRRScjzPD0qIb8sZBvMhOp35U4eLriCEVmChycs4/template/preview?
- Real world problem (i.e. school safety): brainstorm a local problem, research, create a digital presentation using Canva, Prezi or other presentation tools.

Benchmark: Independently create a Google Sheet that is used for ongoing data collection throughout year. Create a summary report of the data, formulate an action plan using the data.

8.1.B Educational Technology: All students will use digital tools to access, manage,evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge. **B. Creativity and Innovation:** Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.

Kindergarten through Grade 2

- **8.1.2.B.1-** Illustrate and communicate original ideas and stories using multiple digital tools and resources.

Assessment Models

- Formative Assessments
- Summative Assessments
- Observation
- Projects

Suggested Learning Activities

- Digital story creation using Storybird.
- Video journaling and response using Flipgrid.
- ABCya
    - All about me
    - Story Maker

Grade 3 through 5

- **8.1.5.B.1 -** Collaborate to produce a digital story about a significant local event or issue based on first-person interviews.

Assessment Models

- Formative Assessments
- Summative Assessments
- Projects
- Graphic Organizers
- Observation
- Participation

Suggested Learning Activities

- Digital story creation tools
    - Powtoons
    - Google Slides
    - Animoto
- Story themes
    - Teacher interviews
    - Community helpers
    - “If I ran the school…”

Grade 6 through 8

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

Assessment Models

- Formative Assessments
- Summative Assessments
- Projects
- Graphic Organizers
- Observation
- Participation

Suggested Learning Activities

- Brainstorm & research a local event (Memorial Day, Spring Clean Up, Fire Prevention Week, etc.), create a digital advertisement for the event.
- Brainstorm & research a global issue (global warming, clean water, educational equality, etc), create a digital graphic organizer/presentation.
- Digital Tools
    - Google Slides
    - Prezi
    - Canva
    - Google Drawing
    - Flipgrid

8.1.C Educational Technology: All students will use digital tools to access, manage,evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge. **C. Communication and Collaboration:** Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of other.

Kindergarten through Grade 2

8.1.2.C.1 - Engage in a variety of developmentally appropriate learning activities with students in other

classes, schools, or countries using various media formats such as online collaborative tools, and social media.

Assessment Models

- Formative Assessments
- Summative Assessments
- Worksheets, handouts
- Reflections
- Journals

Suggested Learning Activities

- Use a discussion prompt to engage with other classes.
- Research a question and engage in a dialog with students in other schools.
- Use of interactive tools:
    - Google Hangouts
    - Skype
    - Flipgrid
- Video clips to aid learning and model discussions.

Grade 3 through Grade 5

8.1.5.C.1 - Engage in online discussions with learners of other cultures to investigate a worldwide issue from multiple perspectives and sources, evaluate findings and present possible solutions, using digital tools and online resources for all steps.

Assessment Models

- Formative Assessments
- Summative Assessments
- Worksheets, handouts
- Reflections

- Journals
- Projects

Suggested Learning Activities

- Endangered Animals research project:
    - gather evidence
    - Create a poster, digital presentation
- Current Events research project
- Newsela news articles, read, analyze and discuss with group, class, other classes
- Discuss and analyze above projects with “video pals” via:
    - Google Hangouts
    - Skype
    - Fligpgrid

Grade 6 through 8

8.1.8.C.1 - Collaborate to develop and publish work hat provides perspectives on a global problem for discussions with learners from other countries.

Assessment Models

- Formative Assessments
- Summative Assessments
- Worksheets, handouts
- Reflections
- Journals
- Projects
- Peer Assessment

Suggested Learning Activities

- Global Issues research project
    - Working in groups, select a topic
    - Research and gather evidence in a graphic organizer
    - Create a digital presentation
- KWL chart to support discussions on global topics
- Video discussions via:
    - Skype
    - Google Hangouts
    - Other approved apps/websites

8.1.D Educational Technology: All students will use digital tools to access, manage,evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge. **D. Digital Citizenship:** Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.

Kindergarten through Grade 2
8.1.2.D.1- Develop an understanding of ownership of print and nonprint information.

Assessment Models
- Formative Assessments
- Summative Assessments
- Worksheets, handouts
- Reflections
- Journals

Suggested Learning Activities
- BrainPop Jr. Plagiarism videos
- Common Sense Media online games and activities https:/www.commonsensemedia.org/

- Be Internet Awesome https://beinternetawesome.withgoogle.com/en/interland (grade 2)
- Lecture, discussion, examples
- Change it up: Rewrite a sentence to make it your own
- Author and Illustrator scavenger hunt, books and online

Grade 3 through 5

- **8.1.5.D.1 -** Understand the need for and use of copyrights.
- **8.1.5.D.2 -** Analyze the resource citation in online materials for proper use.
- **8.1.5.D.3 -** Demonstrate an understanding of the need to practice cyber safety, cyber security, and cyber ethics when using technologies and social media.
- **8.1.5.D.4 -** Understand digital citizenship and demonstrate an understanding of the personal consequences of inappropriate use of technology and social media.

Assessment Models

- Formative Assessments
- Summative Assessments
- Worksheets, handouts
- Reflections
- Journals

Suggested Learning Activities

- BrainPop Plagiarism videos
- Common Sense Media online resources and activities: https:/www.commonsensemedia.org/
- Website evaluation using R.E.A.L. https://www.powtoon.com/c/c0BDHa7x5BU/0/m
- Lecture, Discussion, Examples
- Citations and reference page activity with Polar Animal research project
- BrainPop videos: Social Networking, Cyberbullying, Digital Etiquette, etc. https://www.brainpop.com/technology/digitalcitizenship/socialnetworking/
- Be Internet Awesome https://beinternetawesome.withgoogle.com/en/interland

Grade 6 through 8

- **8.1.8.D.1 -** Understand and model appropriate online behaviors related to cyber safety, cyber bullying, cyber security, and cyber ethics including appropriate use of social media.
- **8.1.8.D.2 -** Demonstrate the application of appropriate citations to digital content.
- **8.1.8.D.3 -** Demonstrate an understanding of fair use and Creative Commons to intellectual property.
- **8.1.8.D.4 -** Assess the credibility and accuracy of digital content.
- **8.1.8.D.5 -** Understand appropriate uses for social media and the negative consequences of misuse.

Assessment Models

- Formative Assessments
- Summative Assessments
- Worksheets, handouts
- Reflections
- Journals

Suggested Learning Activities

- Read and take notes from *What you need to know about plagiarism* from the New Jersey State Bar Foundation.
- Online scavenger hunt/resource citation activity.
- BrainPop videos/activities: Media Literacy, Cyberbullying, Copyright, etc.
    - https://www.brainpop.com/english/studyandreadingskills/medialiteracy/
    - https://www.brainpop.com/english/writing/plagiarism/
    - https://www.brainpop.com/english/writing/onlinesources/
- Lecture and examples of Plagiarism in current and historical times.
- Describe the forms of use in *Creative Commons.*
- Website evaluation using R.E.A.L. https://www.powtoon.com/c/c0BDHa7x5BU/0/m

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

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

Kindergarten through Grade 2

- **8.1.2.E.1 -** Use digital tools and online resources to explore a problem or issue.

Assessment Models

- Pre-Assessment
- Formative Assessments
- Summative Assessments
- Worksheets, handouts
- Reflections
- Journals

Suggested Learning Activities

- Create a Google Search
- Research a topic using *World Book Online, Learn 360,* and other online resources.

Grade 3 through 5

- **8.1.5.E.1 -** Use digital tools to research and evaluate the accuracy of, relevance to, and appropriateness of using print and non-print electronic information sources to complete a variety of tasks.

Assessment Models

- Pre-Assessment
- Formative Assessments
- Summative Assessments
- Worksheets, handouts
- Reflections
- Journals

Suggested Learning Activities

- Polar Animal research project
- Winter Holiday research project
- BrainPop activities
    - https://www.brainpop.com/games/searchshark/
- *World Book Online, Learn 360*

Grade 6 through 8

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

Assessment Models

- Formative Assessments
- Summative Assessments
- Projects
- Worksheets, handouts
- Reflections
- Journals

Suggested Learning Activities

- Global Issue research project
- Newsela reading
- Graphic Organizer of problem, facts & solution.
- Jerseyclicks.org use *Primary Search* http://web.b.ebscohost.com/ehost/search/basic?vid=0&sid=8abb21e5-b671-4202-adc2-8b7ba12b18df%40sessionmgr102and
- *World Book online, Learn 360*

- Local Public Websites (alphaboro.org, other)

8.1.F Educational Technology: All students will use digital tools to access, manage,evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge. **F. Critical thinking, problem solving, and decision making:** Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decision using appropriate digital tools and resources.

Kindergarten through Grade 2

- **8.1.2.F.1 -** Use geographic mapping tools to plan and solve problems.

Assessment Models

- Pre-Assessment
- Formative Assessments
- Summative Assessments
- Worksheets, handouts
- Exit tickets
- Journals

Suggested Learning Activities

- Google Maps usage
- Google Earth website
- Google Exploration App
- World Book research project

Grades 3 through 5

- **8.1.5.F.1 -** Apply digital tools to collect, organize, and analyze data that support a scientific finding.

Assessment Models

- Pre-Assessment
- Formative Assessments
- Summative Assessments
- Google Sheets project
- Projects
- Quiz

Suggested Learning Activities

- Polar Animal research project
- Previous projects

Grades 6 through 8

- **8.1.8.F.1 -** Explore a local issue, by using digital tools to collect and analyze data to identify a solution and make an informed decision.

Assessment Models

- Pre-Assessment
- Formative Assessments
- Summative Assessments
- Google Sheets project
- Projects

Suggested Learning Activities

- Global/Local Issue research project
- Newsela reading
- Graphic Organizer of problem, facts & solution.
- Jerseyclicks.org use *Primary Search* http://web.b.ebscohost.com/ehost/search/basic?vid=0&sid=8abb21e5-b671-4202-adc2-8b7ba12b18df%40sessionmgr102and

- *World Book online, Learn 360*
- Local Public Websites (alphaboro.org, other)

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

8.2.A Technology Education, Engineering, Design and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual,global society, and the environment. **A.The Nature of Technology: Creativity and Innovation:** Technology systems impact every aspect of the world in which we live.

Kindergarten through Grade 2

- **8.2.2.A.1 -** Define products produced as a result of technology or of nature.
- **8.2.2.A.2 -** Describe how designed products and systems are useful at school, home and work.
- **8.2.2.A.3 -** Identify a system and the components that work together to accomplish its purpose.
- **8.2.2.A.4 -** Choose a product to make and plan the tools and materials needed.
- **8.2.2.A.5 -** Collaborate to design a solution to a problem affecting the community.

Assessment Models

- Pre-Assessment
- Formative Assessments
- Summative Assessments
- Oral Presentation
- Teacher Observation

Suggested Learning Activities

- Venn Diagrams (technology v. nature)
- Technology survey
- Create products through MakerSpace activities
- “How does it work?” (select simple, everyday item & explain why we use it & how it works)
- Now build and expand on that item from above ↑.
- Earth Day Group Project: Identify and solve a community/global problem related to ecology.

Grades 3 through 5

- **8.2.5.A.1 -** Compare and contrast how products made in nature differ from products that are human made in how they are produced and used.
- **8.2.5.A.2 -** Investigate and present factors that influence the development and function of a product and a system.
- **8.2.5.A.3 -** investigate and present factors that influence the development and function of a products and systems e.g., resources, criteria and constraints.
- **8.2.5.A.4 -** Compare and contrast how technologies have changed over time due to human needs and economic, political and/or cultural influences.
- **8.2.5.A.5 -** Identify how improvement in the understanding of materials science impacts technologies.

Assessment Models

- Pre-Assessment
- Formative Assessments
- Summative Assessments
- Digital presentations
- Research project

Suggested Learning Activities

- Timelines of innovation
- Compare & Contrast activities
    - Graphic Organizers
    - Venn Diagrams
- Production spreadsheets
- Research the history of a product and its development over time.
- Research global issues through The Global Goals for Sustainable Development, http://www.globalgoals.org/

Grades 6 through 8

- **8.2.8.A.1 -** Research a product that was designed for a specific demand and identify how the product has changed to meet new demands (i.e. telephone for communication - smart phone for mobility needs).
- **8.2.8.A.2 -** Examine a system, consider how each part relates to other parts, and discuss a part to redesign to improve the system.
- **8.2.8.A.3 -** Investigate a malfunction in any part of a system and identify its impacts.
- **8.2.8.A.4 -** Redesign an existing product that impacts the environment to lessen its impact(s) on the environment.
- **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.

Assessment Models

- Pre-Assessment
- Formative Assessments
- Summative Assessments
- Digital presentations
- Research project

Suggested Learning Activities

- Research and present on a particular technology or system.
    - How does it work?
    - How does it make something easier, faster, more efficient?
    - Could it malfunction? Why?
    - Why was it developed in the first place?
    - What could its next version be?
- Production of technology or system videos
    - Youtube https://youtu.be/V8ZVHpgYAzs
    - Khan Academy (NASA) https://www.khanacademy.org/science/science-engineering-partners/nasa/nasa-welcome/nasa-mission-control/v/nasa-khan

8.2.B Technology Education, Engineering, Design and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual,global society, and the environment. **B. Technology and Society:** Knowledge and understanding of human, cultural and societal values are fundamental when designing technological systems and products in the global society.

Kindergarten through Grade 2

- **8.2.2.B.1 -** Identify how technology impacts or improves life.
- **8.2.2.B.2 -** Demonstrate how reusing a product affects the local and global environment.
- **8.2.2.B.3 -** Identify products or systems that are designed to meet human needs.
- **8.2.2.B.4 -** Identify how the ways people live and work has changed because of technology.

Assessment Models

- Pre-Assessment
- Formative Assessments
- Summative Assessments
- Oral Presentation
- Teacher Observation
- Projects
- Exit tickets

Suggested Learning Activities

- Technology survey
- Global Comparison graphic organizers/presentations (compare U.S. use of technology with another country)
    - Cooking implements and methods
    - Transportation
    - School buildings and materials
    - Toys and play
    - Homes
    - Communication
    - Doctors and medicine
- “How does it work?” (select common technology, explain why we use it & how it improves our lives)
- Earth Day Group Project: Identify and solve a community/global problem related to ecology.

- Web based videos and interactive games and design challenges (i.e. https://PBSkids.org/designsquad, https://kids.nationalgeographic.com/)

Grade 3 through 5

- **8.2.5.B.1 -** Examine ethical considerations in the development and production of a product through its life cycle.
- **8.2.5.B.2 -** Examine systems used for recycling and recommend simplification of the systems and share with product developers.
- **8.2.5.B.3 -** Investigate ways that various technologies are being developed and used to reduce improper use of resources.
- **8.2.5.B.4 -** Research technologies that have changed due to society's changing needs and wants.
- **8.2.5.B.5 -** Explain the purpose of intellectual property law.
- **8.2.5.B.6 -** Compare and discuss how technologies have influenced history in the past century.

Assessment Models

- Pre-Assessment
- Formative Assessments
- Summative Assessments
- Digital presentations
- Research project

Suggested Learning Activities

- Timelines of innovation
- Compare & Contrast activities on technology & environmental health
    - Graphic Organizers
    - Venn Diagrams
- Production of spreadsheets (costs vs. benefits)

- Research the history of a product and its development over time with regard to changing needs and wants.
- Use Creative Commons for explanation of fair use and research.

Grades 6 through 8

- **8.2.8.B.1 -** Evaluate the history and impact of sustainability on the development of a designed product or system over time and present results to peers.
- **8.2.8.B.2 -** Identify the desired and undesired consequences from the use of a product or system.
- **8.2.8.B.3 -** Research and analyze the ethical issues of a product or system on the environment and report findings for review by peers and/or experts.
- **8.2.8.B.4 -** Research examples of how humans can devise technologies to reduce the negative consequences of other technologies and present your findings.
- **8.2.8.B.5 -** Identify new technologies resulting from the demands, values, and interests of individuals, businesses, industries and societies.
- **8.2.8.B.6 -** Compare and contrast the different types of intellectual property including copyrights, patents and trademarks.
- **8.2.8.B.7 -** Analyze the historical impact of waste and demonstrate how a product is upcycled, reused or remanufactured into a new product.

Assessment Models

- Pre-Assessment
- Formative Assessments
- Summative Assessments
- Digital presentations
- Research projects

Suggested Learning Activities

- Research and present on a particular product.

    - Desired and undesired consequences of use, including the historical impact of disposal— upcycling, reuse, remanufacture or addition to waste in landfills
    - Ethical issues (cost, environmental impact, ownership)
    - Human/social impact
    - How sustainable is this product? (development, use, refinement, disposal)
- Explore The Global Goals for sustainable development, http://www.globalgoals.org/
- Create a digital presentation that draws conclusions as to how technology evolves to meet society's wants and needs.
- Analyze, Compare, and contrast ways waste is processed.
- Direct instruction and use of Creative Commons for explanation and proper use regarding:
    - Fair use
    - Copyrights
    - Patents
    - Trademarks
        - (Introduce students throughout instruction to the differences among the preceding aspects of intellectual property, for technology, print works, and other products of human invention)
- Digital scavenger hunt: find information, images, quotes, etc. and properly give credit to source or creator.

8.2.C Technology Education, Engineering, Design and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual,global society, and the environment. **C. Design:** The design process is a systematic approach to solving problems.

Kindergarten through Grade 2

- **8.2.2.C.1 -** Brainstorm ideas on how to solve a problem or build a product.
- **8.2.2.C.2 -** Create a drawing of a product or device that communicates its function to peers and discuss.
- **8.2.2.C.3 -** Explain why we need to make new products.
- **8.2.2.C.4 -** Identify designed products and brainstorm how to improve one used in the classroom.
- **8.2.2.C.5 -** Describe how the parts of a common to or tool interact and work as part of a system.
- **8.2.2.C.6 -** Investigate a product that has stopped working and brainstorm ideas to correct the problem.

Assessment Models

- Summative Assessments
- Oral Presentation
- Teacher Observation
- Projects
- Exit tickets
- Drawings

Suggested Learning Activities

- Choose familiar “problems” for students to solve:
    - How to assemble a puzzle
    - How to fix/improve a toy that is not working
    - How to explain how a toy “works”
    - How to use a digital device or application
        - Chromebook, iPads
        - Ozodraw, Path (Dash robot),
- Use the Design Process to identify and articulate the steps in solving the above “problems”.
    - Use drawings to communicate ideas, process, reflection, iterations.
- Give students opportunities to practice explaining why new products of all kinds are developed.
    - Brand new kinds of toys, tools, digital devices

    - Improvements on known and familiar toys, tools, digital devices
- Begin using Tynkercad as design tool

Grade 3 through 5

- **8.2.5.C.1 -** Collaborate with peers to illustrate components of a designed system.
- **8.2.5.C.2.-** Explain how specifications and limitations can be used to direct a product's development.
- **8.2.5.C.3 -** Research how design modifications have lead to new products.
- **8.2.5.C.4 -** Collaborate and brainstorm with peers to solve a problem evaluating all solutions to provide the best results with supporting sketches or models.
- **8.2.5.C.5 -** Explain the functions of a system and subsystems.
- **8.2.5.C.6 -** Examine a malfunctioning tool and identify the process to troubleshoot and present options to repair the tool.
- **8.2.5.C.7 -** Work with peers to redesign an existing product for a different purpose.

Assessment Models

- Formative Assessments
- Summative Assessments
- Digital presentations
- Oral presentations
- Design project
- Self Assessments

Suggested Learning Activities

- Choose various technological systems and have students, working in collaborative groups:
    - Map and illustrate components of a particular system, identifying subsystems and their functions
    - Analyze the system and identify what it COULD do, but is not currently able to do.
    - Explain possible reasons for these limitations in the functions of the systems (resource constraints, cost and feature tradeoffs, consumer demand, etc.)

- Choose a particular product type (containers, shoes, phones, school supplies, computer programs) and have students work in collaborative groups to:
    - Research design modifications in the product type, and analyze how those modifications have led to new versions AND new products
    - Design the next generation or version of a product type:
        - Articulate the problem to be solved by the new product or version
        - Sketch or model the potential solutions to the problem
        - Explain the troubleshooting process that influences a choice of solution
        - Choose one solution and sketch the design, all systems and their function
    - Repeat the process above in collaborative groups, with the focus this time on redesigning an existing product for a new use or purpose
- Have students choose a tool of any kind that is not working as it should.
    - First, students need to identify a process for troubleshooting the malfunction
    - Then, students should present the options for repairing the malfunction
- Begin exploring the Design Process in Tynkercad for 3D printing

Grades 6 through 8

- **8.2.8.C.1 -** Explain how different teams/groups can contribute to the overall design of a product.
- **8.2.8.C.2 -** Explain the need for optimization in a design process.
- **8.2.8.C.3 -** Evaluate the function, value, and aesthetics of a technological product or system, from the perspective of the user and the producer.
- **8.2.8.C.4 -** Identify the steps in the design process that would be used to solve a designated problem.
- **8.2.8.C.5 -** Explain the interdependence of a subsystem that operates as part of a system.
- **8.2.8.C.5a -** Create a technical sketch of a product with materials and measurements labeled.
- **8.2.8.C.6 -** Collaborate to examine a malfunctioning system and identify the step-by-step process used to troubleshoot, evaluate and test options to repair the product, presenting the better solution.

- **8.2.8.C.7 -** Collaborate with peers and experts in the field to research and develop a product using the design process, data analysis and trends, and maintain a design log with annotated sketches to record the developmental cycle.
- **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.

Assessment Models

- Formative Assessments
- Summative Assessments
- Digital presentations
- Oral presentations
- Design project
- Self Assessments

Suggested Learning Activities

- Choose various technological systems and have students, working in collaborative groups:
    - Evaluate the function, value, and aesthetics of the system from BOTH the user and the producer perspective
    - To develop an understanding of the concept of 'optimization,' have students analyze the following:
        - What tradeoffs the producers made in the final design of the system—what did the *producers* choose to optimize?
        - What might the users optimize if they were to redesign the system—what would a *user* optimize?
- Choose a particular product malfunction and in a collaborative group
    - Analyze the source of the malfunction in the context of the overall design of the product. (Map the steps in the design process to locate the place in the process that leads to the malfunction)
    - Create a technical sketch of the particular function/subsystem in the design that is the probable source of the malfunction
    - Identify the step-by-step process used to troubleshoot the solution to the malfunction, given the probable source—i.e., students will create a plan for collecting data and verifying results and conclusions
    - Choose a workable solution and present its advantages over other possible solutions
- Research and design a product that responds to a particular set of defined needs, by working in a collaborative group that includes fellow students and experts in the larger community outside the school. The group should

complete all of the following:
- Data and trend analysis
- Design log (record of design ideas, sketches, choices, and versions)
- Develop a proposal for the chosen design solution that includes models (physical, graphical or mathematical) that explain its functions and their interdependence

8.2.D Technology Education, Engineering, Design and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual,global society, and the environment. **D. Abilities for a Technological World:** The designed world is the product of a design process that provides the means to convert resources into products and systems.

Kindergarten through Grade 2

- **8.2.2.D.1 -** Collaborate and apply a design process to solve a simple problem from everyday experiences.
- **8.2.2.D.2 -** Discover how a product works by taking it apart, sketching how parts fit, and putting it back together.
- **8.2.2.D.3 -** Identify the strengths and weaknesses in a product or system.
- **8.2.2.D.4 -** Identify the resources needed to create technological products or systems.
- **8.2.2.D.5 -** Identify how using a tool (such as a bucket or wagon) aids in reducing work.

Assessment Models

- Summative Assessments
- Oral Presentation
- Teacher Observation

- Projects
- Exit tickets
- Drawings

Suggested Learning Activities

- Choose a familiar tool that has several parts [a wagon, a bicycle, a collapsible box, ball-point pen] and have students working in collaborative groups
    - **Activity One** [Form]
        - Take a picture or make a drawing of the tool
        - Take the tool apart
        - Sketch each of the parts and how they fit together
        - Put the tool back together
    - **Activity Two** [Function]
        - Have students identify how this tool aids humans in reducing work
        - Have students identify the strengths and weaknesses of the tool's design for its intended function
- Choose a familiar technology-based product or system (phone, laptop, television, flashlight). Have students identify the resources needed to create (manufacture, distribute, maintain) this product or system.
- Kano Kit: Using separate pieces,assemble and disassemble a computer.

Grade 3 through 5

- **8.2.5.D.1 -** Identify and collect information about a problem that can be solved by technology, generate ideas to solve the problem, and identify constraints and trade-offs to be considered.
- **8.2.5.D.2 -** Evaluate and test alternative solutions to a problem using constraints and trade-offs identified in the design process to evaluate potential solutions.
- **8.2.5.D.3 -** Follow step by step directions to assemble a product or solve a problem.
- **8.2.5.D.4 -** Explain why human-designed systems, products, and environments need to be constantly monitored, maintained, and improved.

- **8.2.5.D.5 -** Describe how resources such as material, energy information, time, tools, people and capital are used in products or systems.
- **8.2.5.D.6 -** Explain the positive and negative effect of products and systems on humans, other species and the environment, and when the product or system should be used.
- **8.2.5.D.7 -** Explain the impact that resources such as energy and materials used in a process to produce products or system have on the environment.

Assessment Models

- Summative Assessments
- Oral Presentation
- Teacher Observation
- Projects
- Exit tickets
- Drawings

Suggested Learning Activities

- Code.org activities
- Environmental impact research project (from earlier) or an expansion of that project
- Create a list of problems that could be solved by technology (getting food from the farm to the grocery store; getting papers and activities in order; cleaning a house; creating clean water for drinking)
    - Working in groups, choose one of the problems
    - Research the problem so that all aspects of the challenges are known
    - Make a list of ideas about ways to address the problem and meet the challenges
    - Identify the tradeoffs and constraints in each of the possible solutions
    - Evaluate the possible solutions by using the tradeoffs and constraints
    - Choose one solution and write the step by step directions the solution requires to solve the problem
    - Identify the resources the preferred solution would require: material, energy, information, time, tools, people and capital

- Explain the impact of the use of the resources necessary for the chosen solution on humans, other species, the environment
- Create a digital presentation of you findings

Grade 6 through 8

- **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 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**.**
- **8.2.8.D.4 -** Research and publish the steps for using and maintaining a product or system and incorporate diagrams or images throughout to enhance user comprehension.
- **8.2.8.D.5 -** Explain the impact of resource selection and the production process in the development of a common or technological product or system.
- **8.2.8.D.6 -** Identify and explain how the resources and processes used in the production of a current technological product can be modified to have a more positive impact on the environment.

Assessment Models

- Summative Assessments
- Oral Presentation
- Teacher Observation
- Projects
- Exit tickets

- Drawings

Suggested Learning Activities

- Apply the Design Process to simple creations to solve classroom problems
    - Use TynkerCad to create a 3D image product
    - Use a design log (record of design ideas, sketches, choices, and versions)
    - Peer review designs
    - Use 3D printer to create the product
    - Present final product in a multimedia presentation, design portfolio or oral presentation.
- Create a list of products for students to design and build (a bridge, the egg drop, a functioning windmill, build a tower, solar ovens). Working in groups, students will choose a product
    - First, the group must clearly and specifically define the problem their product is intended to solve or the need it is intended to meet.
    - Brainstorm multiple solutions to the problem, identify the design constraints and tradeoffs, and choose one solution
    - Identify the resources needed to build a prototype of the design and the impact of the use of those resources
    - Build the prototype and report the design constraints, the tradeoffs, and likely potential weaknesses in the design in a multimedia presentation, design portfolio or engineering notebook that includes models, sketches, and scientific, engineering and mathematical principles that underlie the design.
- Have students choose an existing technological product and
    - Identify the resources necessary for production, distribution, packaging
    - A systematic methodology for modifying the resources used for production to create a more positive impact on the environment

8.2.E Technology Education, Engineering, Design and Computational Thinking - Programming:

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

Computational thinking builds and enhances problem solving, allowing students to move beyond using knowledge to creating knowledge.

Kindergarten through Grade 2

- **8.2.2.E.1 -** List and demonstrate the steps to an everyday task
- **8.2.2.E.2 -** Demonstrate an understanding of how a computer takes input through a series of written commands and then interprets and displays information as output.
- **8.2.2.E.3 -** Create algorithms (a sets of instructions) using a predefined set of commands (e.g., to move a student or a character through a maze).
- **8.2.2.E.4 -** Debug an algorithm (i.e., correct an error)
- **8.2.2.E.5 -** Use appropriate terms in conversation (e.g., basic vocabulary words: input, output, the operating system, debug, and algorithm)

Assessment Models

- Pre-Assessment
- Formative Assessments
- Summative Assessments
- Teacher Observation
- Exit tickets
- Reflection and self assessment

Suggested Learning Activities

- Web based computer programming
    - Code.org
    - Khan Academy
    - Tynker

    - PBS Kids
- Robotics
    - BeeBot (directional programming)
    - Ozobot (color programming, Ozoblockly programming)
    - Dash & Dot (Icon programming, path coding, Blockly programming)
- Unplugged Activities
    - Sequencing activities
    - Human robot
    - MakerSpace activities

Grade 3 through 5

- **8.2.5.E.1 -** 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).

Assessment Models

- Pre-Assessment
- Formative Assessments
- Summative Assessments
- Teacher Observation
- Exit tickets
- Reflection and self assessment

Suggested Learning Activities

- Web based computer programming
    - Code.org
    - Khan Academy
    - Appinventor.org
    - Code Combat
- Robotics
    - BeeBot (directional programming)
    - Ozobot (color programming, Ozoblockly programming)
    - Dash & Dot (Blockly programming)
- Unplugged Activities
    - Sequencing activities
    - Create a Programming Language (i.e., symbols to represent a desired motion)
    - MakerSpace activities

Grade 6 through 8

- **8.2.5.E.1 -** Identify ways computers are used that have had an impact across the range of human activity and within different careers where they are used.
- **8.2.5.E.2 -** Demonstrate an understanding of the relationship between hardware and software.
- **8.2.5.E.3 -** Develop an algorithm to solve an assigned problem using a specified set of commands and use peer review to critique the solution.
- **8.2.5.E.4 -** Use appropriate terms in conversation (e.g., programming, language, data, RAM, ROM, Boolean logic terms).

Assessment Models

- Pre-Assessment
- Formative Assessments

- Summative Assessments
- Teacher Observation
- Exit tickets
- Reflection and self assessment
- Peer review

Suggested Learning Activities

- Web based computer programming
    - Code.org (blockly, java)
    - Khan Academy (java, HTML, CSS options)
    - Appinventor.org
    - Code Combat (Python, javascript)
- Robotics
    - Ozobot (Ozoblockly programming)
    - Dash & Dot (Blockly programming)
- Unplugged Activities
    - Create a Programming Language (i.e., symbols to represent a desired motion)
    - MakerSpace activities
- Research Project: Ways computers are used that have had an impact across many human activities and within different careers.
    - Choose appropriate digital tools for research
    - Find reliable website using the R.E.A.L. criteria for web evaluation.
    - Create a digital presentation using an appropriate digital platform.
    - Present, self evaluate, peer evaluate

Differentiation: IEPs, 504s, ELL and T&G, students at risk of failure	21st Century Skills / Career
-Modify work as needed	-CRP1- Act as a responsible and contributing citizen and employee

-teacher will read aloud questions -allow more time if needed, preferential seating -Provide challenge activities for enrichment	-CRP2- apply appropriate academic and technical skills -CRP4- communicate clearly and effectively and with reason -CRP6- Demonstrate creativity and innovation -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 -CRP12-work productively in teams while cultural global competence